STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA
TEACHING AND EVALUATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES

DISCIPLINE: APPLIED ELECTRONICS & INSTRUMENTATION ENIGINEERING												SEMESTER: 6TH
SL NO	SUBJECT CODE	SUBJECT	PERIODS			EVALUATION SCHEME						
			L	T	P	INTERNAL EXAM			END SEM EXAM	TERM WORK	PRACTICAL EXAM	TOTAL MARKS
						TA	CT	Total				
THEORY												
1.	BST -501 OR HMT 601	ENVIRONMENTAL STUDIES OR ENTERPRENEURESHIP AND MANAGEMENT	5	-	-	10	20	30	70			100
2.	AIT 601	INDUSTRIAL & INTELLIGENT INSTRUMENTATION	4	-	-	10	20	30	70			100
3.	ETT 602	MICROCONTROLLER, EMBEDDED SYSTEM &PLCS	4	-	-	10	20	30	70			100
4.	ETT 603	DIGITAL SIGNAL PROCESSING	4	-	-	10	20	30	70			100
5.	AIT 602	**ELECTIVE (any ONE)**	4	-	-	10	20	30	70			100
		ARTIFICIAL INTELLIGENCE AND ROBOTICS										
		VIRTUAL INSTRUMENTATION & MEASUREMENT										
		SCIENTIFIC & ANALYTICAL INSTRUMENTATION										
		FIBRE-OPTICS INSTRUMENTATION										
PRACTICAL/TERM WORK												
6.	AIP 601	INDUSTRIAL & INTELLIGENT INSTRUMENTATION LAB	-	-	4	-	-	-	-	25	25	50
7.	ETP 602	MICROCONTROLLER & EMBEDDED SYSTEM LAB	-	-	4	-	-	-	-	25	25	50
8.	ETP 603	COMPUTER HARDWARE & MAINTENANCE LAB	-	-	3	-	-	-	-	25	25	50
9.	ETP 604	PLC & Network Lab	-	-	3	-	-	-	-	25	25	50
10.	AIP 602	INSTRUMENTATION PROJECT WORK & SEMINAR.	-	-	4	-	-	-	-	25	25	50
GRAND TOTAL			**21**	**-**	**18**	**50**	**100**	**150**	**350**	**125**	**125**	**750**
Total Contact hours per week: 39												
Abbreviations: L-Lecture, T-Tutorial, P-Practical, TA- Teacher's Assessment, CT- Class test												
Minimum Pass Mark in each Theory Subject is 35% and in Practical subject is 50%												

N.B. COURSE CONTENTS OF SUBJECTS COMMON TO ETC ARE AVAILABLE IN 6th ETC Syllabus

INDUSTRIAL & INTELLIGENT INSTRUMENTATION

Course code:	AIT 601	Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Tutorial:	-	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

RATIONALE:

Classical sensors have been traditionally used in various measurement and process control applications for a variety of parameters. A signal-conditioning circuit when interfaced to a sensor enhances the performance of the sensors manifold. Signal-conditioning operations are very common in instrumentation systems and have been used since long in the field of measurement and process control applications. With the advent of microprocessors and digital-processing technologies, such signal conditioning operation have been developed rapidly and the technologies have been found to have a good rapport with instrumentation systems. During the last decade, many new types of process parameters have evolved requiring new technologies of sensor or signal-conditioning systems. This new category of sensors carries the tag intelligent and has expanded the scope of incorporating intelligence to instrumentation system.

OBJECTIVES:

To know about the skill of different

1. Intelligent instrumentation& its history.
2. Virtual Instrumentation & Data Acquisition Methods:
3. Interfacings of Instruments & intelligent Sensors

COURSE CONTENT IN TERMS OF SPECIFIC OBJECTIVES:

1. Introduction **06**

1.1 Introduction to intelligent instrumentation,
1.2 Historical Perspective, Current status,
1.3 software based instruments.
1.4 Intelligent versus Dumb instruments.

2.0 Virtual Instrumentation: **10**

2.1 Introduction to graphical programming,
2.2 Data flow & graphical programming techniques,
2.3 Advantage of VI techniques,
2.4 VIs and sub Vis loops and charts,
2.5 Arrays, clusters and graphs, case and sequence structure, formula nodes, string and file I/O, Code Interface Nodes and DLL links.

3.0 Data Acquisition Methods: **10**

3.1 Analog and Digital IO, Counters, Timers,
3.2 Basic ADC designs, interfacing methods of DAQ hardware, software structure,
3.3 Use of simple and intermediate Vis.
3.4 Use of Data Sockets for Networked communication and controls.

