GOVERNMENT COLLEGE OF ENGINEERING, JALGAON [M.S]

(An Autonomous Institute of Government of Maharashtra)

"Globally Accepted Engineers with Human Skills"

Curriculum
for
Third Year B. Tech. Instrumentation
2016-17

IN301 INDUSTRIAL AUTOMATION AND MANAGEMENT

Teaching Scheme: 03L Total: 03 **Credits:** 03
Evaluation Scheme: 10 ISA + 15 ISE1 +15 ISE2 + 60 ESE **Total Marks:** 100
Duration of ESE: 03Hrs

Course Description:

The course focuses on programmable logic controller (PLC) & distributed control system (DCS) based industrial Automation systems and the Industrial management. The course will cover supervisory control system (SCADA), DCS and PLC system in terms of their architecture their interface to the process hardware, the functionality and the application development of the controls of machinery. It gives overview of Industrial management.

Course Objectives:

1. To understand the role of industrial automation for different processes.
2. To learn the application of PLC and DCS based system in process control.
3. To understand the basics of industrial management.

Course Outcomes:

Upon successful completion of this course the students will be able to

1. apply the knowledge of automation in machine control.
2. design and conduct practical in realistic constrain on motors such that it is applicable in manufacturing, testing and maintenance field.
3. design the automation system for fast and value added quality product for economical growth through technological development.
4. solve engineering solution for fast growing industrial sector with reliable atomized system using PLC and SCADA system.
5. appreciate the concepts in industrial management and safety.

Relevance of PO's and Strength of Co-relation:

PO. No.	Programme Outcome	strength of co-relation
e	Understand and utilize programmable logic controllers (PLC), distributed control systems (DCS) and supervisory control systems for control of manufacturing and processing systems	**3**
F	Use modern engineering tools, software and equipments to design and analyze problems.	**2**
J	Follow industrial safety norms and work to benefit environmental and societal context.	**2**
C	Apply concepts of control system and automatic control for the operation of processes	**1**

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Course Content

Industrial Automation Basics

Fundamentals of industrial automation, need and role of automation, evolution of automation, elements of process control loop, current trends, automation strategy evolution, control system audit, automation tools and strategies and their location in plant, introduction to automation tools like PLC, supervisory control and data acquisition (SCADA), distributed control system (DCS), hybrid DCS/PLC.

Programmable Logic Controller

Evolution of PLC, definition, functions, advantages, architecture, DI-DO-AI-AO examples and ratings, I/O module, working of PLC, scan time, types of PLC, choosing PLC for application, installation of PLC, rack installation, grounding and shielding, physical, electrical, maintenance requirements, planning, verifying, troubleshooting, fault diagnosis techniques, Need of interfacing, PLC interface to hydraulic/pneumatic circuits, solid-state device,developmentof relay logic ladder diagram, introduction to PLC programming, programming devices and languages as per IEC 61131-3 like IL, ST, FBD, CFC, SFC, PLC timers and counters, PLC selection, installation and troubleshooting, advanced PLC instructions like program control, comparison, mathematical, logical, communication, shift registers, sequencers, data handling, advanced mathematical, PLC programming for industrial applications using advanced instructions.

Distributed Control System

DCS – basic packages introduction, analog control, direct digital control, distributed process control, DCS configuration with associated accessories, control console equipment, control unit (relay rack mounted equipments), local control units, and attributes of DCS & DCS flow sheet symbols, DCS system integration, I/O hardware stations, set-point station control, supervisory computer tasks & configurations, system integration with PLCs and computers, human machine interface for process monitoring and control, introduction to expert systems, and statistical process controls.

Industrial Applications of Automation Tools

HART protocol, frame structure, programming, implementation examples, advantages and limitations of field bus, FDS configuration, comparison with other field bus standards including device net, profibus, control net, CAN, industrial ethernet, MAP and TOP.

PLC, SCADA, DCS and open system for following plants: cement plant, thermal power plant, power plant, steel plant, glass manufacturing plant, paper and pulp plant.

Industrial Management

Management, administration, organization and their relationship, importance characteristics of management, managerial skills and objectives, principals and functions of management, levels of management and management structure.

Text Books

1. Instruments Engineers Handbook: VoL-II, Process Control by Bela G. Liptak, Third edition,Chilton.1995
2. Programmable Logic Controller by J.D.Otter, first edition, (PHI), 1987.
3. Industrial Engineering and Management by O.P. Khanna, Fourth edition, DhanpatRai Publication, 1999.

Reference Books

1. Application of Computer in Process Control by Considine, Fifth Edition, Tata McGraw Hill 2009.
2. Modern Control Techniques for the process industries by T.H Tsai,J.W Lane, Mareet Dekkar, first edition, N.Y 1986
3. Distributed Computer Control for Industrial Automation by Vijay P. Bhatkar, DobrivojePopovic,Second edition, Dekker,CRC Press 1990.
4. Computer-based Industrial Controls by Krishan Kant, Second edition, PHI 2004.

IN302 CONTROL SYSTEM COMPONENTS

Teaching Scheme: 03L Total: 03 **Credits:** 03
Evaluation Scheme: 10 ISA + 15 ISE1 +15 ISE2 + 60 ESE **Total Marks:** 100
Duration of ESE: 03Hrs

Course Description:

This course provides knowledge about different control system components like various types of transmitters and converters. It gives brief introduction to control valves and the study of various control modes controllers like PID.

Course Objectives:

1. To understand the basic principle of control system components of different systems.
2. To understand the basic principle of controllers.
3. The objective of the course is to provide students with a firm grasp of the essential principles of control system components.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. apply the knowledge of the control system components for controlling various industrial parameters.
2. identify, formulate and solve a problem using hydraulic, electrical & pneumatic system.
3. analyze the process characteristics and apply suitable controller to that process.

Relevance of PO's and Strength of Co-relation:

Po No.	Programme Outcome	strength of co-relation
a	Demonstrates basic knowledge in concepts of Science, mathematics and electrical / electronics to measurement and control systems.	**3**
d	Apply the concepts of digital, analog electronics, microprocessor systems and functionality of system components/devices for the automation of processes.	**2**
f	Use modern engineering tools, software and equipments to design and analyze problems.	**2**
l	An ability to work professionally in both software and hardware system areas including the design and realization of such systems.	**1**

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

Course Content

Introduction to Control System Components

Comparison of different systems: hydraulic, pneumatic and electronic systems, 2-wire transmitters, buoyancy, differential pressure transmitters, temperature, electro-hydraulic transmitters, resistance-to-current converter, voltage-to-current convertor, pneumatic to electric converter, electrical to pneumatic converter, square root extractor, integrator and totalizer.

Control Valves

Terminology, types and characteristics, selection of control valves, concept of C_v, calculation of $C_v$and trim size, cavitations and flashing, noise in control valves, testing of control valve, valve positioners, necessity, types and effect on performance of control valves, electrical, pneumatic and hydraulic actuators, electro-pneumatic and electro-hydraulic actuators.

Pneumatic and Hydraulic Components

Instrument air supply, air filter regulator, simple pneumatic circuits, and fluidic gates, linear motors(piston- cylinder), rotary motors, non-return valves, directional control valve, pressure reducing valves, hydraulic power pack, pumps, simple hydraulic circuits and transmission. power cylinders, servomotors, DC valves.

Controller Principles

Process characteristics, process equation, process load, process lag, self regulation, control system parameter, error, variable range, control parameter range, control lag, dead time, cycling, controller modes, two position mode, multi-position mode, floating control mode, proportional control mode, integral control mode, derivative control mode, PI, PD, PID, its tuning, implementation of control modes in pneumatic, hydraulic, and electronics.

