6.1 EMPLOYABILITY SKILLS – II

L	T	P
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RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. Our diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject to prepare students for employability in job market and survive in cut throat competition among professionals.

DETAILED CONTENTS

1. Oral Practice

i)	Mock interview	(05 hrs)
ii)	Preparing for meeting	(05 hrs)
iii)	Group discussion	(05 hrs)
iv)	Seminar presentation	(05 hrs)
v)	Making a presentation	(12 hrs)

a) Elements of good presentation
b) Structure and tools of presentation
c) Paper reading
d) Power point presentation

6.2 PLC, DCS and SCADA

L	P
4	3

RATIONALE

A diploma holder when employed in automated industrial process controls or in automated power station will be required to know the basics of Programmable Logic Controllers, their working and their programming. In industry, many manufacturing processes demand a sequence of operation, which are to be performed repetitively. Early automation systems were mechanical in design, timing and sequencing being effected by gears and cams. Slowly these design concepts were replaced by electrical drives which were controlled by relays and now by programmable logic controllers (PLCs). A PLC is a solid state device, designed to operate in noisy industrial environments and can perform all logic functions. PLCs are widely used in all industries for efficient control operations. A diploma holder in industry is called upon to design, modify and troubleshoot such control circuits. Looking at the industrial applications of PLCs in the modern industry, this subject finds its usefulness in the present curriculum.

DETAILED CONTENTS

1. Introduction to PLC (12 hrs)

   What is PLC, concept of PLC, Building blocks of PLC, Functions of various blocks, limitations of relays. Advantages of PLCs over electromagnetic relays. Different programming languages, PLC manufacturer etc.

2. Working of PLC (16 hrs)

   - Basic operation and principles of PLC
   - Scan Cycle
   - Memory structures, I/O structure
   - Programming terminal, power supply

3. Instruction Set (20 hrs)

   - Basic instructions like latch, master control self holding relays.
   - Timer instruction like retentive timers, resetting of timers.
   - Counter instructions like up counter, down counter, resetting of counters.
   - Arithmetic Instructions (ADD,SUB,DIV,MUL etc.)
   - MOV instruction
   - RTC(Real Time Clock Function)
   - Watch Dug Timer
   - Comparison instructions like equal, not equal, greater, greater than equal, less than, less than equal
   - Programming based on basic instructions, timer, counter, and comparison instructions using ladder program.

4. DCS Concepts (08 hrs)

   Concept of DDC, DCS I/O hardware, Remote Terminal Unit

5. SCADA (08 hrs)

   Block Diagram of SCADA, Difference between Open Architecture and Dedicated System. Difference between DCS and SCADA

LIST OF PRACTICALS

1. Components/sub-components of a PLC, Learning functions of different modules of a PLC system
2. Practical steps in programming a PLC (a) using a hand held programmer (b) using computer interface
3. Introduction to ladder diagram concepts, instruction list syntax
4. Basic logic operations, AND, OR, NOT functions
5. Logic control systems with time response as applied to clamping operation
6. Sequence control system e.g. in lifting a device for packaging and counting
7. Use of PLC for an application(teacher may decide)

INSTRUCTIONAL STRATEGY

Introduce the subject and make the students familiar with applications of PLCs and Microcontrollers. The inputs shall start with theoretical inputs to architecture, instruction set, assembly language programming, Small projects may be identified, be designed and implemented. PLC ladder diagram and programming should be supplemented with visits to industry. More emphasis may be given to practical work.

RECOMMENDED BOOKS

1) Programmable Logic Controller by Job Dan Otter; P.H. International, Inc, USA
2) Introduction to PLCs by Gary Dunning. McGraw Hill
3) Module on PLCs and their Applications by Rajesh Kumar, NITTTR Chandigarh
4) Programmable Logic Controller and Microcontrollers by Gurpreet Kaur and SK Sahdev by Uneek Publications, Jalandhar
5) Module on "Allen Bradlag PlC (SLC 500), Institution set-1, by Rajesh Kumar, NITTTR, Chandigarh
6) Module on "PLC Applications based on SLC 5/03" By Rajesh Kumar, NITTTR Chandigarh
7) Instrument engineers Handbook - Process Control, Modern Control Techniques for Process Industries by G Liptak

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No	Topic	Time Allotted (hrs)	Marks Allocation (%)
1.	Introduction to PLC	12	20
2.	Working of PLC	16	30
3.	Instruction Set	20	30
4.	DCS Concepts	08	10
5.	SCADA	08	10
	Total	**64**	**100**