4.0 Interfacing: **12**

4.1 Interfacing with RS 232C, RS422, RS423, RS485, USB, VXI, SCXI, PXI -Communication:
4.2 Basic networking methods and their applications in instrumentation,
4.3 Use of Data sockets for distributed control.
4.4 Analysis Techniques: DSP software, Measurement, filters and wavelets, Window, curve fitting

4.5 Ethernet Data Acquisition: Analog, Digital and Serial I/O through Ethernet for Distributed Control Systems

4.6 Modular Ethernet IO Data Acquisition System

5.0 Intelligent sensors: **10**

5.1 Intelligent pressure, Flow, level, Temperature sensor,

5.2 Intelligent sensor application in process control.

5.3 Intelligent analytical instruments.

5.4 Application of intelligent sensor in biomedical engineering.

6.0 SMART INSTRUMENTS **12**

6.1 Smart/intelligent transducer & comparison with conventional transducers ,

6.2 Self diagnosis and remote calibration features

6.3 Smart transmitter with HART communicator

6.4 Micro Electro , Mechanical Systems ,sensors, actuators -principles and applications

BOOKS:

Test Book:

1. G.C. Barney / Intelligent Instrumentation / Prentice Hall,
2. Lisa, K. Wells & Jeffery Travis / Lab VIEW for every one Prentice Hall,
3. Barney G.C.V., Intelligent Instrumentation: Prentice Hall of India Pvt. Ltd., New Delhi,
4. D. Patranabis -Principle of Industrial Instrumentation,TMH,2000

Reference Books:

1. A. S. Morris 8 Principles of measurement and Instrumentation -Prentice Hall.
2. S. Gupta -P.C Interfacing for data Acquisition & Process Control. 2nd Edition
3. Gray Johnson - Lab VIEW Graphical Programming 2nd Edition - Tata McGraw Hill,
4. Bitter, Mohiuddin, Nawrocki -Advance Cal VIEW Programming Techniques.
5. Doebelin, E.O., Measurement systems, McGraw Hill,

VIRTUAL INSTRUMENTATION & MEASUREMENT

Course code:	AIT 602	Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Tutorial:	-	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

A: RATIONALE:

Virtual instrumentation is the use of customizable software and modular measurement hardware to create user-defined measurement systems, called virtual instruments. Traditional hardware instrumentation systems are made up of pre-defined hardware components, their stimulus, analysis, or measurement function. Because of their hard-coded function, these systems are more limited in their versatility than virtual instrumentation systems. The virtual instrumentation is that software is used to replace a large amount of hardware. Virtual instrumentation has gradually increased addressable applications through continuous software innovation and hundreds of measurement hardware devices. Having influenced millions of test and automation professionals, today it is winning over experts in the control and design domains. Virtual Instrumentation is rapidly revolutionizing the functions of control design, distributed control, data logging, design verification, prototyping, simulation and more.

B: OBJECTIVS:

On completion of the study the students will be able to:

1. Introduction to Virtual Instrumentation (VI) & History of VI, Lab View
2. Basic of Lab View& , Components of Lab View, The For Loop, The WHILE Loop, Additional Loop.
3. The Structures & Arrays and Clusters
4. File Input / Output & String Handling functions
5. Introduction, Measurement of Data Acquisition with Lab VIEW.

C: TOPIC WISE DISTRIBUTION OF PERIODS:

1. Introduction to Virtual Instrumentation 14

1.1 Introduction, Computers in Instrumentation,

1.2 What is Virtual Instrumentation (VI)?

1.3 History of VI, Lab View and VI, Conventional and Graphical Programming, Future Perspectives,

1.4 Basic of Lab View:- Introduction, Components of Lab View, Owned and Free Labels, Tools and other Pallettes, Arranging Objects, Pop-up Menus, Colour Coding, Code Debugging, Context Sensitive Help Creating Sub- Vis,

1.5 FOR and WHILE Loops:- Introduction, The For Loop, The WHILE Loop, Additional Loop Problem, Loop Behaviors and Inter loop Communication, Local Variable, Global Variables, Shift Registers, Auto indexing, Loop Timing.