Auxiliary Components

Synchros, servo motor, stepper motor, feeders and dampers, intrinsic safety and components, gyroscope, indicators and alarm annunciator, control panel and their design.

Text Books:

1. Industrial Electronics by Petruzella, first edition, Tata McGraw-Hill, Feb-1995.
2. Pneumatic components and circuits by Mujumdar, first edition, Tata McGraw-Hill 1996.
3. Industrial Hydraulics by Pipenger, third Edition, Tata McGraw-Hill 1987.

Reference Books:

1. Process Control and Instrument Technology by C.D.Jhonson, eighth edition, Prentice-Hall of India 2006.
2. Principles of Process Control by D.Patranabis, third Edition, Tata McGraw-Hill 2012.
3. Instrumentation for Process Measurement and Control by N.A.Anderson, third Edition,CRC Press 2000.
4. Control System Engineering by I.J.Nagrath, M.Gopal,Second Edition, Tata McGraw-Hill 2006.
5. Programmable Logic Controllers by JhonWebb,Fifth Edition, PHI,1999.
6. Automatic Control Engineering by Francis Raven, Fifth Edition, McGraw-Hill 2001.
7. Handbook of Instrumentation Engineers (Process Control) Vol.1. by Bela G.Liptak, Fifth Edition.

IN303 MICROCONTROLLER AND APPLICATIONS

Teaching Scheme: 03L Total: 03 **Credits:** 03
Evaluation Scheme: 10 ISA + 15 ISE1 +15 ISE2 + 60 ESE **Total Marks:** 100
Duration of ESE: 03Hrs

Course Description:

It is an introductory course on microcontrollers with coverage of architecture, hardware interfaces, software and description of applications.

Course Objectives:

1. To provide stimulating learning experience while facilitating students to become proficient in designing with 8051 and PIC.
2. Imparting knowledge about the complete hardware of the microcontrollers and software used to develop programs.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. compare and contrast microprocessors and microcontrollers and understand the concept of embedded system.
2. compare and contrast various members of 8051 family and PIC family.

Relevance of PO's and strength of co-relation:

Po No.	Programme Outcome	strength of co-relation
a	Demonstrates basic knowledge in concepts of science, mathematics and electrical / electronics to measurement and control systems.	**3**
d	Apply the concepts of digital, analog electronics, microprocessor systems and functionality of system components/devices for the automation of processes.	**2**
f	Use modern engineering tools, software and equipments to design and analyse problems.	**2**
g	Participate and succeed in competitive examinations and engage in life-long learning.	**1**

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

Course Content

Introduction to 8051 Microcontroller

Architecture of 8051, memory organization and interface, instruction syntax, data types, subroutines, addressing modes, instruction timings, 8051 instructions.

8051 Programming

Assembly language programs, assembler directives, time delay calculations, software development tools for 8051, integrated development environment, assembler, simulator and compiler.

8051 Parallel I/O Ports

Basic I/O concepts, port structure and operation, interfacing push buttons, matrix keyboard, seven-segment and LCD displays, interfacing D/A and A/D converter using parallel ports, interfacing serial A/D converter, stepper motor and DC motor interface.

8051 Interrupts, Timers/Counters and Serial Communication

8051 Interrupt structure, timers and counters and their operating modes, programming 8051 timers, Basics of serial data communication, 8051 serial communication modes, serial communication programming, Interfacing 8255A with 8051.

Introduction to PIC Microcontroller

PIC architecture and assembly language programming, PIC I/O port programming, PIC programming in C, PIC18F hardware connections, PIC Timer and serial port programming, interrupt programming, ADC/DAC, applications.

Text Books:

1. 8051 Microcontroller Hardware, Software and Applications by V. Udayashankara and M. S. Mallikarjunaswamy, Tata McGraw Hill, 2009.
2. The 8051 Microcontroller and Embedded Systems Using Assembly and C by Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, second edition, Pearson Education, 2006.
3. PIC Microcontroller and Embedded Systems Using Assembly and C for PIC18 by Muhammad Ali Mazidi, Rolind D. Mckinlay and Danny Causey, Pearson Prentice Hall, 2008.

Reference Books:

1. 8051 Microcontroller: Internals, Instructions, Programming and Interfacing by Subrata Ghoshal, second edition, Pearson Education, 2010.
2. 8051 Microcontroller by Sampath K. Venkatesh, published by S. K. Kataria and Sons, 2014.

IN304 POWER ELECTRONICS

Teaching Scheme: 03L Total: 03 **Credits:** 03
Evaluation Scheme: 10 ISA + 15 ISE1 +15 ISE2 + 60 ESE **Total Marks:** 100
Duration of ESE: 03Hrs

Course Description:

The course aims learning of basic principles of power electronics. It comprises of the basic concepts, components and various circuits in power electronics. The students can use this knowledge to understand, design and implement various power electronics circuits for industrial applications.

Course Objectives:

1. Familiarize with principles of power electronics circuits and their classifications.
2. Acquiring an understanding of power conversion using operation, performance and applications of power electronics circuits.
3. Utilize semiconductor devices and technology in power systems, industrial drive controls and automation.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. apply basic knowledge of power family components for designing power control circuits.
2. understand the working principles, classifications of various power electronics circuits.
3. analyze the characteristics, controls, power stages and applications of power electronic circuits.
4. design and implement industrial applications of power electronic circuits.

Relevance of PO's and strength of co-relation:

Po No.	Programme Outcome	strength of co-relation
a	Demonstrates basic knowledge in concepts of science, mathematics and electrical / electronics to measurement and control systems.	**3**
d	Apply the concepts of digital, analog electronics, microprocessor systems and functionality of system components/devices for the automation of processes.	**3**
f	Use modern engineering tools, software and equipments to design and analyze problems.	**2**
g	Participate and succeed in competitive examinations and engage in life-long learning.	**1**

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

Course Content

Power Family Components

SCR; SCR construction and characteristics and working of SCR,Triac, Diac, SCS, SUS, LASCR, methods of turning on an SCR, turn-on, turn-off mechanism and characteristic, device specifications, rating and nomenclature of SCR, SCR triggering circuits, R, RC, pulse and UJT triggering circuits, Protection circuits for SCR, multiple connection of SCR: series operation, parallel operation, string efficiency.

Commutation of SCR: Natural and Forced commutation techniques.

Rectifier and Inverter

Controlled rectifier: Single phase and three-phase controlled rectifier circuits, with R, RL load, with FWD, dual converters.

Inverters: Principle of operation of series inverter, parallel inverter and bridge inverter, designing of commutating component, UPS and SMPS.

AC Voltage Controllers and Cycloconverters

AC voltage controllers: single-phase & three-phase with R and RL load.

Cycloconverter: single-phase and three-phase cycloconverters, induction heating and dielectric heating, resistance welding.

Chopper and Speed Control of Motor

Choppers: classification of choppers, step-up, step-down chopper, Jones chopper, Morgan chopper, and principle of operation for each method. Chopper control techniques, Speed control of single- phase induction motor-using SCR and triac: various methods their circuit diagrams and working.

Industrial Applications

SCR control applications: AC and DC static circuit breaker, over voltage protection circuit, zero voltage switch, Integral-cycle triggering, time delay circuit, soft start circuit, temperature regulator, SCR-controlled dimmer circuit, emergency light using SCR, automatic water level indicator, automatic battery charger using SCR, ultrasonics and it's applications.

Text Books

1. Power Electronics by Dr. P. S. Bimbhra, Fourth Edition, Khanna Publisher.

References Books:

1. An Introduction to Thyristors and Their Applications by M. Ramamoorthy, second edition, East-West Press, 1991.
2. Power Electronics by M. D. Singh and K. B. Khanchandani, second edition, Tata McGraw Hill, 2007.
3. Industrial Electronics and Control by S. K. Bhattacharya, S. Chatterjee, Tata McGraw Hill, 2006.
4. Power Electronics by P. C. Sen, Tata McGraw Hill, 2008.

