6.1 COMPUTER AIDED INSTRUMENTATION

L	T	P
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RATIONALE

Computer aided instrumentation subject makes every student of Instrumentation and control discipline aware of present state-of-art control procedures and fully equipped with taking responsibilities in any automated/computerized control industry/process plants. In this course, the requisite knowledge of firmware and associated specialization is provided along with some hands on experience on simulation strategies.

DETAILED CONTENTS

1. Computer aided Instrumentation (4 hrs)
   - 1.1 Introduction to PC based instrumentation
   - 1.2 PC opened up and architecture
   - 1.3 General structure of PC based instrumentation
   - 1.4 Advantages and disadvantages of computer based instrumentation
   - 1.5 Comparison with other control systems
   - 1.6 Introduction to various instrumentation packages like Lab View, Genie etc.

2. Buses and Standards (8 hrs)
   - 2.1 Introduction
   - 2.2 BUS types
   - 2.3 The I/O BUS
     - a) ISA bus
     - b) EISA Bus
     - c) PCI bus
   - 2.4 GPIB
   - 2.5 RS-232

3. Interfacing Using C/ VB (8 hrs)
   - 3.1 C/VB as an interfacing language
   - 3.2 Small routines for interfacing
   - 3.3 Graphics designing through C/VB
   - 3.4 File generation for data storage
   - 3.5 Data acquisition through C/VB
   - 3.6 Real time interfacing and display
   - 3.7 Software compensation techniques

4. I/O Interfacing Cards for Process Control (12 hrs)
   - 4.1 Digital input-output card PCL – 225
     - a) Introduction
     - b) Block diagram description
     - c) Installation
   - 4.2 Opto Input-Output card
     - a) Introduction
     - b) Block Diagram Description

c) Installation and Programming
d) Main features
e) Specifications
f) Application areas

4.3 High performance analog Data acquisition card with DIO and Timer/Counter
a) Introduction
b) Installation and programming
c) Main features
d) Block diagram description
e) Application Area
- Transient Analysis
- Event triggering
- Industrial measurements
- Process control

5. Linear Circuits and Signal Conditioning (4 hrs)
5.1 Op-Amps
5.2 Instrumentation amplifiers and signal conditioning
5.3 Multiplexers and Demultiplexers
5.4 ADC and DAC

6. Parallel Port (PP) Interfacing Techniques (4 hrs)
6.1 Introduction to parallel port
6.2 Parallel port as output port
6.3 Programming of PP
6.4 Parallel port as input port and its programming

7. Serial Port (SP) Interfacing Techniques (5 hrs)
7.1 Introduction to serial port
7.2 Serial port as output port
7.3 Programming of SP
7.4 Serial port as input port and its programming

8. USB Port Interfacing Techniques (6 hrs)
8.1 Introduction to USB port
8.2 USB port as output port
8.3 Programming of USB
8.4 USB port as input port and its programming

9. Using Instrumentation Package like Lab. View/Daisy lab/Genie (6 hrs)
9.1 Graphical programming
9.2 Configuring sensors and transducers
9.3 Measuring and analysis

10. Case Study (8 hrs)
10.1 CNC Motion controller
10.2 Power plant controller

10.3 Cement plant control
10.4 Sugar plant control
10.5 Textile plant control

LIST OF PRACTICAL

1. Installation and programming of PCL 225 digital I/O card, and controlling of 8 different digital devices using this card

2. Installation and programming of PCL – 206/208 A/D Data acquisition card and study of
   a) Display behaviour trend of an analog input signal
   b) Interlocking experiments by comparing two or more input analog signals
   c) Controlling digital outputs with change in inputs signals

3. Installation and programming of 225/224 and controlling 4 parameters of a process using relays

4. Controlling of relays, and devices using parallel port

5. Installation and programming of PCL 213/214 for capturing a mV signal on the computer and display its value on the monitor

6. Analog to digital conversion using ADC 804

7. Digital to analog conversion using DAC 800

8. Generation of a square wave through parallel port

9. Generation of a rectangular wave through parallel port

10. Graphical display panel on the monitor using C/VB

11. Generating bar graphs according to input values/signals using C/VB

INSTRUCTIONAL STRATEGY

The students should be exposed to various instrumentation packages available while teaching this subject. Assignments for making small GUI and should be given to students. Exercises involving data acquisition should be taken up.