6.3 BIO-MEDICAL INSTRUMENTATION

L	T	P
4	-	3

RATIONALE

Recent advances in medical field have been fuelled by the instruments developed by the Electronics and Instrumentation Engineers. Pacemakers, ultrasound machine, medical diagnostic systems are few names, which have been contributed by engineers. Now health care industry uses many instruments, which are to be looked after by instrumentation engineers. This subject will enable the students to learn the basic principles of different instruments/equipment used in health care industry. The practical work done in this area will impart skill in the use, servicing and maintenance of these instruments/equipment. Proficiency in this area will widen the knowledge and skill of diploma holders in the field of biomedical instrumentation.

DETAILED CONTENTS

1. Introduction to Biomedical Instrumentation (06 hrs)

   Introduction, development of biomedical instrumentation, man-instrumentation system: its components, research and clinical instrumentation, in-vivo and in-vitro measurements.

2. Physiology (12 hrs)

   Introduction, physiological systems of the body: cardiovascular system, respiratory system, nervous system and bio-chemical system.

3. Bioelectric Signals and Electrodes (10 hrs)

   Study of bio-electric potentials, resting and action potentials. Bio-electrodes, electrode- tissue interface, contact impedance, types of electrodes.

4. Diagnostic Instruments (16 hrs)

   Brief study of the following:

   - Electro cardiograph(ECG)
   - Electro encephalograph (EEG)
   - Electro myograph (EMG)
   - Pacemakers
   - Defibrillators
   - Spirometer, pulse oxymeter SPO2, NIBP (non invasive blood pressure), Glucometer
   - Speech audiometer
   - Plethysmograph

5. Bio-telemetry 03 hrs)

   Introduction and telemedicine

6. Intensive Care Unit (05 hrs)

   Introduction, elements of Intensive Care Unit (ICU).

7 Computer applications in biomedical devices. Computerized Axial (08 hrs)

   Tomography(CAT) scanners

8. Application of embedded system in Bio-medical instrumentation (04 hrs)

Note Field visits be arranged for students during the semester for exposure and better understanding of the subject

LIST OF PRACTICALS

1. To measure blood pressure of a person using analog and digital B.P. gauge.
2. To study the various physiological systems of the body.
3. To study the electrode-tissue interface and contact impedance.
4. To study the concept of EEG.
5. To study the concept of EMG.
6. Visit of Intensive Care Units (ICUs) of a hospital and to prepare a report.
7. Measurement of blood sugar of a patient using glucometer.
8. Measurement of heart beat with ECG machine using cardio-scope / ECG machine.
9. To study spirometer concepts & automation in diagnosis.

INSTRUCTIONAL STRATEGY

In addition to classroom teaching, maximum stress may be given on practical exposure in nearby hospitals, clinics, biomedical laboratories etc. Expert lectures may be arranged from field/organization related to biomedical instruments

RECOMMENDED BOOKS

1. Biomedical Instrumentation and Measurements by Cromwell; Prentice Hall of India, New Delhi.
2. Hand book of Medical Instruments by RS Khandpur.
3. Medical Electronics and Instrumentation by Sanjay Guha-University Publication.
4. Bio-Medical Instruments by KR Nahar
5. Introduction to Biomedical Equipment Technology by Carr, Pearson Education, Sector-62, Noida

6. Servicing Medical and Bio-electronic Equipment by Carl JJ.

7. Electronics for Medical Personnel by Buckstein

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No.	Topic	**Time Allotted (hrs)**	**Marks Allocation**
1.	Introduction to Biomedical Instrumentation	6	05
2.	Physiology	12	25
3.	Bioelectric Signals and Electrodes	10	15
4.	Diagnostic Instruments	16	25
5.	Bio-telemetry – Introduction.	03	5
6.	Intensive Care Unit	05	10
7.	Biomedical computer applications. Computerized Axial Tomography (CAT) scanners.	08	10
8.	Application of embedded system in Bio-medical instrumentation	04	5
Total		**64**	**100**

6.4 ELECTIVE

6.4 (a) OPTO ELECTRONIC DEVICES AND THEIR APPLICATIONS

L T P
4 - 3

RATIONALE

To impart latest developments in the opto electronic devices and fiber optics in the field of measurement and instrumentation technology, this subject is included in the syllabus.