IN305 INSTRUMENTATION IN UNIT OPERATION

Teaching Scheme: 03L Total: 03 **Credits:** 03
Evaluation Scheme: 10 ISA + 15 ISE1 +15 ISE2 + 60 ESE **Total Marks:** 100
Duration of ESE: 03Hrs

Course Description:

The course is designed to familiarize the student with the unit operations and the instrumentation systems. This course contains the introduction of unit operations and its application to the present industry. The course contains basic principles of design of controllers for basic operations like evaporation, distillation etc.

Course Objectives:

1. Familiarise the students with the concepts of basic components of chemical engineering.
2. Understand basics of unit processes and how to apply control to these processes.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. understand the basic concepts of material balance and energy balance.
2. understand the concept of different unit operations in industry
3. discuss basics of distillation columns & gas absorptions.
4. understand the process of extraction, crystallization & drying.
5. select suitable size reduction equipment, separation equipment and proper conveying medium.

Relevance of PO's and strength of co-relation:

Po No.	Programme Outcome	strength of co-relation
a	Demonstrates basic knowledge in concepts of chemical engineering, different processes in industry.	**3**
d	Apply the concepts of process control to the automation of processes.	**2**
f	Use modern engineering tools, software and equipments to design and analyze problems.	**1**
g	Participate and succeed in competitive examinations and engage in life-long learning.	**1**

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

Course Content

Introduction

Concepts of unit operation and unit processes, material balance and energy balance.

Evaporation: Liquid characteristics, Types of evaporators: long-tube vertical evaporator (upward flow, downward flow, forced circulations), agitated- film evaporators, method of feeding, single effect and multiple effect evaporator, capacity and economy of an evaporator, Instrumentation and control for this process: evaporator control.

Drying: Classification of dryer, basic principle and operation, Types of dryers: tray drier, rotary drum drier, vacuum drier, fluidized bed drier, Dryer control.

Distillation

Concept of distillation, Methods of distillation: batch distillation, continuous distillation, flash distillation, Material balance and energy balance for simple distillation process, Rayleigh's equation, reflux ratio, Fractionating column: slue plate arrangement, rectification and stripping, Basic control in distillation process.

Leaching and Extraction: Principle of leaching, leaching equipments, Extraction: principle of extraction, various extraction equipments.

Crystallization

Concept of crystallization, saturation and super saturation, effects of temperature on solubility, methods of super saturation. Crystallizers: classification of crystallisers, agitated tank crystallizer, Swenson–Walker crystallizer, vacuum crystallizers, Oslo crystalliszer. Material balance of crystallizer, Crystallizer control.

Mechanical Seperation: Separation of solids from solids**-** screening, screening equipments, Filtration: mechanism of filtration, Types of industrial filter: rotary filter, filter press, centrifuges, bag filter, electrostatic precipitator, centrifuge separator, centrifuge control.

Material Handling Equipments

Transport Equipments, positioning equipments, unit load formation equipment, storage equipment, identification and control equipment.

Size reduction: Principle of commutation, type of size-reduction equipment, Crushers: jaw crusher, roll crusher, Grinders: hammer mill, revolving mill, ball mill.

Heat Exchangers

Basic modes of heat transfer, basic laws, Heat transfer equipments: double pipe heat exchanger, shell and tube heat exchanger: type of shell and tube exchanger, Temperature pattern in heat exchanger.

Boilers: Types of boilers like FBC, CFBC, DIPC, fluidized bed, boiler safety standards, combustion control, air to fuel control, three element drum level control, steam temperature and pressure control, boiler control and optimization.

Application of above unit operation in manufacturing industries like paper industry, fertilizer industry, sugar industry.

Text Books:

1. Unit Operations in Chemical Engineering by W. L. McCabe, J. C. Smith and P. Harriot, VII edition, McGraw-Hill, 2004.
2. Unit operations-II Heat and Mass Transfer by K. A. Gavhane, 23rd edition, Nirali Publications, 2009.

Reference Books:

1. Instrumentation Engineers Handbook Vol II: Process Control and Optimization by Bela G. Liptak, 4th edition, CRC Press, 2006.
2. Automatic Process Control by P. Harriot, Tata McGraw-Hill Publishing Company Limited.
3. Chemical Engineer's Handbook by Perry, 6thedition , McGraw hill int. student ed.
4. Elementary Principles of Chemical Processes by Fedler, Rotsseau, Herriot, Wiley, 1978.
5. Outline of Chemical Technology by Gopalrao, M. Sitting, 2nd edition, East West Press, 1973.

IN306 CONTROL SYSTEM COMPONENTS LAB

Teaching Scheme: 02P Total: 02 **Credit:** 01
Evaluation Scheme: 50 ICA **Total Marks:** 50

Course Description:

This lab course provides the knowledge of various control components and controllers used for Industrial control systems.

Minimum Ten experiments shall be performed to cover entire curriculum of course IN302. The list given below is just a guideline.

List of Experiment:

1. Study of pneumatic components and simple pneumatic circuits.
2. Study of hydraulic components and simple hydraulic circuits.
3. To plot the characteristics of two-wire transmitter.
4. To plot the characteristics of I/P or P/I converter.
5. Calibration of DP transmitter for flow/ level interface.
6. Tuning of PID controller.
7. Study of actuators.
8. To plot the characteristics of control valve.
9. Implement various ISA sequence on alarm annunciator.
10. To plot the characteristics of synchros.
11. To plot the characteristics of square root extractor.
12. Study of Pressure switch / Temperature switch.

Note:

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format**.**

IN307 Industrial Automation and Management Lab

Teaching Scheme: 02P Total: 02 **Credit:** 01
Evaluation Scheme: 25 ICA+ 25 ESE **Total Marks:** 50
Duration of ESE: 03Hrs

Course Description:

In this laboratory, course emphasis will be on design and development of control logic using PLC and DCS and SCADA

Minimum Ten experiments shall be performed to cover entire curriculum of course IN301. The list given below is just a guideline.

List of Experiment:

1. Develop ladder logic program for elevator control.
2. Develop ladder logic program for stepper motor control.
3. Develop ladder logic program for interfacing of proximity switch.
4. Develop one application on SCADA.
5. Develop ladder logic program for interfacing liquid level sensor to PLC.
6. Develop ladder logic program for interfacing bottle filling plant to PLC.
7. Develop logic on DCS to implement ratio control.
8. Develop logic on DCS to implement cascade control.
9. Develop logic on DCS to implement level control.
10. Develop logic on DCS to implement temperature control.
11. Develop logic on DCS to implement flow control.
12. Develop logic on DCS to interface pneumatic components.

Note:

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**
- **ESE –** The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

IN308 MICROCONTROLLER AND APPLICATIONS LAB

Teaching Scheme: 02P Total: 02 **Credit:** 01
Evaluation Scheme: 25 ICA+ 25 ESE **Total Marks:** 50
Duration of ESE: 03Hrs

Course Description:

This course covers various aspects of 8051C and assembly language programming and interfacing. Examples and programs will be covered to clarify the concepts and provide students an opportunity to learn by doing. This course provides the base by which the design and interfacing of microcontroller based embedded systems can be explored.

Minimum Ten experiments shall be performed to cover entire curriculum of course IN303. The list given below is just a guideline.