RECOMMENDED BOOKS

1. Computer Interfacing: A Practical Guide to Data Acquisition and Control by Rigby WH and T Dalby 1995; Prentice Hall Inc. Englewood Cliffs, NJ 232 pp. ISBN 0 – 13 288374 – 0

2. See also accompanying Laboratory Manual by Same title: ISBN 0 –13 – 339797-1

3. Measurement systems: Application and Design 4th Edition by Doeblin, EO, 1990; McGraw Hill Inc., NY. 960 pp. ISBN 0 – 07 – 017338 – 9

4. Measurement and Instrumentation by AK Sawhney, Dhanpat Rai and Sons, New Delhi

5. Microcomputer Control of Thermal and Mechanical systems by Stoecker, WF and PA Stoecker; Van Nostrand Reinhold, NY. 439 pp. ISBN 0 – 442 – 2-648 – 8

6.2 MICRO CONTROLLERS AND PLC BASED INSTRUMENTATION

L	T	P
4	–	2

RATIONALE

Micro-controllers are being excessively used in instrumentation. The students will learn hardware and software of a typical microprocessor and get general information about micro controller systems. In addition, the course will provide the basic knowledge of Programmable Logic Controllers (PLCs) used in process control systems. The basic principle involves the components, programming and application of PLCs. It will help the students in advanced process control applications.

DETAILED CONTENTS

1. Micro Controllers (32 hrs)

    1. Comparing micro controllers and micro-processors
    2. MCS 51 series of controller architecture of 8051, hardware, I/O pins, ports and interfacing circuits, connecting external memory, counters and timers, serial data I/O, interrupts.
    3. Minimum system using 8051 microcontroller
    4. Typical applications of micro-controllers

2. PLCs (32 hrs)

    1. Introduction to PLCs, Areas of applications
    2. Basic Design and Structure and Architecture of a typical PLC
    3. Programming of PLCs, systematic solution finding
    4. Programming languages, PLC Programmers, PC interface
    5. Function block diagram, ladder diagram, instruction list, structured text
    6. Sequential function chart, logic control systems, timers, counters
    7. Commissioning and operational safety of a PLC, data transmission interface and communication in the field area
    8. Guidelines and standards

LIST OF PRACTICAL

Micro Controllers

1. Familiarization with a study of Architecture of 8085 kit, basic sub systems and input output connectors, functions keys on micro controllers kit

2. Familiarization of Micro Controllers (8051) kit
3. Familiarization of Micro controller (8051) based kit

PLCs

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 step 5 programming language, ladder diagram concepts, instruction list syntax
4. Basic logic operations, AND, OR, NOT functions
5. Logic control operations using latching properties e.g. in activating a cylinder
6. Logic control systems with time response as applied to clamping operation
7. Sequence control system e.g. in lifting a device for packaging and counting
8. Use of PLC for various mechanical outputs viz motion of a piston in a single cylinder multiple cylinders, driving machine operation etc.
9. Use of PLC for an application

RECOMMENDED BOOKS

1. Programmeble Logic Controllers by Thomas E.Kissel
2. Design with Micro Controller by C Nagara, Murthy, S Ramgopal, Joshi B Peatman; McGraw Hill, 1988
3. The 8051 Micro controller Architecture Programming and Applications, Second Edition by Kanneth J; Ayala Penram International Publishing (India) 1996
4. Festo Didactic – Programmable Logic Controllers Basic Level – TP 301 – A Training Manual on PLCs
5. Instrument Engineers Handbook Vol.II, by Liptak, P, Chittor Book Company
6. Process control Instrumentation Technology by Johnson, Curtis; EEE Edition, Prentice Hall of India
7. Programmable Logic Controller by Job Dan Otter; P.H.Internaitonal Inc, USA
8. Humphries and Lesly P Sheets, FourthEdition by James T: Demar Publisher Inc by Mazidi

6.3 (Elective-II)
6.3 (a) ADVANCED BIOMEDICAL INSTRUMENTATION

L	T	P
4	-	-

RATIONALE

Recent advances in medical field have been fulfilled by the instruments developed by the Electronics and Instrumentation Engineers. Pacemakers, Ultrasound Machine, CAT Scan, Medical diagnostic systems are few names which have been contributed by engineers. So 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 the health are industry. The practical work done in this area will import 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. Ultrasound Instrumentation (12 hrs)

