Semester V

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-16	EEPC-501	Microprocessor and its Application	2	1	0	3	3
2	Programme core course-17	EEPC-502	Microprocessor and its Application Lab	0	0	2	2	1
3	Programme core course-18	EEPC-503	Energy Conservation and Audit	3	0	0	2	3
4	Programme core course-19	EEPC-504	Energy Conservation and Audit Laboratory	0	0	2	2	1
5	Programme core course-20	EEPC-505	Renewable Energy Power Plants	3	0	0	3	3
6	Programme elective course-2 (Any One to be selected)	EEPE-506/A	Industrial Instrumentation and Condition Monitoring	3	0	0	3	3
		EEPE-506/B	Industrial Automation & Control					
		EEPE-506/C	Switchgear and Protection					
7	Programme elective course-3 (Any One to be selected)	EEPE-507/A	Industrial Instrumentation and Condition Monitoring Lab	0	0	2	2	1
		EEPE-507/B	Industrial Automation & Control Lab					
		EEPE-507/C	Switchgear and Protection Lab					
8	Open elective course-1	(Any one to be selected from Annexure-I)		3	0	0	3	3
9	Summer Internship-II (6 weeks) after IV Semester	EESI-509	Summer Internship – II	0	0	0	0	3
10	Major Project	EEPR-510	Major Project	0	0	2	2	1
Total				**15**	**1**	**6**	**22**	**22**

SEMESTER -V

MICROPROCESSORANDITSAPPLICATIONS

Course Code :	EEPC-501
Course Title :	MICROPROCESSORANDITSAPPLICATIONS
Number of Credits	3 (L: 2, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

Course Outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the below mentioned competency:

a) Interpret the salient features of intel-8085

b) Develop assembly language program with 8085 microprocessor

c) Understand Memory Organization and interfacing of different peripheral devices

d) Use of Microprocessor for measurement of electrical parameters and wave generations

e) Interpret the salient features of microcontroller IC 8051

Course Contents:

Module – I (BASICARCHITECTUREOF8-BITMICROPROCESSOR)

Number of Class hours: 8 hours

Suggestive Learning Outcome: Students would be able to know

1. Hardware features of intel-8085
2. Different Functional blocks of 8085
3. Pindescription of 8085.

Hardware features of intel-8085-functional blocks, bus structure, arithmetic logic unit, generalpurpose registers and special purpose registers, interrupts, serial input and output ports, pindescriptions.

Module – II(MICROPROCESSORPROGRAMMING)

Number of Class hours: 8 hours

Suggestive Learning Outcome: Students would be able to know

1. InstructionsetofIntel-8085
2. Differenttypesofprogrammingmodel
3. Branchandsubroutine

InstructionsetofIntel-8085-
Move,arithmetic,Logic,branchingandmachinecycleinstructionand their timing diagrams.Differenttypesofprogrammingmodel.Simpleprogrammingof8085
Addressingmodes-
Direct,indirect,immediate,register,indexedandrelativemodeof addressing
Introductiontobranchandsubroutine.

Module – III(MEMORYORGANIZATION)

Number of Class hours: 8 hours

Suggestive Learning Outcome: Students would be able to know

1. Memory mapped I/O, I/O mapped I/O
2. HardwareandSoftware&VectoredInterrupts
3. InterfacingofA/DandD/Aconverterswith8085microprocessor

Address space partitioning, memory mapped I/O, I/O mapped I/O, serial, parallel,
synchronous,asynchronousdatatransferanddirectmemoryaccess,MemoryInterfacingconsiderations,Buffered System.
Interrupt–hardwareandSoftware&VectoredInterrupts
Interfacing- SerialandParallel(8251,8255), InterfacingofA/DandD/Aconverterswith8085microprocessorandsimpleprogramming.

Module – IV(APPLICATIONSOF MICROPROCESSOR)

Number of Class hours: 8 hours

Suggestive Learning Outcome: Students would be able to

1. MeasureVoltage,Current, Frequency
2. Generate various types of waveforms
3. Know DC MotorController and temperaturemonitoringandcontroller

MeasurementofVoltage,Current,Frequency ,Generation of square, triangular & Staircase Waveforms.Overcurrent/ under voltage relay, Zero crossing defection & phase sequence detectionSoftwareforthyristortriggering, Briefidea of DC MotorController (SCRControlled). (Tacho generatorfeedback withbang-bang ControlStrategyonly).Hardware&Softwareforthefollowing:-
temperaturemonitoringandcontroller.(ON/OFFController only).Steppermotor controller.

Module – V(APPLICATIONSOF MICROCONTROLLERS)

Number of Class hours: 8 hours

Suggestive Learning Outcome: Students would be able to Know

1. Introduction to Microcontrollers
2. Compare Microprocessor and Microcontrollers
3. Architecture and Block diagram of Microcontroller 8051

Introduction to Microcontrollers, Evolution of Microcontrollers ,Block diagram of Microcomputer, Elements of Microcomputer, types of buses, Von Neuman and Harward Architecture ,Compare Microprocessor and Microcontrollers, Need of Microcontroller ,Family of Microcontrollers and their specifications. Architecture of Microcontroller 8051 Block diagram of 8051, function of each block Pin diagram.