List of Experiment:

1. Introduction to Microcontroller 8051 Instruction set.
2. Write a 8051 assembly language program for multiplication of two 8-bit numbers.
3. Write a 8051 ALP for division of two 8-bit numbers.
4. Write a 8051 ALP to find largest number from a given array.
5. Write a 8051 ALP to find smallest number from a given array.
6. Write a 8051 ALP to transfer the block of memory contents from one to another memory location.
7. Write a 8051 ALP to arrange the numbers in ascending/ descending order.
8. Write a 8051 ALP to add/subtract two numbers and display on LCD display.
9. Introduction to software development tools: SC51 compiler.
10. Write a C program to turn on the buzzer through 8051 I/O ports.
11. Introduction to software development tools: Micro-vision C compiler and simulator.
12. Write a C program to send a message on serial port and simulate the same in Micro-vision C compiler and simulator.
13. Write a C program to turn on the port LEDs based on key input from port pushbuttons.
14. Write a C program for communication between PC and 8051 μc through serial port.
15. Write a program to generate two square waves – one of 5 KHz frequency at pin P1.3 and another of frequency 25 KHz at pin P2.3. Assume XTAL=222 MHz.
16. Write a 8051 C program to send letters ‘M’, ‘D’, ‘E’ to LCD using delays.
17. Write a PIC ALP to find the sum of the values 79H, F5H and E2H. Put the sum in file Reg locations 5 (low byte) and 6 (high byte)
18. Write a PIC ALP to generate a square wave of 50% duty cycle on bit0 of port C.
19. Write a C18 program to toggle all the bits of Port B ports continuously with a 250 ms delay. Assume that the system is PIC18F458 with XTAL = 10 MHz.
20. Write a Program to control the speed of DC motor.
21. Write a program to control the speed of stepper motor.

Note: Minimum 30 percent experiments shall be performed using PIC.

Note:

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**
- **ESE –** The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

IN309 POWER ELECTRONICS LAB

Teaching Scheme: 02P Total: 02 **Credit:** 01
Evaluation Scheme: 25 ICA+ 25 ESE **Total Marks:** 50
Duration of ESE: 03Hrs

Course Description:

In this laboratory, course emphasis on imparting the practical knowledge and understanding of basic principles, characteristic, performance of power family components and power electronics circuits. It also gives the platform for designing and implementing industrial applications of power control circuits for industrial drives and control.

Minimum Ten experiments shall be performed to cover entire curriculum of course IN309. The list given below is just a guideline.

List of Experiment:

Teacher should facilitate learning following lab experiments:

1. Design and plot the characteristics of SCR.
2. Design and plot the characteristics of triac.
3. Design and implement different firing circuit for thyristor.
4. Design and implement single-phase half wave controlled rectifier.
5. Design and implement single-phase full wave controlled rectifier.
6. Design and implement different commutation circuits.
7. Design and implement series inverter.
8. Design and implement parallel inverter.
9. Design and implement single phase cycloconverter.
10. Design and implement step-up chopper.
11. Design and implement step-down chopper.
12. Design and implement SCR controlled dimmer circuit.
13. Design and implement AC/DC universal motor speed control using SCR.
14. Design and implement AC/DC Universal motor speed control using triac.

Note:

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**
- **ESE –** The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

IN310 VIRTUAL INSTRUMENTATION AND LABVIEW (LAB)

Teaching Scheme: 02P Total: 02 **Credits:** 01
Evaluation Scheme: 25 ICA+ 25 ESE **Total Marks:** 50
Duration of ESE: 03Hrs

Course Description:

In this laboratory, course emphasis on imparting the hands on, practical knowledge and understanding of basics of graphical and dataflow programming methods, learning of NI LabVIEW software, use of various tools in software for developing a VI, study of different hardware available in laboratory for interfacing real data signal to LabVIEW., design of real time systems for measurement and control, biomedical.

Prerequisites Courses: Second year engineering and understanding of computer programming.

Course Objectives:

1. Understand graphical programming using LabVIEW.
2. Design virtual instruments using LabVIEW.
3. Acquire knowledge on how virtual instrumentation can be applied for data acquisition and instrument control.
4. Case Study of Labview Projects such as biomedical, aerospace, measurement and control.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. use of various tools in software for developing a VI and interfacing different Hardware.
2. identify salient traits of a virtual instrument and incorporate these traits in their Projects.
3. experiment, analyze and document in the laboratory prototype measurement Systems using a computer, plug-in DAQ interfaces and bench level instrument.

Relevance of PO's and Strength of Co-relation:

Po No.	Programme Outcome	strength of co-relation
a	Demonstrates basic knowledge in concepts of Science, mathematics and electrical / electronics to measurement and control systems.	**3**
d	Apply the concepts of digital, analog electronics, microprocessor systems and functionality of system components/devices for the automation of processes.	**2**
f	Use modern engineering tools, software and equipments to design and analyze problems.	**2**
g	Participate and succeed in competitive examinations and engage in life-long learning.	**1**

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Minimum ten experiments shall be performed. The list given below is just a guideline.
Introduction to virtual instrumentation, need of VI, advantages of VI, define VI, block diagram & architecture of VI, data flow techniques, graphical programming in data flow, comparison with conventional programming, LabVIEW software, study of data acquisition & control using LabVIEW software and hardware.

Teacher should facilitate learning following lab experiments:

1. To study programming for virtual instrument using LabVIEW.
2. Develop a LabVIEW program for conversion
   - degree celsius to fahrenheit
   - degree celsius to kelvin
   - degree celsius to rankin
3. Implementation of full adder using LabVIEW.
4. To generate 'n' random number using for loop and show it on graph.
5. To develop a LabView program for creating function generator for variable with variable amplitude, frequency and phase.
6. To Develop a LabView program for addition of
   - Array with Array
   - Array with Number
   - Cluster with Number
7. Develop a LabVIEW program for addition of matrix with matrix waveform with number.
8. Develop a LabView program for demonstration using case structure.
9. Develop a LabVIEW program for Amplitude, Phase and Frequency measurement.
10. To Integrate and use Hardware compatible with LabVIEW like DAQ Cards, NI ELVISBoard etc.
11. Develop a LabVIEW based temperature measurement and control System.
12. Develop Mini Project on LABVIEW software.
13. Study Integration of LABVIEW with any other Controller.
14. Study five integrated virtual instruments using NI Virtual bench.
15. Study of 12 integrated virtual instrument using NI ELVIS2.
16. Digital I/O handling using NIDAQ6009.
17. Analog I/O handling using NIDAQ6009.

Note:

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **.**
- **ESE –** The End Semester Examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

IN351 DIGITAL CONTROL SYSTEM

Teaching Scheme: 03L Total: 03 **Credits:** 03
Evaluation Scheme: 10 ISA + 15 ISE1 +15 ISE2 + 60 ESE **Total Marks:** 100
Duration of ESE: 03Hrs

Course Description:

This course provides knowledge about discrete time control system and components. It also provides the knowledge state space analysis, representation and useful transformations in state space analysis and design.

Course Objectives:

1. An ability to analyze the requirements of discrete control systems.
2. An ability to design of discrete time control system by conventional methods.
3. An ability to design state space representation of discrete time systems
4. An ability to estimate, analyze, improve the stability.

Course Outcomes:

Upon successful completion of this course the students will be able to

1. analyze the requirements of discrete control systems.
2. design discrete time control system by conventional methods.
3. estimate, analyze, and improve the stability of control systems.

Relevance of PO's and Strength of Co-relation:

PO. No.	Programme Outcome	strength of co-relation
c	Apply the concept of control system and automatic control for the operation of continuous and discrete systems.	**3**
f	Use modern engineering tools, softwares and equipments to design and analyse problems	**2**
i	Model and simulate the automatic control system	**2**

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

Course Content

Introduction: State, state space, state variables, state vector, state matrix, Jordan canonical form, state transition matrix.