1.6 The Structures:- Introduction, Sequence Structures, Case Structures, Case Structure, Formula Node.

2.0 Arrays and Clusters 10

2.1 Introduction, Arrays, Clusters, Inter-conversion of Arrays and Clusters,

2.2 Graphs and Charts:-Introduction, Waveforms Chart, Resetting Plots, Waveform Graph, Use of Cursors, X-Y Graph

2.3 State Machines:-Introduction, What is a State Machine?, A Simple State Machine, Event Structures,

3.0 File Input / Output 10

3.1 Introduction, File Formats, File I/O Functions, Path Functions, Path Functions,

3.2 Sample VIs to Demonstrate File WRITE and READ, Generating Filenames Automatically.

4.0 String Handling **10**

4.1 Introduction, String Functions,

4.2 Lab VIEW String Formats, Examples, Some More Functions,

4.3 Parsing of Strings, Basics of Data Acquisition:- Introduction, Classification of Signals, Real World Signals, Analog Interfacing ,

4.4 Connecting the Signal to the Board, Guidelines

4.5 Practical vs. Ideal Interfacing

4.6 Bridge Signal Sources

5. Data Acquisition with Lab VIEW DAQ Vis **8**

5.1 Introduction, Measurement and Automation Explorer,

5.2 The Waveform Data Type, use of Simple VIs, Intermediate VIs, Use of DAQmx

6. Interfacing Instruments **8**

6.1 Define interfacing connection using GPIB and RS 232

6.2 Introduction, RS232C vs. GPIB, Handshaking,

6.3 GPIB Interfacing, RS232C/RS485 Interfacing,

6.4 Standard Commands for Programmable Instruments, VISA, Instrument Interfacing and Lab VIEW.

BOOKS:

TEXT BOOKS

1. Sanjay Gupta and Joseph John "Virtual Instrumentation Using Lab VIEW, TMH Publications.

2. Gary Johnson, Lab VIEW Graphical Programming, 2nd Edition, McGraw Hill, New York, 1997.

REFERENCE BOOKS:

1. Lisa K. wells & Jeffrey Travis, "Lab VIEW for everyone", Prentice Hall, New Jersey, 1997.

2. Jane W. S. Liu, "Real-time Systems", Pearson Education India, 2001.

SCIENTIFIC & ANALYTICAL INSTRUMENTATION

Course code:	AIT 602	Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Tutorial:	-	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

A: RATIONALE:

The scientific instrument is an instrument used for scientific purposes. Over time, instruments have become more accurate and precise. Scientific instruments are part of laboratory equipment, but are considered more sophisticated and more specialized than other measuring instruments as scales, meter sticks, chronometers, thermometers or even waveform generators. They are increasingly based upon the integration of computers to improve and simplify control, enhance and extend instrumental functions, conditions, parameter adjustments and data sampling, collection, resolution, analysis (both during and post-process), storage and retrieval.

B: OBJECTIVES:

On completion of the study the students will be able to:

1. Introduction to Scientific and Analytical Instruments
2. Spectrophotometers & Infrared spectroscopy
3. Atomic absorption spectroscopy applications
4. Nuclear magnetic Resonance spectrometer concepts
5. Blood gas analyzer & Industrial gas analyzer details

C: COURSE CONTENT &DISTRIBUTION OF PERIODS

1. Introduction: 10

1.1 Introduction to Scientific and Analytical Instruments

1.2 Spectrophotometers: Electromagnetic Radiations, Laws relating to absorption of radiation, Absorption of radiation, Absorption instruments,

1.3 Single beam Null type spectrophotometer, Direct reading, Double beam ratio recording, Dual wavelength spectrophotometer,

1.4 Sources of errors in spectro photometric measurements.

2. IR spectrophotometer: 10

2.1 Define & Explain Infrared spectroscopy

2.2 Basic components, types, sample handling techniques, FIR, calibration, ATR technique

3. Atomic Absorption spectrophotometer: 08

3.1 Explain Atomic absorption spectroscopy,

3.2 Explain Atomic absorption instrumentation,

3.2 What are sources of interference?

4. Mass Spectrometer: 10

4.1 Basic mass spectrometer

4.2 Principle of operation types, components, Application of mass Spectrometer

4.3 ICR mass spectrometer,-operation & application

4.4 Basics of Gas chromatograph- mass spectrometer, liquid chromatographic mass spectrometer.

5. Nuclear magnetic Resonance spectrometer: 10

5.1 NMR spectroscopy, Principles, types, constructional details,

5.2 Sensitivity enhancement for analytical NMR spectroscopy.

5.3 Explain X-ray spectrum,

5.4 Instrumentation for x-ray spectrometry, x-ray defracto meter, x-ray absorption meter x-ray house scence spectrometry

6. Blood gas analyzer & Industrial gas analyzer 12

6.1 Explain Acid Base balance, Blood PH measurement, measurement of Blood PCO2 Blood PO2 measurement, a complete blood gas analyzer.