DETAILED CONTENTS

1. Fundamentals of optics (10 hrs)

   Reflection, refraction, diffraction interference, polarization, photo-electric field, dispersion

2. Optical sources

   Light emitting diodes (LEDs), their structure, materials characteristics, efficiency, laser diodes, infrared and ultra-violet sources, power LEDs.

3. Photo-detectors (08 hrs)

   Photo-diodes, Avalanche photo-diodes, PIN diodes, LDRs and photo-conductive devices, phototransistors, opto-isolators.

4. Optical fibers and their applications (16 hrs)

   Principle of transmission through fiber, construction, classification and material consideration of optical fiber, mode of communication, characteristics of fibers, optical transmitters and detectors used in optical fibers, coupling, splices and connectors.

5. Lasers (10 hrs)

   Fundamentals of laser emission, types of Lasers. Use of Lasers in measurement of dimensions, distance, velocity, acceleration, Industrial applications of Lasers.

6. Optical instruments (12 hrs)

   Light intensity meter, optical pyrometer, polari-meter, infra-red thermometer, spectro-photo meter, optical filters, beam splitters.

LIST OF PRACTICALS

1. Verification of laws of reflection in curved mirrors.
2. Measurement of refractive index and critical angle.
3. Measurement of light intensity/optical power of 1. A bulb, 2. LED, 3. Laser diode and its variation with distance.
4. Study characteristics of photo-diode detector and one of its applications (say light intensity measurement).
5. Use of photo-resistor (LDR) for controlling light sensitive switch.
6. Study and use of opto – isolation, triggering an SCR/Triac.
7. Study and use of optical pyrometer for temperature measurement.
8. Measurement of distance using laser based trans-receiver.
9. Study and use of optical fiber based trans-receiver.
10. Detection of laser beam using Photodiode.

RECOMMENDED BOOKS

1. Optical Fiber Communication by M Senior; Prentice Hall of India, New Delhi
2. Fiber Optics: Theory and Practices by W.B. Allan, Plenum Press, London
3. Optical Electronics by A K Ghatak and K Thyagrajan, Cambridge Press
4. Optical Electronics by Amnon Yarib; CBS College Publishing.

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (hrs)	Marks Allocation
1.	10	10
2.	08	15
3.	08	10
4.	16	25
5.	10	15
6.	12	25
Total	**64**	**100**

6.4(b) ADVANCED MEASUREMENT TECHNIQUES

L	T	P
4	–	3

RATIONALE

The syllabus has been designed to impart advanced knowledge about various measurement systems to the students. These concepts will help the students in learning advanced measurement techniques comprising optical vibration, high frequency, ultrasonic etc.

DETAILED CONTENTS

1. Review of Measurement System (10 hrs)
   - Functional elements of a measuring system
   - Input – output configuration of instrumentation system

2. Measurement of Flow (10 hrs)
   - Construction, working principle and application of flows with orifice, magrettee ultrasonic and rotameter

3. High Frequency Measurement (12 hrs)
   - Resonance methods
   - Measurement of inductance and capacitance
   - Measurement of effective resistance by resistance variation method and reactance variation method
   - T networks – parallel T networks and bridge T networks
   - Radio frequency measurement – sensitivity and selectivity measurement of radio receiver

4. Opto Electronic Measurement (12 hrs)
   - Photo sensitive devices – light emitting diodes, photo diodes, photo conductors
   - Photo voltaic cell, photo thyristors, photo transistors
   - Light modulating techniques – light suppression, light attenuation, photo-metric and radiometric fittings

5. Temperature Measurement (10 hrs)
   - Construction, working principle and application of temperature sensors
   - Thermocouple RTD's, Thermister, Radiation pyrometry, IR detectors

6. Measurement of Level (10 hrs)
   - Construction, working principle and application of float, level gauges, optical level devices and thermal level sensors

LIST OF PRACTICALS

1. To measure flow using rotameter
2. To measure flow using orifice
3. To measure temperature using thermocouple
4. Measurement of temperature using optical pyrometer
5. To measure level using any method

INSTRUCTIONAL STRATEGY

This being an advanced subject the teacher should lay emphasis on fundamental concepts for measurement techniques. Field application of various transducers should be dealt thoroughly. For exposure the students may be taken to industry

RECOMMENDED BOOKS

1. Measurement systems, Application and Design – E.O Doeblin, McGraw Hill International Editions
2. A Course in Electrical and electronics Measurement and Instrumentation by AK Sawhney; Dhanpat Rai and Co Pvt. Ltd., New Delhi
3. Mechanical and Industrial Measurement by R K Jain, Khanna Publishers, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (hrs)	Marks Allocation
1.	10	10
2.	10	10
3.	12	20
4.	12	20
5.	10	20
6.	10	20
Total	**64**	**100**

6.4(c) VIRTUAL INSTRUMENTATION

L - P
4 - 3

RATIONALE

Virtual instrumentation is one of the latest emerging techniques in the field of instrumentation. Because of its numerous advantages over traditional instruments, VI is being used in almost every field. Knowledge of this subject will enable diploma students to make them aware of hardware, software and interfacing devices and its importance in the field of instrumentation.