Discrete-Time Control Systems: Introduction basic building blocks of discrete time control system quantization and quantization error, sampling theorem, Z transform applications for solving differential equations.

Z Plane Analysis of Discrete-Time Control Systems: Introduction impulse sampling and data hold transfer function of zero order hold and first order hold pulse transfer function.

Design of Discrete Time Control System by conventional methods: Introduction mapping between the S plane and Z plane. stability analysis in Z-plane, Jury stability criterion, bilinear transformations digital controller design using analytical design method.

State Space Analysis of Discrete Time Control System

state space representation of discrete time systems solution of discrete time state space equations pulse transfer function matrix discretization of continuous time state space equations, similarity transformations.

Pole Placement and Observer Design

Concept of controllability and observability useful transformations in state space analysis and design stability improvement by state feedback, design via pole placement, state observers.quadratic optimal control steady-state quadratic optimal control.

Text Books

1. Discrete Time Control systems by K. Ogata, 2nd Edition, Prentice Hall, 2003.
2. Digital Control and State Variable Methods by M. Gopal, 3rd edition,Tata McGraw Hill, 2003.

Reference Books

1. Digital control of Dynamic Systems by G.F.Franklin, J. David Powell, Michael Workman, 3rd edition, Addison Wesley, 2000.
2. Digital Control Engineering by M. Gopal, Wiley Eastern Ltd, 1st edition, 1989.
3. Digital Control by KannanMoudgalya, 3rd edition, John Wiley and Sons, 2007.
4. Digital Control – Fundamental theory and Practice, by Forsytheand W. and Goodall R.N McMillan,Vol. 3, 1st edition,1991.
5. Digital Control Systems by Contantine H. Houpis and Gary B. Lamont, 2nd Edition, McGraw-Hill International, 2002.

IN352 DIGITAL SIGNAL PROCESSING

Teaching Scheme: 03L Total: 03 **Credits:** 03
Evaluation Scheme: 10 ISA + 15 ISE1 +15 ISE2 + 60 ESE **Total Marks:** 100
Duration of ESE: 03Hrs

Course Description:

This course provides knowledge about discrete Fourier transform, FFT algorithms. Not only this but also students can design the IIR and FIR filters. This course also includes DSP processor and its applications.

Course Objectives:

1. To understand discrete time Fourier series & its properties.
2. To study and design of FIR filter, and IIR filter.
3. To study DSP hardware and design applications of DSP processor for biomedical, Speech, image processing.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. apply the various programming techniques on DSPs.
2. design FIR and IIR filters using different techniques.
3. compute the DFT and FFT methods for various signals.

Relevance of PO's and Strength of Co-relation:

Po No.	Programme Outcome	strength of co-relation
a	An ability to apply knowledge of mathematics, science, and engineering.	**3**
e	An ability to identify, formulates, and solves engineering p	**2**
f	Use modern engineering tools, software and equipments to design and analyze problems.	**3**
l	An ability to work professionally in both software and hardware system areas including the design and realization of such systems	**1**

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

Course Content

Convolution and DFT

Convolution sum, methods for finding convolution, correlation, cross correlation and auto correlation, frequency response analysis of signal using DFT, discrete Fourier transfer & its properties, convolution by means of DFT and IDFT.

FFT Algorithms

Decimation in time and frequency radix-2 FFT algorithms, IFFT by using DIT and DIF algorithm, IDFT using FFT algorithms.

FIR Filter

Introduction to finite impulse response filter, concept of linear phase filters, FIR filter design using different windowing techniques & frequency sampling method, basic structure of FIR system.

IIR Filter

Introduction to infinite impulse response filter, impulse invariance and bilinear transformation, design specification of IIR low pass filter and frequency transformation, design of IIR filter using Butterworth, Chebyshev approximation, filter realization methods for IIR filter, finite word length effects.

DSP Processor

Introduction to DSP hardware, block diagram of TMS320C67XX processor, applications of TMS320C67XX like applications of DSP processor in biomedical, speech, audio signals and radar processing.

Text Books:

1. Discrete time signal processing by Oppenheim and Schafer, 2nd edition, Pearson Publication, 2007.
2. Digital Signal Processing, by S.Salivahanan, 2nd edition, Tata McGraw Hill,2007.
3. Digital Signal Processing by Ramesh Babu, 4th edition, Scitech Publication Pvt Ltd. India, 2007.

Reference Books:

1. Digital Signal Processing: Principles, algorithms and applications by Proakis, Manolakis, PHI, 4th edition, 2007.
2. Digital Signal Processing by A. NagoorKani, 2nd edition, McGraw Hill, 2012.
3. Digital Signal Processing, applications using C & TMS320C6X DSK by Rulph Chassaing, 1st edition, WILEY publication, 2002.

IN353 DATA COMMUNICATION AND TELEMETRY

Teaching Scheme: 03L Total: 03 **Credits:** 03
Evaluation Scheme: 10 ISA + 15 ISE1 +15 ISE2 + 60 ESE **Total Marks:** 100
Duration of ESE: 03Hrs

Course Description:

This course provides knowledge about the communication system, waves and navigation techniques. It also emphasizes on use and understanding of digital modulation techniques along with analog and digital telemetry systems.

Course Objectives:

1. Understand the communication system, waves and navigation techniques.
2. Identify and apply the different modulation techniques.
3. Introduce to digital modulation techniques.
4. Familiarize with fiber optics communication.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. understand the communication system, waves and navigation techniques.
2. apply the different modulation techniques to the signals.
3. understand requirements of digital modulation techniques and its implementation.
4. use different telemetry systems.

Relevance of PO's and Strength of Co-relation:

Po No.	Programme Outcome	strength of co-relation
a	Demonstrates basic knowledge in concepts of Science, mathematics and electrical / electronics to measurement and control systems.	**3**
d	Apply the concepts of digital, analog electronics, microprocessor systems and functionality of system components/devices for the automation of processes.	**2**
f	Use modern engineering tools, software and equipments to design and analyze problems.	**2**
g	Participate and succeed in competitive examinations and engage in life-long learning.	**1**

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Course Content

Elements of communication system

Need for modulation, amplitude modulation and detection, generation and detection of DSB-SC, SSB and vestigial side band modulation, carrier acquisition, AM transmitters and receivers.

Modulation

Introduction, sampling process, pulse width modulation and pulse position modulation, waveform coding techniques: discretization in time and amplitude, quantization process, quantization noise, pulse code modulation, differential pulse code modulation, delta modulation and adaptive delta modulation.

Digital Modulation Techniques

Types of digital modulation, waveforms for amplitude, frequency and phase shift keying methods of generation of coherent and non-coherent ASK, FSK and PSK, comparison of above digital techniques.

Time Division Multiplexing

Fundamentals, TDM and FDM, Introduction to TDMA,FDMA and CDMA, Introduction to Information theory: Measure of information, entropy and information rate, channel capacity, Hartley Shannan law, Huffman coding, ShannanFano coding.

Telemetry

Introduction to telemetry and telecontrol-telemetry links-telemetry error, remote sensor. classification of signals-their suitability for telemetry, analog and digital telemetry, landline telemetry-mechanical, pneumatic and electrical systems – industrial telemetry, application of negative feedback for pneumatic and wire telemetry systems.