   - Basic principle of ultrasonic
   - Doppler principle
   - Foetal monitor
   - Pulse-echo technique
   - Pulse-echo instruments and imaging system
   - Scanner

2. Medical Display System (12 hrs)

   - Cordioscope sub system
   - Cardioscope
   - Multichannel display system
   - Computer application in patient monitoring

3. Nuclear Medicine Instrument (10 hrs)

   - Types of radio-active particle
   - Radiation detector
   - Nuclear scanners
   - Gamma Camera

4. Imaging System (10 hrs)

   - X-Rays
   - CAT Scan
   - MRI

5. Analytical Instruments for Biomedical Instrumentation (10 hrs)

   Blood gas analysis, oxygen, PCO_2, PO_2 measurement, cell counter, Spiro meter, basic audiometer, speech audiometer

6. Telemedicine (8 hrs)

   - Concept of telemedicine
   - Application area
   - Communication Protocol
   - Advantages and disadvantages

7. Incubators and Ovens (2 hrs)

   Types of incubators and ovens, temperature control of incubator and ovens. Troubleshooting of incubator and ovens.

RECOMMENDED BOOKS

1. Medical Instrumentation by John. G. Webstere –John Wiley Publshers,New Delhi
2. Principles of Applied Biomedical Instrumentation by Goddes & Bakse – John Wiley Publishers, New Delhi
3. Biomedical Instrumentation and Measurement by Carr & Brown-Pearson Publishers
4. Biomedical Instrument by Cromwell-Prentice Hall of India, New Delhi
5. Hand book of Medical instruments by R.S. Khandpur –Tata McGraw Hill Publishers, New Delhi
6. Medical Electronics and Instrumentation by Sanjay Gupta – University Publication
7. Introduction to Biomedical Electronics by Edward J. Bukstein – Sam and Co. Inc. USA
8. Modern Electronic Equipment by RS Khandpur, CSIO, Chandigarh, Tata McGraw Hill Publishers, New Delhi

6.3 (Elective-II)
6.3(b) QUALITY AND RELIABILITY TECHNIQUES

L	T	P
4	-	-

RATIONALE

This course is designed to acquaint the students with the elementary concepts of total quality and reliability tools. The course aims at make the students understand and apply these concepts in their work situations.

DETAILED CONTENTS

1. Quality organization and Management (10 hrs)
   Introduction, Quality Policy, Task for Quality and Introduction to Total Quality Systems

2. Quality costs (12 hrs)
   Prevention costs, appraisal costs, internal failure costs, external failure costs, impact of quality costs on profitability

3. Quality circle (10 hrs)
   Formation of circles, team building, management teams, conducting quality circle meetings, areas of problems and issues considered for quality circles, reports preparation and approvals. Quality feedback

4. Supplier quality assurance (10 hrs)
   Personal behaviour, quality evaluation, technical aids, proprietary information, communication, procurement standards and specifications

5. Introduction to statistical process control (6 hrs)
   Introduction, 7 QC tools, perato analysis, cause and effect analysis, histogram, new seven tools

6. Reliability (6 hrs)
   Philosophy of reliability, statistical applications, failure models, reliability programme

7. Maintainability (4 hrs)
   Maintainability measures, product safety

8. Probability (6 hrs)
   Principals of probability, probability, randomness, subjective probabilities, odds and probability

RECOMMENDED BOOKS

1. Quality Engineering Handbook by Thomas PYZDER (TMH)
2. Total quality Management by Prof. DD Sharma, Sultan Chand & Sons, New Delhi

6.4 ANALYTICAL AND ENVIRONMENTAL INSTRUMENTS

L	T	P
4	-	-

RATIONALE

Today the whole world is facing the problem of pollution. The pollution maybe of air, water and noise. Whenever installation of a new industry takes place, problems of wastes and gases come in picture. It becomes essential to study different methods of analyzing the air and water in order to know their contaminants. Students will measure and check the different harmful constituents in air and water. After studying this subject, a student will be in a position to analyze and control the harmful pollutants.