References:

1. MicroprocessorArchitecturesandApplications ,Gaonkar

2. Microprocessors:Principles and Applications , A.K. Pal, Tata Mc-Graw-Hill

3. Microprocessorsandits applications, Leventhal

4. TextofMicroprocessorbaseexperimentsandProjects, A.K.Mukhopadhaya

5. Microprocessorsanditsinterfacing, B.RAM, Dhanpat Rai Publications

6. Kenneth, Ayala, 8051 Microcontroller Architecture Programming and Application, PHI Learning, New Delhi,ISBN: 978-1401861582

MICROPROCESSOR AND ITS APPLICATIONLAB

Course Code :	EEPC-502
Course Title :	MICROPROCESSOR AND ITS APPLICATIONLAB
Number of Credits	1(L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

Course outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the below mentioned competency:

a) Interpret the salient features of 8085 microprocessor

b) Maintain the program features of the 8085 microprocessor based application

c) Develop assembly language program and demonstrate outcome

d) Develop program to interface 8085 microprocessor with different peripheral devices

Practicals:

1. Hands on practice and observation& study on 8085 microprocessor.
2. Develop and execute Assembly language programs using Arithmetic Instructions and demonstrate outcome for a given input data
3. Develop and execute Assembly language programs using Logical Instructions and demonstrate outcome for a given input
4. Develop and execute an Assembly language program for Addition of series of 8 bit nos, 16 bit result and demonstrate outcome for a given input data
5. Develop and execute Assembly language program for addition/subtraction of 16 bit no/multibyte nos. and demonstrate outcome for a given input data
6. Measurementofdifferentphysicalparameterssuchasvoltage,frequency, speed,temperature using 8085microprocessor.
7. Generationofdifferentwaveformusing8085basedD/Aconverters.
8. Thyristor triggering using 8085 based system
9. Studyof 8255 PPIatdifferent modes.
10. Electromagneticrelayoperationusing8085basedsystem.
11. Studyofinterfacing&executionofsteppermotor using8085basedsystem.

List of Equipments:

1. Microprocessor 8085 Training and Development System
2. 8255 PPI Study Card
3. 8253 Timer/Counter Study Card
4. Analog to Digital Converter

5. Digital to Analog Converter

ENERGY CONSERVATION AND AUDIT

Course Code :	EEPC-503
Course Title :	ENERGY CONSERVATION AND AUDIT
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences: • Undertake energy conservation and energy audit.

Course outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

a) Interpret energy conservation policies in India(k3).

b) Implement energy conservation techniques in electrical machines(k3).

c) Apply energy conservation techniques in electrical installations(k3).

d) Use Co-generation and relevant tariff for reducing losses in facilities(k3).

e) Analyse the report of energy audit for electrical system(k4).

Course contents:

Module – I Energy Conservation Basics

No of Class Hours-6

Suggested Learning Outcomes: Students would be able to understand

1. Energy Scenario in India.
2. Concept of Energy Conservation.
3. Concept of Energy Audit.

Energy Scenario: Primary and Secondary Energy, Energy demand and supply, National scenario. Energy conservation and Energy audit; concepts and difference Indian Electricity Act 2001; relevant clauses of energy conservation BEE and its Roles, MEDA and its Roles, Star Labelling: Need and its benefits.

Module – II Energy Conservation in Electrical Machines

No of Class Hours- 8

Suggested Learning Outcomes: Students would be able to understand

1. Need for Energy Conservation.
2. Need for Energy efficient Machines

Need for energy conservation in induction motor and transformer. Energy conservation techniques in induction motor by: Improving Power quality. Motor survey, Matching motor with loading. Minimizing the idle and redundant running of motor. Operating in star mode. Rewinding of motor, Replacement by energy efficient motor, Periodic maintenance, Energy conservation techniques in Transformer, Loading sharing, Parallel operation, Isolating techniques. Replacement by energy efficient transformers, Periodic maintenance, Energy Conservation Equipment: Soft starters, Automatic star delta convertor, Variable Frequency Drives, Automatic p.f. controller (APFC), Intelligent p.f. controller (IPFC) Energy efficient motor; significant features, advantages, applications and limitations, Energy efficient transformers, amorphous transformers; epoxy Resin cast transformer / Dry type of transformer.

Module– III Energy conservation in Electrical Installation systems

No of Class Hours-8

Suggested Learning Outcomes: Students would be able to

1. Understand Aggregated Technical and commercial losses.
2. Understand the concept of Energy Conservation in Electrical Machines.

Aggregated Technical and commercial losses (ATC); Power system at state, regional, national and global level. Technical losses; causes and measures to reduce by. a) Controlling I^2R losses. b) Optimizing distribution voltage c) Balancing phase currents d) Compensating reactive power flow Commercial losses: pilferage, causes and remedies, Energy conservation equipments, Maximum Demand Controller, kVAR Controller, Automatic Power Factor controller(APFC) Energy Conservation in Lighting System a) Replacing Lamp sources. b) Using energy efficient luminaries. c) Using light controlled gears. d) Installation of separate transformer / servo stabilizer for lighting. e) Periodic survey and adequate maintenance programs. Energy Conservation techniques in fans, Electronic regulators.

Module– IV Energy conservation through Cogeneration and Tariff

No of Class Hours-8

Suggested Learning Outcomes: Students would be able to understand

1. Co-generation and it’s impact on tariff.
2. Different types of tariff.
3. Application of tariff system to reduce energy bill

Co-generation and Tariff concept, significance for energy conservation, Co-generation, Types of cogeneration on basis of sequence of energy use (Topping cycle, Bottoming cycle) Types of cogeneration basis of technology (Steam turbine cogeneration, Gas turbine cogeneration, Reciprocating engine cogeneration). Factors governing the selection of cogeneration system. Advantages of cogeneration. Tariff: Types of tariff structure: Special tariffs; Time-off-day tariff, Peak-off-day tariff, Power factor tariff, Maximum Demand tariff, Load factor tariff. Application of tariff system to reduce energy bill.

Module– V Energy Audit of Electrical System

No of Class hours-4

Suggested Learning Outcomes: Students would be able to understand

1. Impact of Energy Conservation Act.
2. How to prepare questionnaire for energy audit projects

Energy audit (definition as per Energy Conservation Act), Energy audit instruments and their use. Questionnaire for energy audit projects. Energy flow diagram (Sankey diagram), Simple payback period, Energy Audit procedure (walk through audit and detailed audit). Energy Audit report format.

References:

1.Guide Books No. 1 and 3 for National Certification Examination for Energy Managers and Energy Auditors, Bureau of Energy Efficiency (BEE), Bureau of Energy Efficiency (A Statutory body under Ministry of Power, Government of India) (Fourth Edition 2015).

2. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi

3. Henderson, P. D., India - The Energy Sector, University Press, Delhi, 2016. ISBN: 978-0195606539 4. Turner, W. C., Energy Management Handbook, Fairmount Press, 2012, ISBN 9781304520708

5. Sharma, K. V., Venkataseshaiah; P., Energy Management and Conservation, I K International Publishing House Pvt. Ltd; 2011 ISBN 9789381141298

6. Mehta ,V. K., Principles of Power System, S. Chand &Co.New Delhi, 2016, ISBN 9788121905947

7. Singh, Sanjeev; Rathore, Umesh, Energy Management, S K Kataria&Sons,New Delhi ISBN-13: 9789350141014.

8. Desai, B. G.; Rana, J. S.; A. Dinesh, V.; Paraman, R., Efficient Use and Management of Electricity in Industry, Devki Energy Consultancy Pvt. Ltd.

9. Chakrabarti, Aman, Energy Engineering And Management, e-books Kindle Edition

ENERGY CONSERVATION AND AUDIT LABORATORY

Course Code :	EEPC-504
Course Title :	ENERGY CONSERVATION AND AUDIT LABORATORY
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

Course Objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences: • Undertake energy conservation and energy audit.

Course outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

a) Understand energy conservation policies in India(k2).

b) Determine the reduction in power consumption techniques in electrical machines(k4).

c) Understand suitable tariff for energy conservation and its impact on energy bill(k2).

d) Estimate energy saving by improving power factor and load factor for given cases(k6).

e)Prepare an energy audit report(k3).

Practicals:

1. Identify star labelled electrical apparatus and compare the data for various star ratings.

2. Determine the '% loading' of the given loaded Induction motor.

3. Determine the reduction in power consumption in star mode operation of Induction motor compared to delta mode.

4. Use APFC unit for improvement of p. f. of electrical load.169 Electrical Engineering Curriculum Structure

5. Compare power consumption of different types of TL with choke, electronic ballast and LED lamps by direct measurements.

6. Determine the reduction in power consumption by replacement of lamps in a class room / laboratory.

7. Determine the reduction in power consumption by replacement of Fans and regulators in a class room / laboratory.

8. Collect electricity bill of an industrial consumer and suggest suitable tariff for energy conservation and its impact on energy bill.

9. Collect electricity bill of a commercial consumer and suggest suitable tariff for conservation and reduction of its energy bill.

10. Collect electricity bill of a residential consumer and suggest suitable means for conservation and reduction of the energy bill.

11. Estimate energy saving by improving power factor and load factor for given cases.

12. Prepare a sample energy audit questionnaire for the given industrial facility.

13. Prepare an energy audit report (Phase-I)

14. Prepare an energy audit report (Phase-II)

15. Prepare an energy audit report (Phase-III)

References:

1.Guide Books No. 1 and 3 for National Certification Examination for Energy Managers and Energy Auditors, Bureau of Energy Efficiency (BEE), Bureau of Energy Efficiency (A Statutory body under Ministry of Power, Government of India) (Fourth Edition 2015).

2. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi

3. Henderson, P. D., India - The Energy Sector, University Press, Delhi, 2016. ISBN: 978-0195606539 4. Turner, W. C., Energy Management Handbook, Fairmount Press, 2012, ISBN 9781304520708

5. Sharma, K. V., Venkataseshaiah; P., Energy Management and Conservation, I K International Publishing House Pvt. Ltd; 2011 ISBN 9789381141298

6. Mehta ,V. K., Principles of Power System, S. Chand &Co.New Delhi, 2016, ISBN 9788121905947

7. Singh, Sanjeev; Rathore, Umesh, Energy Management, S K Kataria&Sons,New Delhi ISBN-13: 9789350141014.

8. Desai, B. G.; Rana, J. S.; A. Dinesh, V.; Paraman, R., Efficient Use and Management of Electricity in Industry, Devki Energy Consultancy Pvt. Ltd.

9. Chakrabarti, Aman, Energy Engineering And Management, e-books Kindle Edition

RENEWABLE ENERGY POWER PLANT

Course Code :	EEPC-505
Course Title :	RENEWABLE ENERGY POWER PLANT
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

Course outcomes:

After completion of this course students will be able to:

a). Maintain the optimized working of solar PV power plants.(K3)
b). Gain knowledge about working principle small wind turbines. (K1)
c). Maintain the optimized working of mini and micro hydro power plants.(K3)
d). To understand the role of Geo-thermal energy and ocean energy in the Energy Generation (K2)
e). Get the utilization of Biogas plants (K3)

Course contents:

Module – I: Solar Energy

Number of class hours: 6 Hours

Suggestive Learning Outcomes: Students will be able to:

1. Describe the Fundamentals of Solar Photo Voltaic Conversion process.
2. Understand the function of different parts of a solar power plant.
3. Explain the working of Solar PV Power Generation systems.
4. Know the applications of Solar PV.

Detailed content of the unit: -

Fundamentals of Solar Photo Voltaic Conversion, Solar Cells Solar Photovoltaic (PV) power plant: components layout, construction, working. Rooftop solar PV power system, Solar PV Power Generation systems: Off-grid systems, Grid connected systems, Solar PV Applications

Module – II: Wind Energy and Small Wind Turbines

Number of class hours: 10 Hours

Suggestive Learning Outcomes: Students will be able to

1. Know the Basic principles of wind energy conversion.
2. Know the application of Wind Energy.

3. Explain the working of different types of small wind turbine.

Detailed content of the unit: -

Scope for Wind energy in India, Basic principles of wind energy conversion. Site selection considerations, Basic components of wind energy conversion system, Application of Wind Energy, Solar wind hybrid system

Horizontal axis small wind turbine: direct drive type, components and working Horizontal axis small wind turbine: geared type, components and working

Vertical axis small wind turbine: direct drive and geared, components and working Types of towers and installation of small wind turbines on roof tops and open fields. Electric generators used in small wind power plants

Module – III: Mini and Micro-hydro Power Plants

Number of class hours: 8 Hours

Suggestive Learning Outcomes: Students will be able to:

1. Know the Overview of micro, mini and small hydro systems.
2. Know the site selection of small hydroelectric plant.
3. Draw the Layouts of micro-hydro power plants.
4. Describe the working of small (Mini and Micro) hydro-electric power generation system.

