SEMESTER-5

ELECTRICAL & ELECTRONICS ENGINEERING

COURSE TITLE : INDUSTRIAL MANAGEMENT & SAFETY
COURSE CODE : 5001
COURSE CATEGORY : C
PERIODS/WEEK : 4
PERIODS/SEMESTER : 52
CREDITS : 4

TIME SCHEDULE

MODULE	TOPIC	PERIODS
1	Principles of management Human resources management Wages and incentives	13
2	Quality planning and Development Material and sales management	13
3	Project management techniques and quantitative techniques	13
4	Industrial safety , entrepreneurship	13
TOTAL		**52**

COURSE OUTCOME

SL.NO.	STUDENT WILL BE ABLE TO
1	Understand the principles of management practices
2	Appreciate the significance of human resources management
3	Understand the principles of wage payment system and incentives
4	Appreciate the significance of quality planning and development
5	Understand the functions of material and sales management
6	Appreciate the role of project management techniques
7	Apply the principles of quantitative techniques in managenent
8	Understand the features of industrial safety
9	Appreciate the qualities of an entrepreneur

SPECIFIC OUTCOME

MODULE I

1.1.0 Understand the principles of management practices.

1.1.1 Explain the meaning of Management.
1.1.2 Explain the development of management theory of F.W.Taylor and Henry Foyal.
1.1.3 State and explain the functions of management .
1.1.4 State the forms of business organization.
1.1.5 Explain different types of ownership .
1.1.6 Explain different types of organizational structure .

1.2.0 Appreciate the significance of human resources management

1.2.1 Outline the importance of HRM.
1.2.2 State and explain the functions of HRM .
1.2.3 Explain the process of man power planning.
1.2.4 Explain Job analysis, job evaluation, merit rating, performance appraisal .
1.2.5 Describe the steps in selection of workers.
1.2.6 Explain the objectives of training.
1.2.7 State and explain the methods of training.
1.2.8 Define labour turn over.

1.3.0 Understand the principles of wage payment system and incentives

1.3.1 Define different types of wages.
1.3.2 Define incentives.
1.3.2 Identify financial, non-financial and semi financial incentives.
List different types of financial incentive plans.

MODULE II

2.1.0 Appreciate the significance of quality planning and development**.**

2.1.1 List the dimensions (characteristics) of quality.
2.1.2 List the objectives of quality planning.
2.1.3 Describe Three prong approach to quality planning.
2.1.4 List the developments in quality planning.
2.1.5 Explain the concept and role of ISO standards.
2.1.6 List the elements of ISO 9000 series.
2.1.7 List the steps for ISO 9000 installation.
2.1.8 List the objectives of quality audit.
2.1.9 Describe the concept of Total Quality Management (TQM).
2.1.10 Discuss the link between ISO and TQM.
2.1.11 List the ten “manthras’’ of TQM.
2.1.12 Explain mission, vision and quality policy.

2.2.0 Understand the functions of material and sales management.
2.2.1 List the objectives of purchase department.

2.2.2 State the buying techniques.
2.2.3 Describe purchase procedure.
2.2.4 Define inventory.
2.2.5 Classify the inventory.
2.2.6 Explain inventory models such as EOQ and ABC.
2.2.7 List the objectives of stores management.
2.2.8 Explain the functions of store keeping.
2.2.9 Describe the store keeping records.
2.2.10 Explain the concept of store layout.
2.2.11 Describe the centralised and de-centralised store.
2.2.12 Outline the importance of sales department.
2.2.13 List the functions of sales department.
2.2.14 Explain the process of sales forecasting.

MODULE III

3.1.0 Appreciate the role of project management techniques
3.1.1 Outline the network technique .
3.1.2 List different applications of CPM and PERT
3.1.3 Outline scope of PERT and CPM
3.1.4 Define the terms used in CPM .
3.1.5 Compute the project duration, slack and critical path by using AOA method only.
3.1.6 Distinguish between CPM and PERT.
3.1.7 Define the terms used in PERT .
3.1.8 Explain the terms pessimistic, optimistic and most likely time.
3.1.9 Calculate the expected time for each activity.
3.1.10 Compute the project duration ,slack and mark the critical path.

3.2.0 Apply the principles of quantitative techniques in management.
3.2.1 List different quantitative techniques.
3.2.2 Formulation of Linear Programming Problem (LPP).
3.2.3 Graphical solution of given LPP on maximisation and minimisation.
3.2.4 Explain the scope of transportation problem.
3.2.5 Compute the initial feasible solution of transportation problem by using Least cost method
3.2.6 Explain game theory.
3.2.7 Compute the saddle point, optimum strategy of the game, two - person - zero sum using max- min and min-max principle.

MODULE IV

4.1.0 Understand the features of industrial safety
4.1.1 Explain the importance and need for safety measures in industries
4.1.2 Define the meaning of the terms - factory, accident, frequency rate, severity rate, incidence rate, performance index, accident proneness, unsafe acts, unsafe conditions, job safety analysis, plant safety inspections, industrial safety policy.
4.1.3 Identify the various accident factors, mechanical factors, environmental factors, and personal factors.