DETAILED CONTENTS

1. Introduction
   - Fundamental blocks of analytical instruments (Brief details) (2 hrs)

2. Spectroscopic Analysis s (6 hrs)
   - Absorption spectroscopy
   - Emission spectroscopy
   - Mass spectroscopy
   - (Basic concepts of all these methods)

3. Gas Analysis (2 hrs)
   - Infrared gas analyzer
   - Paramagnetic oxygen analyzers
   - Magnetic force type
   - Magnetic wind type
   - Thermal conductivity analysis

   (Principles of working of these analyzers and block – diagram explanation only)

4. Chromatography (10 hrs)
   - Introduction or basic of chromatography
   - Gas chromatography
   - Liquid chromatography
   - Working classification and applications

5. Liquid Analysis (4 hrs)
   - Principle of pH measurement
   - Electrodes for pH measurement
   - Electrochemical analyzer

6. Environmental Pollution Instruments (10 hrs)
   - Air quality standards and emission standards
   - Types and concentration of various gas pollutants in atmosphere

- Ionization smoke detectors
  * Principles
  * Applications
  * Special features
- Smoke meters
- Dust measurement
- Visible emission monitoring systems
- Emission controls for coal-fired power plants

7. Electrochemical Instruments (8 hrs)
   - Electrochemical cell
   - Types of electrodes
   - Potentiometers
   - Conductivity meters
   - Aqua meters

8. Water and Noise Pollution (6 hrs)
   - Water pollution and its monitoring
   - Noise pollution and its monitoring

9. Biosensors (10 hrs)
   - Amperometric biosensors
   - Volta metric biosensors
   - Conductivity based biosensors
   - Polymer biosensors
   - Solid state biosensors
   - Optical biosensors

RECOMMENDED BOOKS

1. Handbook of analytical instruments by R.S. Khandpur, Tata McGraw Hill Publishers, New Delhi
2. Introduction to Environmental engineering and science by G.M. Master, Prentice Hall of India, New Delhi
3. Mechanical and Industrial Instruments by RK Jain
4. Principles of Industrial Instrumentation by D. Patrababis
5. Biosensors by Terman

Note:

For the following, field visits may be organized

1. To measure vibration using piezo electric transducer
2. To study thermal conductivity gas analyzer
3. To measure CO_2 in a given sample by carbon dioxide analyzer
4. To measure total dissolved solutions in water
5. To study spectropho meter
6. Demonstration of gas chromatograph

6.5 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

L	T	P
3	-	-

RATIONALE

Entrepreneurship Development and Management is one of the core competencies of technical human resource. Creating awareness regarding entrepreneurial traits, entrepreneurial support system, opportunity identification, project report preparation and understanding of legal and managerial aspects can be helpful in motivating technical/ vocational stream students to start their own small scale business/enterprise. Based on the broad competencies listed above, following detailed contents are arrived to develop the stated competencies.

DETAILED CONTENTS

(1) Entrepreneurship (4 hrs)

- 1.1 Concept/Meaning
- 1.2 Need
- 1.3 Competencies/qualities of an entrepreneur

(2) Entrepreneurial Support System (6 hrs)

- 2.1 District Industry Centres (DICs)
- 2.2 Commercial Banks
- 2.3 State Financial Corporations
- 2.4 Small Industries Service Institutes (SISIs), Small Industries Development Bank of India (SIDBI), National Bank for Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State level

(3) Market Survey and Opportunity Identification (Business Planning) (6 hrs)

- 3.1 How to start a small scale industry
- 3.2 Procedures for registration of small scale industry
- 3.3 List of items reserved for exclusive manufacture in small scale industry
- 3.4 Assessment of demand and supply in potential areas of growth
- 3.5 Understanding business opportunity
- 3.6 Considerations in product selection
- 3.7 Data collection for setting up small ventures

(4) Project Report Preparation (6 hrs)

- 4.1 Preliminary Project Report
- 4.2 Techno-Economic feasibility report
- 4.3 Project Viability

(5) Managerial Aspects of Small Business (8 hrs)

5.1 Principles of Management (Definition, functions of management viz planning, organisation, coordination and control
5.2 Operational Aspects of Production
5.3 Inventory Management
5.4 Basic principles of financial management
5.5 Marketing Techniques
5.6 Personnel Management
5.7 Importance of Communication in business

(6) Legal Aspects of Small Business (6 hrs)

6.1 Elementary knowledge of Income Tax, Sales Tax, Patent Rules, Excise Rules
6.2 Factory Act and Payment of Wages Act

(7) Environmental considerations (6 hrs)