Detailed content of the unit: -

Small Hydropower Systems: Overview of micro, mini and small hydro systems,

Selection of site for small hydroelectric plant. Layouts of micro-hydro power plants, Main elements of small (Mini and Micro) hydro-electric power generation system, control requirements in small hydro power plants. Advantages of small hydro power plants over large hydro power generation systems

Module – IV: Geo-Thermal and Ocean Energy

Number of class hours: 8 Hours

Suggestive Learning Outcomes: Students will be able to:

1. Know the sites of Geothermal Energy in India.
2. Know the Resources of geothermal energy.
3. Understand the Principle of OTEC system.
4. Understand the Principle of Tidal Power.
5. Know the Classification of Tidal Power Plants.
6. Know the Electricity generation from Waves.

Detailed content of the unit: -

Geothermal Energy: Introduction, Geothermal sites in India Capacity and Potential, Resources of geothermal energy.Ocean Thermal Energy: Ocean Thermal Energy Conversion (OTEC), Principle of OTEC system, Methods of OTEC power generation. Tidal power plants: Basic Principle of Tidal Power, Components of Tidal Power Plant, Classification of Tidal Power

Plants. Electricity generation from Waves.

Module – V: Biomass-based Power Plants

Number of class hours: 8 Hours

Suggestive Learning Outcomes: Students will be able to:

1. Describe the properties of fuel used in Biomass-based Power Plants.
2. Know the Bio-mass Conversion Technologies.
3. Know the types of biogas plants.
4. Describe the Methods for obtaining energy from biomass.
5. Explain the Advantages and disadvantages of types of biogas plants.

Detailed content of the unit: -

Properties of solid fuel for biomass power plants: bagasse, wood chips, rice husk, municipal waste.

Properties of liquid and gaseous fuel for biomass power plants: Jatropha, bio-diesel gobar gas. Bio-mass Conversion Technologies: Wet and Dry processes. Generation-Factors affecting biogas Generation,

Types of biogas plants, Methods for obtaining energy from biomass. Advantages and disadvantages of types of biogas plants

Industrial Instrumentation and Condition Monitoring

Course Code	EEPE-506/A
Course Title	Industrial Instrumentation and Condition Monitoring
Number of Credits	3 (L: 3, T: 0, P:0)
Prerequisites	NIL
Course Category	PE

Course outcomes:-

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- CO-1 Select relevant instruments used for measuring electrical and non-electrical quantities.(k3)
- CO-2 Select relevant transducers/sensors for various applications. (k3)
- CO-3 Use relevant instruments for measuring non-electrical quantities.(k4)
- CO-4 Check the signal conditioning and telemetry system for their proper functioning.(k3)
- CO-5 Use data acquisition systems in various applications.(k4)
- CO-6 Undertake condition monitoring for diagnostic analysis of electrical equipment(k3)

Course Contents:-

Module- 1:- Fundamentals of instrumentation
Number of class hours: 8 (Four) Hrs

Suggestive Learning Outcomes:-
Students will be able to:
1. Gather knowledge about Basic purpose of instrumentation
2. Know about Basic block diagram(transduction, signal conditioning, signal presentation) and their function.
3. Know about Construction, working and application of switching devices

Detailed Content of the Unit:-
Basic purpose of instrumentation.
Basic block diagram (transduction, signal conditioning, signal presentation) and their function.
Construction, working and application of switching devices- Push button, limit switch, float Switch, pressure switch, thermostat, electromagnetic relay.

Module 2:- Transducer
Number of class hours: 8 (Four) Hrs

Suggestive Learning Outcomes:-

Students will be able to:

1. Distinguish between different transducer
2. Know about Construction and principle of resistive transducer & Inductive transducers
3. Know about Construction, principle and applications of transducers – Piezo-Electric transducer, photoconductive

Detailed Content of the Unit:-

Distinguish between Primary and Secondary, Electrical and Mechanical, Analog and Digital, Active and Passive. Mechanical devices pry. And sec. transducers
Advantages of electric transducers
Required characteristics of transducers.
Factors affecting the choice of transducers
Construction and principle of resistive transducer-Potentiometer –variac and strain gauges -No derivation. Only definition and formula for gauge factor
Types of strain gauges like unbonded, bonded and semiconductor.
Construction and principle of Inductive transducers-L.V.D.T. and R.V.D.T, their applications.
Construction, principle and applications of transducers – Piezo-Electric transducer, photoconductive
cells, photo voltaic cells.

Module 3:- Measurement of Non-Electrical Quantities
Number of class hours: 8 (Four) Hrs

Suggestive Learning Outcomes:-

Students will be able to:

1. Know about Construction and Working of RTD, Thermistor and Thermocouple, radiation pyrometer ctc
2. Know about Construction and Working of Speed Measurement by contacting and non-Contact
3. Know about Construction and Working ofLiquid & Thickness level measurement by resistive, inductive, Capacitive,

Detailed Content of the Unit:-

Temperature measurement - Construction and Working of RTD, Thermistor and Thermocouple,radiation pyrometer, technical specifications and ranges.
Pressure measurement – Construction and working of bourdon tube, bellow diaphragm and strain gauge, Combination of diaphragm and inductive transducer, Bourdon tube and LVDT, bellow and LVDT, diaphragm capacitance and bridge Circuit.
Construction and Working of Speed Measurement by contacting and non-Contact Type- DC tachometer, photo- electric tachometer, toothed rotor tachometer Generator - magnetic pickup

and Stroboscope. Construction and Working of Vibration measurement by accelerometer-LVDT accelerometer, Piezo electric type.
Construction and Working of Flow measurement by electromagnetic and Turbine Flow meter.
Construction and Working of Liquid level measurement by resistive, inductive, Capacitive gamma rays and Ultrasonic methods.
Construction and Working of Thickness measurement by resistive, inductive, capacitive, ultrasonicand Nuclear methods