6.2 Industrial gas analyzer**:** Definition, Types, paramagnetic oxygen analyzer, magnetic wind instruments, IR gas analyzers, Thermal conductivity analyzers, Analyzers based on gas density method based on ionisation of gases.

BOOKS:

Text Books:

1. R.S. Khandpur - Analytical Instruments, TMH Publications
2. D. Patranabis, - Principles of Industrial Instrumentation, TMH Publications.

REFERENCES BOOKS

1. B.G. Liptak, - Process Measurement and Analysis, 4th Edition, CRC Press

FIBER OPTIC INSTRUMENTATION

Course code:	AIT 602	Semester	6th
Total Period:	60	Examination	3 hrs
Theory periods:	4P/week	Class Test:	20
Tutorial:	-	Teacher's Assessment:	10
Maximum marks:	100	End Semester Examination:	70

A: RATIONALE:

The fiber optic Instrumentation is a sensor that uses optical fiber either as the sensing element ("intrinsic sensors"), or as a means of relaying signals from a remote sensor to the electronics that process the signals. Fibers have many uses in remote sensing. Depending on the application, fiber may be used because of its small size, or because no electrical power is needed at the remote location, or because many sensors can be multiplexed along the length of a fiber by using light wavelength shift for each sensor, or by sensing the time delay as light passes along the fiber through each sensor.

B: OBJECTIVES:

On completion of the study the students will be able to:

1. Expose the students to the basic concepts of optical fibres and their properties.
2. Provide adequate knowledge about the Industrial applications of optical fibres.
3. Expose the students to the Laser fundamentals.
4. Provide adequate knowledge about Industrial application of lasers.
5. Provide adequate knowledge about holography and Medical applications of Lasers.
6. Provide knowledge of Fibre Optics Sensors

C: COURSE CONTENT &DISTRIBUTION OF PERIODS

1. **Optical sources:** **8**
   - 1.1 Define Light Emitting Diodes (LEDs). LED Structures & its applications.
   - 1.2 Light Source Materials Quantum Efficiency and LED Power, Modulation of an LED.
2. **LASER diodes**: **12**
   - 2.1 Define Laser Diode & its Principle of Operation, Modes and Threshold Conditions, Structure Optical output power
   - 2.2 Explain resonant frequencies, Radiation pattern, Single Mode Lasers, Modulation of Laser diode.
   - 2.3 Optical Detectors: P-n junction Photo diode-how they work, Power relationship,
   - 2.4 Explain p-n photo detector & p-i-n photo diode –operation & working princile
   - 2.5 Explain APD photodiode- Principle of operation & application
3. **Optical Fiber**, **10**
   - 3.1 Define Optical Fibre
   - 3.2 Explain Fiber Materials: Ray Propagation in Step-Index Fibers, Total Internal reflection, Ray Propagation in Graded Index Fibers, Mode Theory, Mono mode Fibers,
   - 3.3 Attenuation in Optical Fibers- Absorption, scattering and bending losses
   - 3.4 Define Numerical Aperture,
4. **Fiber Optic Sensors**. **12**
   - 4.1 Define Fibre Optic Sensor
   - 4.2 Explain Intensity Modulated Sensors, Phase Modulated Sensors. Fiber-optic Mech-Zehnder Interferomatric sensors, Fiber-Optic Gyroscope Spectrally Modulated Sensors. Distributed Fiber Optic

Sensors.

4.3 Explain Medical Applications of Fibre Sensors

5. Optical Amplifiers: **10**

5.1 Define Optical Amplifier**.**

5.2 Explain Semiconductor Optical amplifiers (SOA).

5.3 Fibre- optic Measurements: Define Modulation of intensity by sources. Modulation of Intensity by Transmission medium.

6. Splicing FIbre Optics - **08**

6.1 Introduction of Splicing of Fibre

6.2 Steps involvements in Splicing

6.3 Different types of Splicing & application.

BOOKS:

TEXT BOOKS:

1. Gerd Keiser, Optical Fiber Communication, 3rd Edition, TMH
2. R.P. Khare, Fibre Optics & Opto electronics, Oxford University Press.
3. Optical Fibres and Fibre Optic Communication System-Dr. Subir Kumar Sarkar, S Chand

REFERENCES BOOKS:

1. Harold Kolimbins, Fiber Optic Communication, 3rd Edition, Pearson Education
2. Optical Fiber Communication - Senior (3rd Edition) PHI

INDUSTRIAL & INTELLIGENT INSTRUMENT LAB.