7.1 Concept of ecology and environment
7.2 Factors contributing to Air, Water, Noise pollution
7.3 Air, water and noise pollution standards and control
7.4 Personal Protection Equipment (PPEs) for safety at work places

(8) Miscellaneous (6 hrs)

8.1 Human relations and performance in organization
8.2 Industrial Relations and Disputes
8.3 Relations with subordinates, peers and superiors
8.4 Motivation – Incentives, Rewards, Job Satisfaction
8.5 Leadership
8.6 Labour Welfare
8.7 Workers participation in management

(9) Motivation (4 hrs)

9.1 Factors determining motivation
9.2 Characteristics of motivation
9.3 Methods of improving motivation
9.4 Incentives – pay, promotion, rewards

(10) Leadership (2 hrs)

10.1 Need for leadership
10.2 Functions of a leader
10.3 Factors to be considered for accomplishing effective leadership

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
3. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi
4. Environmental and Pollution Awareness by Sharma BR, Satya Prakashan , New Delhi
5. Thakur Kailash, Environmental Protection Law and policy in India: Deep and Deep Publications, New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by Dr DD Sharma, Sultan Chand and Sons, New Delhi.
9. Principles of Management by Philip Kotler TEE Publication

6.6 MAJOR PROJECT WORK

L	T	P
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RATIONALE

Major Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place students for project oriented practical training in actual work situation for the stipulated period with a view to:

i) Develop understanding regarding the size and scale of operations and nature of field-work in which students are going to play their role after completing the courses of study.

ii) Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.

iii) Develop first hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems related to the world of work.

Iv) Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.

The individual students have different 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. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. 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 project work identified in collaboration with industry should be preferred.

This practical training cum project work **should not be considered** as merely conventional industrial training in which students are sent at work places with either minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/ field organizations. Each teacher is expected to supervise and guide 5-6 students.

Some of the project activities are given below:

1. Design, construction and implementation of load cell in a given problem
2. Design and construction of pressure transducers for industrial implementation
3. ECG analyzer while taking a case
4. Spiro data analysis for a given case
5. PLCs based design and implementation for industrial control system
6. Study and analysis of a plant Digital Distribution Control (DDC)
7. Study and analysis of a plant SCADA
8. Study and analyze automation of a sugar plant
9. Study and analyze automation of cement/textile/sugar/refinery
10. Study and analyze of a digital control system (DCS)
11. Data acquisition and handling for industrial problems
12. Waveform Generation using 8085
13. Measurement of Certain parameters in CNC Lathe/ Milling Controller
14. Trouble shooting of industrial plant operations
15. Estimation and costing of control system design in an industrial plant
16. Production scheduling and control technology in an industrial plant instrumentation
17. Stepper motor control using 8-bit micro-controller/ microprocessor
18. 2 x 16 alphanumeric LCD interface using 8-bit micro-controller/microprocessor
19. EPROM programmer using 8051 series micro-controller/microprocessor
20. Real time clock using 8-bit micro-controller/microprocessor
21. Temperature control using 8-bit micro-controller/microprocessor
22. Draw specifications, diagrams of various equipment systems and accessories used in a process control system. Prepare cost and time estimates

23. 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
    h) Simulate control operations of pressure control and compressor
    i) Simulate control operations of temperature control
    j) Simulate control operations of ratio control
    k) Simulate control operations of cascade control
    l) Simulate control operations of feed forward control

24. 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
    f) Traffic light control using microprocesssor

25. Control of a conveyor belt using PLC/PC

26. Simple control of pick-and-place robot using PC/PLC

27. Water level controller using 8085/PLC

28. Alphanumeric display system using LEDs

29. Pulse rate meter

NOTE:

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

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

Sr. No.	Performance criteria	Max. marks	Rating Scale				
			Exce-llent	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**

The overall grading of the practical training shall be made as per following table.

In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance to improve and re-evaluated before being disqualified and declared "not eligible to receive diploma ". It is also important to note that the students must get more than six "goods" or above "good" grade in different performance criteria items in order to get "Overall Good" grade.

	Range of maximum marks	Overall grade
i)	More than 80	Excellent
ii)	79 <> 65	Very good
iii)	64 <> 50	Good
iv)	49 <> 40	Fair
v)	Less than 40	Poor

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.**

3. **The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.**

4. **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 nearby industries are approached for instituting such awards.**

The teachers are free to evolve another criteria 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 organisations 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.

NOTE:

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 student