Module 4:- Signal Conditioning

Number of class hours: 8 (Four) Hrs

Suggestive Learning Outcomes:

Students will be able to:

1. Know about Basic Concept of signal conditioning System.
2. Know about Different Parameters of op-amp
3. Know about Filters

Detailed Content of the Unit:-

Basic Concept of signal conditioning System.
Draw pin configuration of IC 741.
Define Ideal OP-AMPand Electrical Characteristics of OP-AMP.
Different Parameters of op-amp:-Input offset voltage, Input offset current, Input bias current, Differential input resistance, CMMR, SVRR, voltage gain, output voltage, slew rate, gain bandwidth.
Output, short circuit current.
Use of op-amp as inverting, non- inverting mode, adder, subtractor, and Working of Differentialamplifier and instrumentation amplifier.
Filters: Types of RC filters and frequency response -no derivation.
Sample and hold circuits - operation and its application.

Module 5:- Data Acquisition System

Number of class hours: 8 (Four) Hrs

Suggestive Learning Outcomes:-

Students will be able to:

1. Know about Generalized DAS- Block diagram and description of Transducer, signal conditioner, multiplexer etc.
2. Know about Digital to Analog conversion
3. Know about Concept and methods of data transmission of electrical and electronic transmission.

Detailed Content of the Unit:-

Generalized DAS- Block diagram and description of Transducer, signal conditioner, multiplexer,converter and recorder
Draw Single Channel and Multi-channel DAS- Block diagram only. Difference between Signal
Channel and Multi-Channel DAS.

Data conversion- Construction and Working of Analog to digital conversion- successive approximationmethod, ramp type method.
Digital to Analog conversion- Construction and Working of binary weighted resistance method.
Concept and methods of data transmission of electrical and electronic transmission.
Construction and principle of telemetry system and its type - Electrical telemetering system-
Digital display device- operation and its application of seven segment display, dot matrix displayand concept of 3½, 4½ digits, LED and LCD applications

References:

1. Sawhney, A.K. Electric and Electronic Measurement and instrumentation, Dhanpat Rai and Co.,Nineteenth revised edition 2011 reprint, 2014**,** ISBN:10: 8177001000
2. Rangan, C.S. G.R.Sharma. andV.S.V.Mani, Instrumentation devices and system, Pen ram International*Publishing* India Pvt. Ltd. Fifth edition, ISBN:10: 0074633503
3. Mehta, V.K. Electronics and instrumentation, Third edition-S.Chand and company Pvt Ltd Reprint,2010, ISBN:81-219-2729-3
4. Singh, S.K. Industrial instrumentation and control, Tata McGraw-Hill, 1987. ISBN: 007451914X,9780074519141.
5. J.G. Joshi, Electronic Measurement and Instrumentation, Khanna Publishing House, New Delhi(ISBN: 978-93-86173-621)

INDUSTRIAL AUTOMATION & CONTROL

Course Code	EEPE-506/B
Course Title	Industrial Automation & Control
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	EEPC307, EEPC405
Course Category	PE

Course Outcomes: -

After completion of the course student will be able to :

1.identify different types of automation systems (K-3 Level).
2.interface I/O devices with the PLC modules (K-4 Level).
3.develop PLC ladder programs for various applications (K-4 Level).
4.prepare simple SCADA applications(K-4 Level).

Course Content:-

Module- 1: Introduction to Industrial Automation

Number of class hours: 04(Four) Hrs

Suggestive Learning Outcomes: Studentswillbe ableto:

1. To be able to explain significance of automation.
2. To be able to state advantages of automation.
3. To be able to differentiate Relay based & PLC based controlsystem.

Detailed content of the unit: -

Automation: Need and benefits; Types of automation system: Fixed, Programmable, Flexible; Different systems used for Industrial automation: PLC, HMI, SCADA, DCS, Drives; Evolution of PLC.

Module- 2: PLC Fundamentals

Number of class hours: 06(six) Hrs

Suggestive Learning Outcomes: Studentswillbe ableto:

1. To be able to draw generalized block diagram of PLC.
2. To be able to draw simple block diagrams and functions of different input modules.
3. To be able to know type and use of memory.
4. To be able to compare PC and PLC.
5. To be able to develop block diagram ofPLC power supply.

Detailed content of the unit: -

Building blocks of PLC**:** CPU, Memory organization, Input- output modules (discrete and analog),Specialty I/O Modules, Power supply;Fixed and Modular PLC and their types,

Redundancy in PLC module;I/O module selection criteria; Interfacing different I/O devices with appropriate I/O modules.

Module- 3: PLC Programming basics

Number of class hours: 5(Five) Hrs

Suggestive Learning Outcomes: Studentswillbe ableto:

1. To be able to name different PLC Programming languages.
2. To be able to understand Ladderdiagram development.
3. To be able to develop the PLC ladder programs for the given situation

Detailed content of the unit: -

PLC I/O addressing;PLC programming Instructions**:** Relay type instructions, Timer instructions: On delay, off delay, retentive, Counter instructions: Up, Down, High speed, Logical instructions, Comparison Instructions, Data handling Instructions, Arithmetic instructions; PLC programming language**:** Functional Block Diagram (FBD), Instruction List. Structuredtext, Sequential Function Chart (SFC), Ladder Programming.Simple Programming examples using ladder logic**:** Language based on relay, timer counter,logical, comparison, arithmetic and data handling instructions.

Module- 4: PLC wiring diagrams and Ladder logic

Number of class hours: 08(Eight) Hrs

Suggestive Learning Outcomes: Studentswillbe ableto:

1. To be able to develop ladder diagrams for the given situations
2. To be able to prepare the relevant wiring diagram for connecting the given type of PLC
3. To be able to describe the method to troubleshoot the given PLC ladder diagram and wiring diagram.