Course code:	AIP 601	Semester	6th
Total Period:	60	Examination	4 hrs
Lab. periods:	4 P / week	Term Work	25
Maximum marks:	50	End Semester Examination:	25

A: RATIONALE:

Industrial & Instrumentation lab enhances the performance of the sensors manifold. Signal-conditioning operations are very common in instrumentation systems and have been used since long in the field of measurement and process control applications in recent manufacturing Industries with the advent of microprocessors and digital-processing technologies, such signal conditioning operation have been developed rapidly and the technologies have been found to have a good rapport with instrumentation systems. This new category lab has expanded the scope of incorporating intelligence to instrumentation system.

B: OBJECTIVS:

On completion of this Lab the students will be able to:

1. Design and Simulation of Instrumentation amplifier.
2. Study and simulation of ADC.& DAC.
3. Concept of microcontroller based storage & display device.
4. Study of phase sensitive detector.
5. Study Communication for Basic networking methods and their applications in instrumentation,
6. Knowledge in DSP software, Measurement, filters and wavelets,
7. Ideas of Ethernet Data Acquisition: Analog, Digital and Serial I/O
8. Study of Smart/intelligent transducer

C:List of Experiments:

1. Design and Simulation of Instrumentation amplifier.
2. The study and simulation of Analog to Digital Conv erter (ADC).
3. Study and Simulation of Digital to Analog Conv erter (DAC).
4. Design of a microcontroller based storage & display device.
5. Study of phase sensitive detector.
6. Study of RS 232C, RS422, RS423, RS485, USB, VXI, SCXI, PXI. -Communication for Basic networking methods and their applications in instrumentation,
7. DSP software, Measurement, filters and wavelets, Window, curve fitting probability & statistics.
8. Study of Ethernet Data Acquisition: Analog, Digital and Serial I/O through Ethernet for Distributed
9. Case Study of Smart/intelligent transducer
10. Projects as above & Industrial Visit

INSTRUMENTATION PROJECT WORK & SEMINAR

Course code:	AIP 602	Semester	6th
Total Period:	60	Examination	4 hrs
Lab. periods:	4 P / week	Term Work	25
Maximum marks:	50	End Semester Examination:	25

A: RATIONALE:

The Project work is intended to integrate the knowledge, skills and attitudes developed after completion of subjects for developing competency in a particular specialized job. In this activity the role of teachers is a facilitator or co-ordinator. The student will select a topic, perform design work, place the indents and get the raw materials either from the department or from the local market and implement the design. The leadership quality, coordination of job and maintaining a good communal harmony is important factor of activity. It is the process, which is to be evaluated along with students knowledge and their dedication. The success of the project is no doubt the goal but the group activity will also be critically evaluated. It is necessary to develop the communication skill both for verbal and written presentation of facts and data. For developing the skill of presenting the fact related to technical matter in terms of oral presentation the seminar is to be arranged. For developing the skill of presenting the report of any observed phenomena the preparation of report is needed. The job is designed in such a way that both the verbal and writing skill as well as techniques of presentation will be developed.

B: OBJECTIVS:

On completion of the Project Work the students will able to:

1. Select a suitable project work.
2. Design the job.
3. Prepare job schedule.
4. Select and Indent the materials.
5. Procure material.
6. Exhibit co-operative attitude towards the peer group.
7. Develop leadership.
8. Develop cost awareness.
9. Develop attitude for proper utilization of time.
10. Develop marketing strategies.
11. Develop quality consciousness.
12. After successful completion of this seminar, the student will able to
13. Present the facts or data or concept through a seminar for developing oral communication skill.
14. Interacting with the audience during questionnaire session.
15. Write the reports containing synopsis, content and other description with suitable display items.
16. Presentation will be either OHP/Power Point Presentation or chart display etc.

C: COURSE CONTENT:

1. The students should be divided into group of 4 or 5 students. Each faculty should guide one group & he should that act as project guide. The students should select the projects of advanced topic of their own choice (Hardware /Software) in consultation with project guide.
2. The Sessional records should be maintained and evaluated by a team of faculty members and the final marks awarded by the team.