Reference Books:

1. Communication Systems by Simon Haykin, 4th edition, John Wiley & Sons, 2001.
2. Electronic Communication Systems by G.Kennedy and B. Davis, 4th edition, Tata McGraw Hill, 1999.
3. Modern Analog & Digital Communication Systems" by B.P. Lthi, 4th edition, Oxford University Press, 2009.
4. Communication System: Analog and Digital by Taub & Schilling, 3rd edition, Tata McGraw Hill, 2007.
5. Communication Systems Analog and Digital by R.P.Singh& S.D. Sapre, 2nd edition, Tata McGraw Hill, 2008.
6. Telemetry Principles by Patranabis, 1st edition, McGraw-Hill Education Pvt. Ltd., 1999

IN354 ANALYTICAL INSTRUMENTATION

Teaching Scheme: 03L Total: 03 **Credits:** 03
Evaluation Scheme: 10 ISA + 15 ISE1 +15 ISE2 + 60 ESE **Total Marks:** 100
Duration of ESE: 03Hrs

Course Description:

It is the course which provides the knowledge of different analytical methods used in chemical analysis and role of instrumentation in it.

Course Objectives:

1. To understand principles of instrumental analysis
2. To study the theory and design of analytical instruments
3. To develop problem-solving skills applicable to real-world problems

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. understand the capabilities and limitations of analytical instruments.
2. select and apply an analytical instrument in the physical, chemical and biological world and appreciate the role of instrumentation.
3. learn the advances in analytical instrumentation.

Relevance of PO's and strength of co-relation:

Po No.	Programme Outcome	strength of co-relation
a	Demonstrates basic knowledge in concepts of Science, mathematics and electrical / electronics to measurement and control systems.	**3**
d	Apply the concepts of digital, analog electronics, microprocessor systems and functionality of system components/devices for the automation of processes.	**2**
f	Use modern engineering tools, software and equipments to design and analyze problems.	**2**
g	Participate and succeed in competitive examinations and engage in life-long learning.	**1**

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

Course Content

Chemical Analysis and Analytical methods

Classification of Analytical Methods: Classical and instrumental methods, comparison of these methods, classification of instrumental methods (spectral, electro analytical and separative methods)

UV Visible and Spectroscopy: Laws of photometry, Beer and Lambert's law, monochromator design and monochromator performance, colorimeters, single beam and double beam spectrophotometers, dual wavelength and double monochromatic systems, direct reading multichannel spectrophotometers, diode array rapid scanning spectrophotometers, reverse optics technique.

IR spectroscopy: Instrumentation, sources, detectors, FTIR. Raman Spectrometry, Raman effect, Raman spectrometer components, LASER Raman spectrophotometer

Emission and Absorption Spectroscopy

Emission Spectroscopy: Principle of emission spectroscopy, sources of excitation, DC arc, AC arc, AC spark and Plasma excitation sources

Flame photometry: Principle, instrumentation constructional details, fuel gases, atomizer, burner, optical system, recording system. Interferences in flame photometry, applications

Atomic Absorption Spectroscopy (AAS): Principle, instrumentation-hollow cathode lamps, burners and flames, plasma excitation sources, optical and electronic systems, interferences in AAS, applications

Nuclear Magnetic Resonance (NMR) Spectrometry:

Principle, nuclear spin, nuclear energy levels, resonance condition, NMR absorption spectra, chemical shift, constructional details of NMR spectrometer, sensitivity enhancement techniques, spin decoupler, Fourier transform NMR spectroscopy;

Electron Spin Resonance (ESR) Spectrometry: Principle, constructional details.

Fluorimeters and Phosphorimeters: Principle, single and double beam filter fluorimeter, ratio fluorimeter, spectrofluorimeter, microprocessor-based instruments, phosphorescence spectrometer.

Mass Spectrometry

Principle of mass spectrometer, basic mass spectrometer components, types, magnetic deflection type, time of flight, radio frequency, double focusing, quadrupole type, gas chromatograph mass spectrometer (GCMS) system resolution of mass spectrometer, applications, introduction to electrophoresis and densitometer.

Electron and Ion Spectroscopy: Surface spectroscopic techniques, electron spectroscopy for chemical analysis (ESCA), Auger spectroscopy (AES), secondary ion mass spectrometry (SIMS) and ion scattering spectroscopy (ISS).

Radio Chemical Instrumentation: Radio chemical methods, radiation detectors, ionization chamber, Geiger Muller counter, proportional counter, scintillation counter, semiconductor detectors, pulse height analyzer.

X-ray Spectrometry: X-ray spectrum, instrumentation for X-ray spectrometry, X-ray diffract meters, X-ray absorption meter. Chromatography: classification; basic parts of gas

Chromatography

Introduction to chromatograph, classification of chromatograph, gas chromatograph and liquid chromatograph.

Gas Chromatography: Principle of gas chromatograph, classification, components of gas chromatograph like carrier gas, sample injection system, chromatographic column, thermal compartment, temperature programming, dual column system, detectors-thermal conductivity, flame ionization, electron capture, Argon ionization detector, recording instruments.

Liquid Chromatography: Introduction and its classification, components of liquid chromatograph, solvent programming, HPLC, introduction to electrophoresis and densitometer.

Gas analyzers: Oxygen, carbon monoxide, carbon dioxide, nitrogen analyzer, gas density analyzers. Environment monitoring system.

Text Books:

1. Handbook of Analytical Instruments by R.S. Khandpur, Second ed., 2006. Tata McGraw-Hill.
2. Instrumental Methods of Analysis by Willard, Merritt, John Aurie Dean, CBS Publishers & Distributors, New Delhi, Seventh ed., 1988.
3. Instrumental Methods of Chemical Analysis by B. K. Sharma, Goyal publications house Meerut , 23th edi., 2004.

Reference Books:

1. Principles of Industrial Instrumentation by D. Patranabis, second edition, Tata McGraw-
2. Instrumental Methods of Chemical Analysis by G. W. Ewing, 4th Edi, McGraw Hill, 1975.
3. Analytical Instrumentation Handbook by Bela G Liptak, Chilton, Second ed., 1994.
4. Principles of Instrumental Analysis by Skoog, Holler, Nieman, Thomson books-cole publications, Sixth ed., 2006.

SH 351 ENTREPRENEURSHIP AND BUSINESS MANAGEMENT

Teaching Scheme: 03L + 00T **Credit:** 03
Evaluation Scheme: 15 ISE1 + 15 ISE2 + 10 ISA + 60 ESE **Total marks:** 100
Duration of ESE: 3 Hrs.

Entrepreneur & Entrepreneurship

Evolution of the term entrepreneur, who is an entrepreneur, entrepreneur and enterprise, entrepreneurs and managers, traits of a true entrepreneur, characteristics of a successful entrepreneur, classification of entrepreneurs, functions of an entrepreneur, problems faced by entrepreneurs behavioral patterns of entrepreneurs.

Concepts of entrepreneurship, importance of entrepreneurship, myths of entrepreneurship, stages in the entrepreneurial process, barriers to entrepreneurship, socio-economic origins of entrepreneurship, environmental factors affecting entrepreneurship, views of Schumpeter.

Setting Up a Small Business Enterprise

Search for a business idea, sources of ideas, idea processing, selection of idea, identifying the business opportunity, business opportunities in various sectors, formalities for setting up of a small business enterprise, environment pollution related clearances, preparation of project report guidelines, procedures and formalities for registration, role of industrial fairs.
Institutions supporting small business enterprises: introduction, central level institutions, state level institutions, other agencies, industry associations

Project Identification, Formulation

Meaning of project, project identification, project classification, internal and external constraints, project objectives, desk research and techno-economic survey, project life cycle. Project formulation: need concept significance and elements of project formulation, feasibility analysis. Project report, project selection, appraisal format, project formulation and financial institutions and government.