Detailed content of the unit: -

Seal in circuits using PLC.Ladder and wiring diagram of DOL starter with OLRLatching relay using PLCBased Applications: Motor sequence control, Traffic light control, Elevator control, TankLevel control, Conveyor system, Stepper motor control, Reactor Control Gate trigger circuits– Resistance and Resistance-Capacitance circuits.

Module- 5:Supervisory Control and Data Acquisition System (SCADA)

Number of class hours:8(Eight) Hrs

Suggestive Learning Outcomes: Studentswillbe ableto:

1. To be able to identify the specific components of the given SCADA system.
2. To be able to prepare block diagram of the given architecture of SCADA.
3. To be able to understand various applications of SCADA.

Detailed content of the unit: -

Introduction to SCADA: Typical SCADA architecture/block diagram, Benefits of SCADA;
Various editors of SCADA;Interfacing SCADA system with PLC: Typical connection diagram, Object Linking & embeddingfor Process Control(OPC) architecture, Steps in Creating SCADA Screen for simple object,Steps for Linking SCADA object (defining Tags and Items) with PLC ladder program usingOPC;Applications of SCADA: Traffic light control, water distribution, pipeline control.

References: -

1. Dunning, G., Introduction to Programmable Logic Controllers, Thomson /Delmar learning, New Delhi, 2005,ISBN 13 : 9781401884260
2. Jadhav, V. R., Programmable Logic Controller, Khanna publishers, New Delhi, 2017, ISBN : 9788174092281
3. Petruzella, F.D., Programmable Logic Controllers, McGraw Hill India, New Delhi, 2010, ISBN: 9780071067386
4. Hackworth, John; Hackworth, Federic, Programmable Logic Controllers, PHI Learning, New Delhi, 2003, ISBN : 9780130607188
5. Stenerson Jon, Industrial automation and Process control, PHI Learning, New Delhi, 2003, ISBN : 9780130618900
6. Mitra, Madhuchandra; Sengupta, Samarjit, Programmable Logic Controllers and Industrial Automation - An introduction, Penram International Publication, 2015, ISBN: 9788187972174
7. Boyar, S. A., Supervisory Control and Data Acquisition, ISA Publication, USA, ISBN: 978-1936007097 Electrical Engineering Curriculum Structure
8. Bailey David ; Wright Edwin, Practical SCADA for industry, Newnes (an imprint of Elsevier), UK 2003, ISBN:0750658053

SWITCHGEAR AND PROTECTION

Course Code :	EEPE-501/C
Course Title :	SWITCHGEAR AND PROTECTION
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

Course outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

1.Identify various types of faults in power system (K1).
2.Select suitable switchgears for different applications (K3).
3.Test the performance of different protective relays (K5).
4.Maintain protection systems of alternators and transformers (K3).
5.Maintain protection schemes for motors and transmission lines (K3).
6.Maintain protection schemes for power system against over voltages (K3).

Course contents:

Module – I Basics of Protection

Number of class hours: 6(six) Hrs
Suggested Learning Outcomes: Students would be able to understand

1 Functions of protective system.
2 Types of faults and their causes.
3 Short circuit fault calculations.

Detailed content of the unit: -

Necessity, functions of protective system.Normal and abnormal conditions.Types of faults and their causes.Protection zones and backup protectionShort circuit fault calculations in lines fed by generators through transformers. Need of current limiting reactors and their arrangements.

Module – II Circuit Interruption Devices

Number of class hours: 8 (Eight) Hrs
Suggested Learning Outcomes: Students would be able to understand
1 Arc formation process.
2 HT circuit breakers
3 LT circuit breakers

Detailed content of the unit: -

Isolators- Vertical break, Horizontal break and Pantograph type.HRC fuses – Construction, working, characteristics and applications.Arc formation process, methods of arc extinction (High resistance and Low resistance), Arcvoltage, Recovery voltage, Re-striking voltage, RRRV.HT circuit breakers (Sulphur-hexa Fluoride (SF6), Vacuum circuit breaker) - Working, construction,specifications and applications.L.T. circuit breaker (Air circuit breakers (ACB), Miniature circuit breakers (MCB), Moulded case circuit breakers (MCCB) and Earth leakage circuit breaker (ELCB)) - Working and applications.Selection of LT and HT circuit breakers (ratings), Selection of MCCB for motors.Gas insulated switchgear.

Module– III Protective Relays

Number of class hours: 8 (Eight) Hrs
Suggested Learning Outcomes: Students would be able to

1 Understand Aggregated Basic relay terminology.
2 Understand the concept of Protective relays.

Detailed content of the unit: -

Fundamental quality requirements: Selectivity, Speed, Sensitivity, Reliability, Simplicity,Economy.Basic relay terminology- Protective relay, Relay time, Pick up, Reset current, current setting, Plug setting multiplier, Time setting multiplier.Protective relays: Classification, principle of working, construction and operation of – Electromagnetic (Attracted armature type, Solenoid type, Watt-hour meter type) relay, Thermal relay. Block diagram and working of Static relay.Over current relay-Time current characteristics.Microprocessor based over current relays: Block diagram, working.
Distance relaying- Principle, operation of Definite distance relays.Directional relay: Need and operation. Operation of current and voltage differential relay.

Module– IV Protection of Alternator and Transformer

Number of class hours: 6 (Six) Hrs
Suggested Learning Outcomes: Students would be able to understand

1 Protection of Alternator
2 Protection of Transformer

Detailed content of the unit: -

Alternator Protection: Faults, Differential protection Over current, earth fault, overheating and field failure, protection.Reverse power protection.

Transformer Protection: Faults, Differential, over current, earth fault, over heating protection, Limitations of differential protection.Buchholz relay: Construction, operation, merits and demerits.

Module– V Protection of Motors, Bus-bar and Transmission Line

Number of class hours: 6 (Six) Hrs

Suggested Learning Outcomes: Students would be able to understand

1 Different types of protection of Motor.
2 Different types of protection of Busbar and Transmission line

Detailed content of the unit: -

Motor: Faults. Short circuit protection, Overload protection, Single phase preventer**.**

Bus bar and Transmission line: Faults on Bus bar and Transmission Lines.Bus bar protection: Differential and Fault bus protection.Transmission line: Over current, Distance and Pilot wire protection.