DETAILED CONTENTS

1. Introduction to Virtual Instrumentation (08 hrs)

   Historical perspective, advantages of virtual instruments over conventional/traditional instruments, block diagram and architecture of virtual instruments.

2. Learning Lab view (22 hrs)

   Introduction, Front panel, Block diagram, Menus, Palettes, VI &Sub VI, Editing and Debugging VI, Structures, Arrays, clusters, charts & Graphs, Data acquisition, Instrument control, signal processing examples

3. Data Acquisition Basics (20 hrs)

   ADC, DAC, DIO, connectors and timers, PC hardware structure, Introduction to various Data Acquisition Cards.

4. Common Instrumentation Interfaces (08 hrs)

   Introduction to RS232 / RS485, GPIB, USB, instrumentation buses(introduction such as inter bus).

5. Applications of VI in process control like pressure, temperature control etc (06 hrs)

LIST OF PRACTICALS

1. G-programming using LAB view/flex pro.
2. - Create a simple VI consisting of a dial and a thermometer.
   - Developing VI for converting temperature in degree Centigrade to degree Fahrenheit.
3. Creation of sub-VI using above VI as sub VI to convert the temperature in degree Kelvin.

4. Application of LABVIEW / Flex Pro.
5. Simulation of Process control system using computer simulation.
6. Acquisition of signals from transducers such as temperature, acceleration or function generator using USB interface and transfer the same to PC.

RECOMMENDED BOOKS

1. LABVIEW Graphical Programming by Gary Johnson; Tata McGraw Hill Publishing Co. New Delhi
2. Basic Concepts of LABVIEW 4 by SOKO loft; PHI
3. PC Interfacing for data acquisition and Process Control by S Gupta, JP Gupta; Instrument Society of America.
4. Learning with Lab View 7 by Robert H. Bishop, Pearson Education.
5. Labview for Every One by Jeffrey Tran's, Pearson Education.

SUGGESTED DISTRIBUTION OF MARKS

Topic	**Time Allotted (hrs)**	**Marks Allocation**
1.	8	15
2.	22	30
3.	20	30
4.	8	15
5.	6	10
Total	**64**	**100**

6.5 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

L	T	P
3	-	-

RATIONALE

In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management.

DETAILED CONTENTS

SECTION – A ENTREPRENEURSHIP

1. Introduction (14 hrs)

- Concept /Meaning and its need
- Qualities and functions of entrepreneur and barriers in entrepreneurship
- Sole proprietorship and partnership forms of business organisations
- Schemes of assistance by entrepreneurial support agencies at National, State, District level: NSIC, NRDC, DC:MSME, SIDBI, NABARD, Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubator (TBI) and Science and Technology Entrepreneur Parks (STEP).

2. Market Survey and Opportunity Identification (10 hrs)

- Scanning of business environment
- Salient features of National and State industrial policies and resultant business opportunities
- Types and conduct of market survey
- Assessment of demand and supply in potential areas of growth
- Identifying business opportunity
- Considerations in product selection

3. Project report Preparation (08 hrs)

- Preliminary project report
- Detailed project report including technical, economic and market feasibility
- Common errors in project report preparations
- Exercises on preparation of project report

SECTION –B MANAGEMENT

4. Introduction to Management (04 hrs)

- Definitions and importance of management
- Functions of management: Importance and Process of planning, organising, staffing, directing and controlling
- Principles of management (Henri Fayol, F.W. Taylor)
- Concept and structure of an organisation
- Types of industrial organisations

  a) Line organisation
  b) Line and staff organisation
  c) Functional Organisation

5. Leadership and Motivation (03 hrs)

a) Leadership

- Definition and Need
- Qualities and functions of a leader
- Manager Vs leader
- Types of leadership

b) Motivation

- Definitions and characteristics
- Factors affecting motivation
- Theories of motivation (Maslow, Herzberg, McGregor)