Modern Small Business Enterprises

Role of small-scale industries, concepts and definitions of SSI, government policy and development of the small-scale sector in India, growth and performance of small scale industries in India, small and medium enterprises (SME) in other countries, problems for small-scale industries, prospects of the small-scale industries in a free economy, role of FICCI, CII & chamber of commerce, NIPM (National Institute of Personnel Management). Sickness in small business enterprises: definition of sickness and status of sickness of SSI in India, criteria to identify sickness/incipient sickness, causes for sickness/incipient sickness in SSI, symptoms of sickness, cures for SSI sickness.

Family Business

Importance of family business, various types of family businesses, succession in family business, management development plan in family business, how to save the family business.

Note: It is expected that student (or group of two) should visit to small scale industry in nearby area and interact with Unit head/owner. The student should prepare a report based on said visit which may be considered for 10 marks as Internal Student Assessment (ISA).

Text Books:

1. Entrepreneurship Development small business Enterprises by Poornima Charantimath-Pearson, 1st Edi. Reprint, 2005.
2. Entrepreneurial Development by C.B. Gupta, Srinivasan by Sultan Chand & Sons. 5th edition, 2008.
3. Dynamics of Entrepreneurship Development and Management by Vasant Desai, Himalaya. 1st edition, 2009.

Reference Books:

1. Entrepreneurship, Robert D. Hisrich, Michal P. Peters, Tata McGraw-Hill Edition, Jan 1, 2007.
2. Entrepreneurship Development by S.S. Khanka, S. Chand, Rev. edition, 1999.
3. Entrepreneurship by M Lall, S Sahai, Excel Books, 2nd edition 2008.
4. Entrepreneurship Development and Project Management by Neeta Baporikar, Hiimalaya, 2nd edition, 2011.
5. Entrepreneurship Management by Aruna Kaulgud – Thomson, 1st edition, 2003.
6. Patterns of Entrepreneurship by Jack M. Kaplan, Willey Publications, 4th edition, 2013.
7. Entrepreneurship Development by Cynthia L. Greene, Cenage Learning, 4th edition, 2008.

IN355 DIGITAL SIGNAL PROCESSING LAB

Teaching Scheme: 02P Total: 02 **Credit:** 01
Evaluation Scheme: 25 ICA+ 25 ESE **Total Marks:** 50
Duration of ESE: 03Hrs

Course Description:

This lab course provides the knowledge of convolution, designing of filters by using MATLAB/open source softwares. Students can design and implement the FIR and IIR filters. It gives introduction to DSP processor.

Minimum Ten experiments shall be performed to cover entire curriculum of course IN352. The list given below is just a guideline

List of Experiment:

1. Shifting and folding of digital signal.
2. Linear convolution
1. 3- Circular convolution.
3. Discrete Fourier transforms.
4. Fast Fourier transforms.
5. Design and implement FIR filter using windowing method.
6. Design and implement IIR filter using Butterwoth approximation.
7. Design and implement IIR filter using Chebeshev approximation.
8. Sine/square wave generation using TMS32OC67XX.
9. FIR filters implementation using TMS32OC67XX.
10. IIR filter implementation using TMS32OC67XX.
11. Filtering using discrete wavelet transforms.

Note:

- **ICA –** Internal continuous assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format.

- **ESE –** The end semester examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute

IN356 DATA COMMUNICATION AND TELEMETRY LAB

Teaching Scheme: 02P Total: 02 **Credit:** 01
Evaluation Scheme: 25 ICA+ 25 ESE **Total Marks:** 50
Duration of ESE: 03Hrs

Course Description:

Minimum Eight experiments shall be performed to cover entire curriculum of course IN356. The list given below is just a guideline.

List of Experiment:

1. Study of AM transmitter
2. Study analysis of AM demodulation signal.
3. Study FM transmitter.
4. Study analysis of FM demodulation signal.
5. Study of PAM modulator and demodulator.
6. Study of PWM modulator and demodulator.
7. Study of fiber optic trainer Kit.
8. Study of PPM modulator and demodulator.
9. Study of amplitude limiter circuit.
10. Study to calculate gain for RF.

Note:

- **ICA –** Internal continuous assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

- **ESE –** The end semester examination (ESE) for this laboratory course shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

IN357 ANALYTICAL INSTRUMENTATION LAB

Teaching Scheme: 02P Total: 02 **Credit:** 01
Evaluation Scheme: 50 ICA **Total Marks:** 50

Course Description:

In this laboratory, course emphasis on imparting the practical knowledge and understanding of analytical instruments for qualitative and quantitative analysis

Minimum Ten experiments shall be performed to cover entire curriculum of course IN202. The list given below is just a guideline

List of Experiment:

1. Study of filter photometer.
2. Study of flame photometer.
3. Study of Densitometer.
4. Study of spectrophotometer (visible and infra-red region)
5. Study of single beam spectrophotometer for UV/VIS range.
6. Study of double beam spectrophotometer for UV/VIS range.
7. Study of mass spectrometers.
8. Study of gas chromatographs.
9. Study of liquid chromatographs.
10. Study of N.M.R. and E.S.R. spectrometer.
11. Study of atomic absorption spectrophotometer.
12. Study of Refractometer.

Note:

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format **(S 10).**

IN358 ELECTRONICS WORKSHOP LAB

Teaching Scheme: 02P Total: 02 **Credit:** 01
Evaluation Scheme: 25 ICA+ 25 ESE **Total Marks:** 50
Duration of ESE: 03Hrs

Course Description:

In this laboratory, course emphasis on imparting the practical knowledge and understanding of PCB Design and Manufacturing. Use of latest available software for PCB design. Understand and do practices for laying components, soldering and testing of Single sided PCB.

Course Objective:

The objective of the course is to provide knowledge about practical practices used in electronics engineering. This course will help students to use various tools for measurement and testing of electrical and electronics apparatus. The subject provides scope for practical applications of electronics engineering. The course will also help students to use and implement efficient and techno commercial aspect of maintenance and installation.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. understand various electrical symbols and their use in electrical and electronics drawing.
2. familiar with the safety precautions and practices while working in industrial and domestic premises.
3. understand various testing and maintenance schemes such.
4. select correct size and type of cables and wires for different applications.
5. use different types of measuring instrument and instrumentation and testing equipments.
6. discharge the professional duties in technical field of maintenance and automation.

Relevance of PO's and Strength of Co-relation:

Po No.	Programme Outcome	Strength of Co-relation
d	Apply the concepts of digital, analog electronics, microprocessor systems and functionality of system components/devices for the automation of processes.	**2**
f	Use modern engineering tools, software and equipments to design and analyze problems.	**3**
i	Model and simulate the automatic control system	**1**
j	Follow industrial safety norms and work to benefit environmental and societal context.	**1**

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Printed Circuit Board Design Guidelines: General components layout scheme, grid system, PCB size mechanical stress, design rules for analog and digital circuit PCB, single, multi-layer and SMD boards, artwork CAD packages, plating process, etching process, PCB drilling, soldering techniques.

Course Contents

The study of following topics is expected in the electronics workshop.

1. Design and Fabrication of PCB (printed circuit boards) using any PCB design software.
2. Layout of circuit using standard Layout tool (Orcad / Protel / CADstar / Pads / Ultiboard etc) should be designed and PCB making process should be carried out.
3. Study of different tools required in electronic workshop (e.g. striper, cutter, nose pliers, crimping tools, drilling machine, tube bender, pipe cutters, etc.)
4. Testing of different electronic components (e.g. resistor, capacitor, inductor, diodes, Transistors, etc).
5. Study of different auxiliary electronic/electrical components and different cables (e.g. lugs, ferrules, glands, relays, contractors, audio/microphone cables, ribbon cables, data transmission cables, power cables, fiber optic cables, video/TV cable etc).

Note: The term-work should include a minimum of eight assignments and final PCB manufacturing from the above topics.