References:

1. Mehta V. K ;Rohit Mehta, Principles of Power System, S .Chand and Co., NewDelhi., ISBN: 978-81-2192-496-2.
2. Rao.Sunil S., Switchgear and Protection, Khanna Publishers, New Delhi, ISBN: 978-81-7409-232-3.
3. Singh, R. P., Switchgear and Power System Protection, PHI Learning, New Delhi,ISBN: 978-81-203-3660-5.
4. Gupta. J. B.. Switchgear and Protection, S. K. Kataria and Sons, New Delhi, ISBN: 978-93-5014-372-8.
5. Veerapan, N.,Krishnamurty, S. R., Switchgear and Protection, S .Chand and Co., New Delhi. ISBN: 978-81-2193-212-7.
6. Ram, Badri; Vishwakarma D. N., Power System Protection and Switchgear, McGraw-Hill, New Delhi. ISBN : 978-07-107774-X

Industrial Instrumentation and Condition Monitoring Laboratory

Course Code	:EEPE507/A
Course Title	: Industrial Instrumentation and Condition Monitoring Laboratory
Number of Credits	: 1(L: 0, T: 0, P: 2)
Prerequisites	:NIL
Course Category	: PE

Course outcomes:-

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

CO-1 Select relevant instruments used for measuring electrical and non-electrical quantities.

CO-2 Select relevant transducers/sensors for various applications.

CO-3 Use relevant instruments for measuring non-electrical quantities.

CO-4 Check the signal conditioning and telemetry system for their proper functioning.

CO-5 Use data acquisition systems in various applications.

CO-6 Undertake condition monitoring for diagnostic analysis of electrical equipment

Practicals:-

1. Identify different switches used in instrumentation system.
2. Measure linear displacement by L.V.D.T.
3. Measure the strain with the help of strain gauge
4. Measure temperature by PT-100, thermistor, thermocouple along with simple resistance bridge.
5. Use Thermocouple to control the temperature of a furnace/machine.8. Measure the flow using flow meter.
6. Measure pressure using pressure sensor kit.
7. Measure angular speed using stroboscope and tachometer.
8. Measure the flow using flow meter.
9. Use op-amp as inverter, non-inverting mode, adder, differentiator and integrator.
10. Convert digital data into analog data by using analog to digital converters and analog data

into digital data by digital to analog converter.

11. Visit to testing center of electrical testing lab for tan delta and diagnostic tests and determine

polarization index

12. Prepare a Report on various tools and equipment used for condition monitoring of electrical

Machines.

Industrial Automation & Control Laboratory

Course Code	EEPE-507/B
Course Title	Industrial Automation & Control Laboratory
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	EEPC308, EEPC406
Course Category	PE

Course Outcomes: -

After completing the course student will be able to:-

CO-1 identify different types of automation systems (K-3 Level).
CO-2 interface I/O devices with the PLC modules (K-4 Level).
CO-3 develop PLC ladder programs for various applications (K-4 Level).
CO-4 prepare simple SCADA applications(K-4 Level).

Course Content:-

Practicals:

1. Identify various automation systems available in different appliances/ devices/ machines in day to day use. (*)
2. Identify various parts of the given PLC and front panel status indicators.(*)
3. Use PLC to test the START STOP logic using two inputs and one output.(*)
4. Develop/Execute a ladder program for the given application using following: - timer, counter, comparison, logical, arithmetic instructions.
5. Use PLC to control the following devices like lamp, motor, push button switches, proximity sensor.(*)
6. Measure the temperature of the given liquid using RTD or Thermocouple and PLC.
7. Develop/test ladder program to blink the LED/lamp.(*)
8. Develop / test the Ladder program for sequential control application of lamps/ DC motors.
9. Develop ladder program for Traffic light control system.(*)
10. Develop /test ladder program for Automated car parking system.
11. Develop / test ladder program for Automated elevator control.
12. Develop / test ladder program for rotating stepper motor in forward and reverse direction at constant speed.
13. Develop /test ladder program for tank water level control.
14. Develop / test ladder program for control of speed of stepper motor with suitable drivers.
15. Use various functions of SCADA simulation editors to develop simple project.
16. Develop a SCADA mimic diagram for Tank level control.
17. Develop SCADA mimic diagram for Flow control in a given system.
18. Simulate Tank level control using available SCADA system.

Note:

A minimum of 10(ten) or more practical need to be performed, out of which the practicals marked as '*' are compulsory.

List of Equipments/Instruments required:

Sl. No.	Equipment name with broad specifications	Practical No.
1.	Control components: Push bottons(5 Nos), indicating lamps (5 Nos), float switch(2 Nos)	2-14
2.	Three phase AC contactors (2 Nos)	2-14
3.	PLC with minimum 8 I/O and HMI and its simulation/ programming software.(1 Nos)	2-14
4.	Stepper motor drive module	12
5.	Traffic light simulation practical module	9
6.	Temperature control system	6
7.	Elevator Control Module for PLC	11

SWITCHGEAR AND PROTECTION LABORATORY

Course Code :	EEPC-507/C
Course Title :	SWITCHGEAR AND PROTECTION LABORATORY
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PE

Course Objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Maintain switchgear and protection schemes used in electrical power systems.

Course outcomes:

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

a) Identify various types of faults in power system (K1).
b) Select suitable switchgears for different applications (K3).
c) Test the performance of different protective relays (K4).
d) Maintain protection systems of alternators and transformers (K3)
e) Maintain protection schemes for motors and transmission lines (K3).
f) Maintain protection schemes for power system against over voltages (K3).