6. Management Scope in Different Areas (06 hrs)

a) Human Resource Management

- Introduction and objective
- Introduction to Man power planning, recruitment and selection
- Introduction to performance appraisal methods

b) Material and Store Management

- Introduction functions, and objectives
- ABC Analysis and EOQ

c) Marketing and sales

- Introduction, importance, and its functions
- Physical distribution
- Introduction to promotion mix
- Sales promotion

d) Financial Management

- Introductions, importance and its functions
- Elementary knowledge of income tax, sales tax, excise duty, custom duty and VAT

7. Miscellaneous Topics (03 hrs)

a) Customer Relation Management (CRM)

- Definition and need
- Types of CRM

b) Total Quality Management (TQM)

- Statistical process control
- Total employees Involvement
- Just in time (JIT)

c) Intellectual Property Right (IPR)

- Introductions, definition and its importance
- Infringement related to patents, copy right, trade mark

Note: In addition, different activities like conduct of entrepreneurship awareness camp extension lecturers by outside experts, interactions sessions with entrepreneurs and industrial visits may also be organised.

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment or seminar method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations on visit. Approach extracted reading and handouts may be provided.

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development published by Tata McGraw Hill Publishing Company Ltd., New Delhi
3. Entrepreneurship Development in India by CB Gupta and P Srinivasan; Sultan Chand and Sons, New Delhi
4. Entrepreneurship Development - Small Business Enterprises by Poornima M Charantimath; Pearson Education, New Delhi
5. Entrepreneurship : New Venture Creation by David H Holt; Prentice Hall of India Pvt. Ltd., New Delhi
6. EDM by Bajaj and Chawla, Ishan publication
7. Principles and Practice of Management by L M Prasad; Sultan Chand & Sons, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	14	28
2	10	20
3	08	16
4	04	10
5	03	06
6	06	14
7	03	06
Total	**48**	**100**

6.6 MAJOR PROJECT WORK

L T P

- - 9

RATIONALE

Project plays an important role in the final stage of learning for assimilation of all what has been learnt till now. It also gives an opportunity to the students to show their innovation capabilities. In addition, it gives a confidence in handling different technical situations faced in the world of work. In this syllabus, topics of projects have been listed. The faculty is advised to encourage new projects to be cultivated by the students themselves.

Project work aims at developing skills in the students whereby they apply the totality of knowledge and skills gained through the course in the solution of particular problem or undertaking a project. The students have various aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The students should identify the project or give project assignment at give least two to three months in advance. The project work identified in collaboration with industry should be preferred.

The students may be given major project assignment for a period of 8 weeks at a stretch during the final semester. During this project period, concerned teacher will monitor the progress of students by paying regular visits to the industry. The students will submit a comprehensive project report (in a presentable manner, preferably typed and bound) for evaluation by the teacher/guide, an expert from industry and an external examiner.

SUGGESTED LIST OF PROJECTS

Some of the project activities are given below:

1. Controls of Thermal Power station and Cement Plant. Prepare process flow and piping and instrumentation diagram of a section. Identify their various instruments, systems and control parameters, ranges, specifications and making of each item.

2. Design and rigging up of a simple control loop for example temperature control in an oven, maintaining constant temperature in hot water tank, level control in a water tank, flow control in a pipe line, control of pressure in a pressurized vessel by injection (acid or alkali).

3. Design and making a simple on/off controller for temperature using ICs, capacitors, resistors on a printed circuit board.
4. Design an alarm annunciation scheme for motor control (trip, supply, failure, overheating) and realizing the same in a control panel using lamps.
5. Design and making a DC regulated power supply.
6. Design and fabricate a digital combination lock
7. Design and fabricate a digital frequency counter.
8. Design and fabricate a digital stop watch
9. Design and fabricate a digital timer.
10. To dismantle and lap a control valve. Assemble and test it hydraulically.
11. Design and fabricate a simple measuring instruments for temperature, pressure, flow or level
12. Design and fabricate a signal converter.
13. Design and fabricate a signal transmitter.
14. Use of PLC for DAS controls.
15. Design, construction and implementation of load cell in a given problem
16. Design and construction of pressure transducers for industrial implementation
17. ECG analyzer while taking a case
18. Spiro data analysis for a given case
19. PLCs based design and implementation for industrial control system
20. Study and analysis of a plant Digital Distribution Control (DDC)
21. Study and analysis of a plant SCADA
22. Study and analysis of automation of a cement plant,sugar plant and Regional Research Laboratory.
23. Study and analyze automation of textile/refinery
24. Study and analyze distributed control system (DCS)
25. Data acquisition and handling for industrial problems
26. Waveform Generation using 8085
27. Measurement of Certain parameters in CNC Lathe/ Milling Controller
28. Trouble shooting of industrial plant operations
29. Estimation and costing of control system design in an industrial plant
30. Production scheduling and control technology in an industrial plant instrumentation
31. Stepper motor control using 8-bit micro-controller/ microprocessor
32. 2 x 16 alphanumeric LCD interface using 8-bit micro-controller/microprocessor