Note:

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format.
- **ESE –** The End Semester Examination (ESE) for this laboratory course shall be based on continuous evaluation of student performance throughout semester and practical fabrication of PCB which the group of students fabricated and submitted by them by oral/presentation/performance.

IN359 MINI PROJECT

Teaching Scheme: 02Hrs/week **Credit:** 01
Evaluation scheme: 25 ICA+ 25 ESE **Total Marks:** 50
Duration of ESE: 03Hrs

Course Description:

The mini project is one of the most important single piece of work in the degree programme. It is introduced in curriculum to put into practice some of the techniques that have been taught to students in earlier years. It also provides the opportunity to students to demonstrate independence and originality, to plan and organise a large project over a long period. The mini-project topic should be selected to ensure the satisfaction of the need to establish a direct link between the techniques they learnt and productivity. Thus it should reduce the gap between the world of work and the world of study.

Desirable Awareness/Skills:

Knowledge of concepts, principles and techniques studied in all earlier courses.

Course Objectives:

The objectives of offering this course are:

1. to develop ability to synthesize knowledge and skills previously gained and to put some of them into practice.
2. to make students capable to select from different methodologies, methods and forms of analysis studied to produce a suitable system or sub-system.
3. to inculcate ability to present the findings of their technical solution in a written report.
4. to plan and organise a large project over a long period.

Course outcome:

On successful completion of this course students shall be

1. able to apply the knowledge and skills previously gained into practice.
2. take appropriate decision wrt various parameters related to production of a system or sub-system.
3. demonstrate the leadership quality along with ability to work in a group.
4. prove the ability to present the findings in a written report or oral presentation.

Relevance of PO's and Strength of Co-relation:

Sr No	PO	Level of co-relation
c	Apply concepts of control system and automatic control for the operati of continuous and discrete systems.	**3**
e	Understand and utilize programmable logic controllers (PLC), distributed control systems (DCS) and supervisory control systems for control of manufacturing and processing systems.	**2**
f	Use modern engineering tools, softwares and equipments to design and analyse problems.	**2**
j	Follow industrial safety norms and work to benefit environmental and societal context.	**1**

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

Course Content

- The mini project shall be carried out in-house i.e. in the department's laboratories/centres by a group 2 – 4 students. In any case the group shall not consist of more than four students.
- The mini project shall consist of design and implementation of any suitable electronic system, sub system or circuit based on knowledge and skills previously gained.
- The mini project outline (a brief or condensed information giving a general view of mini project topic) on the selected topic should be submitted to the course coordinator for approval within one weeks from the commencement of the term.
- Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation.
- **Mini Project Deliverables:** A mini project report as per the specified format (available on in the department and institutes website), developed system in the form of hardware and/or software. In addition, student shall maintain a record of attendance and continuous progress (log book in appropriate format available on institute/department's web site) duly signed by course coordinator and present as mini project deliverable along with report.

Evaluation System:

It includesInternal Continuous Assessment (ICA) and End Semester Examination (ESE). Guidelines for ICA and ESE are given bellow.

Internal Continuous Assessment (ICA)

- The ICA shall be evaluated by course coordinator.
- Course coordinator shall judge the students on the principle of continuous evaluation and contribution of individual student in the group.
- It shall be evaluated on the basis of deliverables of mini project and depth of understanding.
- Course coordinator shall maintain the record of continuous evaluation in appropriate format available on institute/department's web site.

End Semester Examination (ESE)

- The End Semester Examination for this course shall be based on demonstration of the system or sub system developed by the group of students, deliverables of mini project and depth of understanding (oral examination). It shall be evaluated by two examiners out of which one examiner shall be out of institute.

IN 361 INDUSTRIAL LECTURE - I

Teaching Scheme: 01 L; Total: 01 **Credit:** NA
Evaluation scheme: NA **Total Marks:** NA

Course Description:

This course reflects on the importance of acquaintanceships and the interchange of needed information between practicing engineers in industry and students in educational institutions. There is a criticism, especially from practicing engineers, that existing engineering education is too theoretical and numerical with less orientation toward practical aspects. This course is designed to overcome this criticism. This course is intended to generate such interaction directly, through expert lectures by outstanding practicing engineers. This course will prove helpful to denote and understand the relations among the employers, employees and other organizations.

Desirable Awareness/Skills:

Listening, understanding and analyzing ability along with the knowledge of concepts, principles and techniques studied earlier.

Course Objectives:

The objectives of offering this course are:

1. to make students familiar with industrial environment i.e. to provide appropriate exposure to world of work.
2. to know and understand the industrial experience, attitudes, needs, and viewpoints of industrial expert to students.
3. to denote and understand the role of various parties' viz., employers, employees, and state in maintaining industrial relations.
4. to improve industry institute interaction.

Course Outcome:

On successful completion of this course students shall

1. become familiar with industrial environment/ world of work.
2. understand expectations of industry wrt expertise, attitude and viewpoint.
3. demonstrate the good inter personnel relations.
4. be able to work in industrial environment either as employee or self employed (entrepreneur) with comfort.

Relevance of PO's and Strength of Co-relation:

Sr No	PO	Level of co-relation
d	Apply the concepts of digital, analog electronics, microprocessor systems and functionality of system components/devices for the automation of processes.	**2**
f	Use modern engineering tools, softwares and equipments to design and analyse problems.	**1**
h	Communicate effectively and work in multidisciplinary teams.	**2**
j	Follow industrial safety norms and work to benefit environmental and societal context.	**2**

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlate

Course Content

- There shall be minimum 6 lectures of 60 -90 minutes duration.
- The lecture shall include presentation, informal discussions with students and faculty, and laboratory tours (if required).
- Topics of Industrial Lectures shall be technical in nature and should not be the specific or extended part of the curriculum.
- Typically speakers should talk about:
    i. Their own career following (and sometimes including)university.
    ii. Interesting jobs/projects they have had worked on.
    iii. The areas of work they are currently involved in.
    iv. The type of work engineering graduates can expect.
    v. Current job opportunities that may be available for engineering graduates in general and electronics and telecommunication engineering graduates in particular.
    vi. Any suggestions for students with regard to job hunting / CV writing / interviews etc.
    vii. Latest technology used in the industry which is not the part of curriculum or routine training programmes.
    viii. Any other suitable topic/information which provides industrial exposure and improves entrepreneurship quality/ employability of the students.
- Course coordinator shall discuss with students on the content of lecture and may conduct oral or give written assignments to judge the depth of understanding of students.
- Students shall submit the report based on minimum six lectures giving summary of the lecture delivered.
- The summary should contain brief resume of the expert, brief information of his organization and brief summary of the lecture in the format provided by institute/department.
- Industrial Lecture deliverables: An industrial lecture report as per the specified format (available on the department and institute's website) and assignments given by course coordinator (if any).

(**Note:** List of renowned experts/Officials/Entrepreneurs from Industries/Government Organizations/Private Sectors/Public Sectors / R&D Labs etc. shall be prepared by the committee appointed by HoD and shall be approved by principal. After approval from the principal, minimum six Industrial Lectures shall be arranged, which shall be delivered by experts to cover the various aspects of course content.)

Evaluation system:

It includes Internal Continuous Assessment (ICA). Guidelines for ICA are given bellow.

Internal Continuous Assessment (ICA)

- The ICA shall be evaluated by course coordinator.
- Course coordinator shall judge the students on the principle of continuous evaluation and contribution of individual student.
- It shall be evaluated on the basis of deliverables of industrial lecture and depth of understanding (oral conducted by course coordinator).
- Course coordinator shall maintain the record of continuous evaluation (oral) and handover to HoD as the marks and credits are to be allotted in the VIII semester.