Practicals:

1. Identify various switchgears in the laboratory and write their specifications.
2. Test HRC fuse by performing the load test.
3. Test MCB by performing the load test
4. Dismantle MCCB/ELCB and identify various parts.
5. Dismantle ACB/VCB and identify different parts.
6. Set the plug and time (with PSM, TSM) of induction type electromagnetic relay.
7. Test electromagnetic over-current relay by performing load test.
8. Simulate differential protection scheme for transformer with power system simulation kit.
9. Test the working of the single phasing preventer using a three phase induction motor.
10. Simulate transmission line protection by using the impedance relay/over current relay for various faults. (On transmission line protection simulation Kit).
11. Dismantle Thyrite type arrester and identify different parts.
12. Perform neutral earthing at different substations / locations.

Summer Internship-II

Course Code	EESI-509
Course Title	Summer Internship-II
Number of Credits	3 (L: 0, T: 0, P: 0)
Prerequisites	Fundamental and basic practical skills of relevant discipline/programme
Course Category	Internship

Internships may be full-time or part-time; they are full-time in the summer vacation and part-time during the academic session.

Sl. no.	Schedule	Duration	Activities	Credits	Hours of Work
1	Summer Vacation after 4th Semester	6 Weeks	Industrial/Govt./NGO/MSME/ Rural Internship/Innovation / Entrepreneurship ##	3	120 Hours

(##During the summer vacation after 4th Semester, students are ready for industrial experience. Therefore, they may choose to undergo Internship /Innovation /Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry. In case a student want to pursue his/her family business and don't want to undergo internship, a declaration by a parent may be submitted directly to the TPO.)

Course Outcome: -

After completion of the course, students will be able to:

C.O.1: **Describe a better understanding of the engineering / technological workplace**(K2).

C.O.2: **Develop and demonstrate workplace competencies necessary for professional and academic success (K2).**

C.O.3: **Classify career preferences and professional goals (K3).**

C.O.4: Develop preliminary portfolio including work samples from the internship (K2).

C.O.5: **Increase competitiveness for full-time engineering employment / start-up** (K3).

Course Content:-

Internships are educational and career development opportunities, providing practical experience in a field or discipline. The Summer Internship-II is a student centric activity that would expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the

intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

1. Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
2. Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
3. Exposure to the current technological developments relevant to the subject area of training.
4. Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions.
5. Create conditions conducive to quest for knowledge and its applicability on the job.
6. Learn to apply the Technical knowledge in real industrial situations.
7. Gain experience in writing Technical reports/projects.
8. Expose students to the engineer's responsibilities and ethics.
9. Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
10. Promote academic, professional and/or personal development.
11. Expose the students to future employers.
12. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
13. Understand the psychology of the workers and their habits, attitudes and approach to problem solving.

Overall compilation of Internship Activities / Credit Framework:

Major Head of Activity	**Credit**	**Schedule**	**Total Duration**	**Sub Activity Head**	**Proposed Document as Evidence**	**Evaluated by**	**Performance appraisal/ Maximum points/ activity**
Innovation / IPR / Entrepreneurship	3	Summer Vacation after 4th Semester	6 Weeks	Participation in innovation related completions for eg. Hackathons etc.	Certificate	Faculty Mentor	Satisfactory/ Good/ Excellent
				Development of new product/ Business Plan/ registration of start-up	Certificate	Programme Head	Satisfactory/ Good/ Excellent
				Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business	Certificate	President/ Convener of ICC	Satisfactory/ Good/ Excellent

				Completion/ Technical Expos etc.			
				Work experience at family business	Declaration by Parent	TPO	Satisfactory/ Good/ Excellent
Internship	3	Summer Vacation after 4th Semester	6 Weeks	(Internship with Industry/ Govt. / NGO/ PSU/ Any Micro/ Small/ Medium enterprise/ Online Internship	Evaluating Report	Faculty Mentor/ TPO/ Industry supervisor	Satisfactory/ Good/ Excellent
Rural Internship	3	Summer Vacation after 4th Semester	6 Weeks	Long Term goals under rural Internship	Evaluating Report	Faculty Mentor/ TPO/ NSS/ NCC head	Satisfactory/ Good/ Excellent

STUDENT'S DIARY/ DAILY LOG

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day-to-day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed at the end of each day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor visiting the industry from time to time and get ratified on the day of his visit.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

a) Regularity in maintenance of the diary.
b) Adequacy & quality of information recorded.
c) Drawings, sketches and data recorded.
d) Thought process and recording techniques used.
e) Organization of the information.

INTERNSHIP REPORT

After completion of Internship, the student should prepare a comprehensive report to indicate what he has observed and learnt in the training period. The student may contact Industrial Supervisor/ Faculty Mentor/TPO for assigning special topics and problems and should prepare the final report on the assigned topics. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The training report should be signed by the Internship Supervisor, TPO and Faculty Mentor. The Internship report will be evaluated on the basis of following criteria:

a) Originality.
b) Adequacy and purposeful write-up.
c) Organization, format, drawings, sketches, style, language etc.
d) Variety and relevance of learning experience.
e) Practical applications, relationships with basic theory and concepts taught in the course.

Major Project - I

Course Code	CEPR-510
Course Title	Minor Project
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

After completion of the course, students will be able to:

C.O. 1: Demonstrate a sound technical knowledge of their selected project topic and the knowledge, skills and attitudes of a professional engineer (K2).

C.O. 2: Develop the skill of working in a Team (K3).

C.O. 3: Design engineering solutions to complex problems utilising a systems approach (K6).

C.O. 4: Design the solution of an engineering project involving latest tools and techniques (K6).

C.O. 5: Develop the skill of effective communication with engineers and the community at large in written an oral forms. (K3)

Course Content:-

The major project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should have the following-

1) Develop sound knowledge about the domain of the project work.
2) Perform detailed study about various components of a project.
3) Learn to be an important member of a team for successful execution of a project work.
4) Study about methodologies and professional way of documentation and communication related to project work.
5) Develop idea about problem formulation, finding the solution of a complex engineering problem.
6) Develop project report as per the suggested format to communicate the findings of the project work.
7) Acquire the skill of effective oral communication to the fellow engineers and people in the society at large.