3. In the end examination, a team of External Examiners and Internal examiner will evaluate students.
4. Suggested Project activity.
5. The students should select the projects of advanced topic of their own choice (Hardware /Software) in consultation

D: The Project Work:

i)The Project Work- This is to enable the student to take up investigative study in the broad field of Electronics & Communication Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

- Survey and study of published literature on the assigned topic;
- Working out a preliminary Approach to the Problem relating to the assigned topic;
- Conducting preliminary Analysis/Modeling/Simulation/Experiment/Design/Feasibility;
- Preparing a Written Report on the Study conducted for presentation to the Department;
- Final Seminar, as oral Presentation before a Departmental Committee

ii) The Project Work II & Dissertation – This is to enable the student to extend further the investigative study taken up under EC P1, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Departmental one or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

- In depth study of the topic assigned in the light of the Report prepared ;
- Review and finalization of the Approach to the Problem relating to the assigned topic;
- Preparing an Action Plan for conducting the investigation, including team work;
- Detailed Analysis/Modeling/Simulation/Design/Problem Solving/Experiment as needed;
- Final development of product/process, testing, results, conclusions and future directions;
- Preparing a paper for Conference presentation/Publication in Journals, if possible;
- Preparing a Dissertation in the standard format for being evaluated by the Department

1. **A practical project needs to be taken**. The steps involved in the project work are:
    a. Identification of the project.
    b. Problem definition.
    c. Gathering information / Data needed for the project.
    d. Selection of best solution.
    e. Selection and collection of suitable material.
    f. Planning and fabrication.
    g. Detailed Design.
    h. Testing.
    i. Preparing a detailed project report.

2. The Project report (Dissertation) should have the following features.

a. Introduction.
b. Name and feature of the project
c. Block diagram of the project.
d. Circuit diagram and its brief description
e. Flow chart
f. Components layout.

g. Printed circuit pattern or layout diagram of the circuit.
h. Front panel and cabinet drawing.
i. Components list
j. Cost estimation of the project
k. Power Supply.
l. Testing points and waveforms if any
m. Operation and maintenance & design procedure
n. Suggestion for improvement if any
o. Operation and maintenance procedure.
p. Electrical safety information
q. Electrical safety information
r. Conclusion
s. Scope for feature

3. **The internal and final evaluation marks** have to be awarded on the basis of the above features along with viva-voce at the end.

4. **Evaluation based on:**
   a. Work done during Semester for Project.
   b. Testing & Working of Project.
   c. PPP Seminar Presentation.

5. **Students may be advised to do the project in the following related areas.**

A: Minor project (at least any two projects)

Develop a power supply related project.

(a) Develop a simple IC based project.
(b) Develop a simple Audio power project.
(c) Develop an Smart related Instrumentation.
(d) Develop a simple Electronics Chime / Sound generation Circuit/Develop any protective Circuit.
(e) Develop any Medical Electronics related project
(f) Preparation of Instrument Amplifier
(g) Project based on Sensor Application

N.B.: The Minor project must be course related.

B: Major project (at least any Two projects)

a. The project based on following topics
- Microcontroller Based
- Power Electronics & Industrial Control based.
- Robotics Based.
- Mechatronics Based
- Embedded System Based
- Industrial Application Based
-Sensor based

N.B : Any other Project may also be carried out in consultation with the Project guide as per suitability. Each project report must contain the technical data of live components i.e. Transistor. ICs etc and pin diagrams of the such devices component layout diagram etc.

- Use pisspice /Electronics work branch for initial work and simulation purpose.
- Use METLAB for project work and simulation purpose.

E. SEMINAR

- Classes should be divided into smaller groups of not more than four in each group. One group should be assigned a topic for the Seminar. The topic should be usually related to their course of

studies or should be of general interest. Every student of the group should prepare on a particular aspect of the main topic with active support and guidance from a teacher guide. The student should be encouraged to extensively use the library facilities and also to collect relevant material from different Technical Magazines and Journals. Each student should be usually asked to present his paper on the topic of the Seminar within 15 minutes after which a question answer session may follow for 5 minutes. The Sr. Lecturer or Sr. faculty member should preside over the Seminar and ensure its smooth conduct. The student should be encouraged to use Audio-Visual Aids and other modern teaching methods during presentation of the topics in the Seminar. The Chairman should give the valedictory address and offer suggestions for quality improvement of the Seminar. The Chairman should give the valedictory address and offer suggestions for quality improvement of the Seminar. Each student at-least speaks for a minimum of two times during the semester.

- The Sessional Records should be maintained and evaluated by a team of faculty members and the final marks awarded by the team.