33. EPROM programmer using 8051 series micro-controller/microprocessor
34. Real time clock using 8-bit micro-controller/microprocessor
35. Temperature control using 8-bit micro-controller/microprocessor
36. Draw specifications, diagrams of various equipment systems and accessories used in a process control system. Prepare cost and time estimates
37. Draw specifications, diagrams of various equipment system and accessories used in process control in the

    a) Heat exchanger
    b) Evaporator
    c) Crystalizer
    d) Ratio control
    e) Cascade control
    f) Feed forward control
    g) Distillation column

38. Simulate control operations of

    i) pressure control and compressor
    ii) Simulate control operations of temperature control
    iii) Simulate control operations of ratio control
    iv) Simulate control operations of cascade control
    v) Simulate control operations of feed forward control

39 a) To operate and control the temperature by PLC
    b) To operate and control the flow by PLC
    c) To operate and control the pressure by PLC
    d) To operate the cascade control using PLC
    e) To operate the ratio control by PLC

40. Traffic light control using microprocessor
41. Control of a conveyor belt using PLC/PC
42. Simple control of pick-and-place robot using PC/PLC
43. Water level controller using 8085/PLC
44. Alphanumeric display system using LEDs

45. Digital Pulse rate meter using photo sensor
46. Design and fabrication of a panel for control of temperature and Pressure in a boiler
47. Study of various control elements in furnace instrumentation.

Additional List

1. Automatic Data level controller using Microcontroller
2. On-Off Temperature controller/Display using Microcontroller
3. Seven segment display using Micro-controller
4. Design of real time-clock using micro-controller
5. Automatic land Rover using Micro-controller
6. Automatic land Rover Control using Mobile phone.
7. Water level control using Micro-controller
8. Water level control using Mobile phone
9. Home Lighting control system using mobile phone
10. Control of conveyor belt using PLC
11. Water level control using PLC
12. Temperature control using PLC/MC
13. Traffic light control using PLC/MC
14. Secure Door opening control MC
15. Home security system using Mobile phone/MC
16. To control flow of liquid using PLC
17. To design a display system using Micro-controller
18. To design a object counter using PLC and MC
19. Speed checker for highways
20. Line followed Robot based on MC.
21. Speed control of motor using M.C
22. Control of Railway crossing using M.C.
23. Buzzer Control using M.C.
24. Steeper motor control using MC.
25. To control a Robotic arm using MC.
26. Water purifier system
27. Inverter
28. UPS
29. Solar energy based project
30. Wind energy based project
31. Sequence control using PLC.

Note:

1. **The list is only the guideline for selecting a project, however a student is at liberty to select any other related project of his choice independently under guidance of his teacher**

1. **The quality of end-product and process adopted by the students in its execution should be taken into consideration along with other parameters while evaluating the students**

A suggestive criteria for assessing student performance by the external (personnel from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance criteria	Max. Marks	Rating Scale				
			Excellent	Very Good	Good	Fair	Poor
1.	Selection of project assignment	10	10	8	6	4	2
2.	Planning and execution of considerations	10	10	8	6	4	2
3.	Quality of performance	20	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20	20	16	12	8	4
5.	Sense of responsibility	10	10	8	6	4	2
6.	Self expression/communication skills	5	5	4	3	2	1
7.	Interpersonal skills/human relations	5	5	4	3	2	1
8.	Report writing skills	10	10	8	6	4	2
9.	Viva voce	10	10	8	6	4	2
Total marks		**100**	**100**	**80**	**60**	**40**	**20**

Important Notes

1. This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.
2. The criteria for evaluation of the students have been worked out for 100 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.

The teachers are free to evolve another criterion of assessment, depending upon the type of project work. It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organizations in such an exhibition. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific industries are approached for instituting such awards.