4.1.4 Discuss the 4 E's of accident prevention technique.
4.1.5 Discuss the role of safety council and safety officer.
4.1.6 Discuss emergency preparedness and response.
4.1.7 Discuss the precautions to be observed in preventing accident while working in hazardous environment.

4.2.0 Appreciate the qualities of an entrepreneur
4.2.1 Describe the profile of an entrepreneur
4.2.2 List the functions of an entrepreneur
4.2.3 Identify the risk taking qualities of an entrepreneur
4.2.4 Explain the concept of student entrepreneur.
4.2.5 List the different factors contributing to the failure of entrepreneurial ventures
4.2.6 Identify industrial support needed programs existing in India, Kerala
4.2.7 State the concept of DSIR,TBI, MSME.etc.
4.2.8 State the steps involved in starting small-scale industry
4.2.9 Describe the procedure for the registration of SSI
4.2.10 Identify the net work of financial assistances given to an entrepreneur
4.2.11 Identify the different constituents of feasibility study
4.2.12 Prepare the feasibility report / project report

CONTENT DETAILS

MODULE I

1. Principles of management

Introduction - meaning of management - development of management theory: - Taylor's scientific management,- Modern approaches-compare F.W. Taylor and Henry Fayol's contributions
Functions of management- Different types of ownership: - Sole proprietorship, partnership, private Ltd company, public Ltd company, co-operative society-transnational organizations (brief description only)
Organizational structure: - Definition of organization-components of organizational structure- different types of organizational structure-line, functional, line & staff organization (brief description)

2. Human Resource Management (HRM)

Concept of HR Management - functions of HRM - requirements of manpower planning - factors affecting the manpower planning - job evaluation - steps required for job evaluation - methods for job evaluation - merit rating - objectives and methods - performance appraisal - training - importance of training - methods of training - advantages of training (brief description only) , labour turn over.

3. The principles of a good wage payment system

Importance of good wage plan-types of wages - nominal, real, living, fair, and minimum wages - requirement of a good wage payment system - Incentives - definitions, types of incentive plan for dire

MODULE II

1. Quality Planning and its developments

Definitions of quality- dimensions of quality- ISO 9000 & Installation -Concept and role of ISO 9000, elements of ISO 9000, steps for installation of ISO 9000 - preparatory step, implementation step, registration and certification step-Quality Audit - objectives
list the objectives of quality planning -three prong approach to quality planning-
Documentation-Quality management system.
TQM -Concept, ten mantras of TQM, the link between ISO 9000 and TQM -mission, vision and quality policy.

2. Materials and sales management.

objectives of purchase department.-State the buying techniques.-Describe purchase procedure.
classification -spot quotation -floating the limited enquiry -tenders -single and open -earnest money -security deposit
Inventory management -definition and -inventory models -EOQ and ABC.
Stores management -introduction -store keeping functions -duties of store keeper -store layout -centralised and decentralised store -store records -indent forms -bincard -store ledger. Sales -importance -functions of sales department -sales forecasting

MODULE III

1. Project Management Techniques .

Introduction to Network analysis - application of CPM and PERT -scope of CPM and PERT -commonly used terms in CPM: - Operation, pre-operation, post operation, concurrent operation, earliest finish time (EFT), latest finish time (LFT), critical activities, critical path, event, slack or float, dummy activity -procedure for CPM -simple problems on CPM (by AOA method only).
PERT - comparison between CPM and PERT -procedure for PERT - calculation of expected time -commonly used terms in PERT, event, activity, successor event, predecessor event, Earliest expected time, Latest allowable time, slack - simple problems in PERT.

2. Quantitative techniques in management.

Introduction -methods -Linear programming: - Formulation of LPP -solution of given LPP using graphical method -transportation problem -meaning -initial feasible solution of transportation

MODULE IV

1. Industrial safety.

Importance of safety in work place -increasing trends in industrial accidents -terminology -factory -accident -incident -severity rate -- frequency rate -incidence rate -safety performance index -accident proneness -unsafe acts
list the causes of accidents: - Mechanical, Environmental, personnel factors -accident prevention techniques - 4 E'S of accident prevention technique .
organizing safety -role of management -safety officers -government norms -factories act of 1948 -factories rule 1960 -emergency preparedness and response -precautions to be observed in hazardous situations like toxic ,,flammable ,,electrical shock and material handling.

2. Concept of entrepreneurship- profile of an entrepreneur- functions-risk taking qualities-concept of student entrepreneur.- factors contributing to the failure of entrepreneurial ventures- industrial support needed programs existing in India, Kerala-concept of DSIR, TBI, MSME. etc.- steps involved in starting small-scale industry- registration of SSI-agencies for financial assistances - feasibility study - Preparation of feasibility report and project report.

TEXT BOOKS

1. O P Khanna-Industrial Engineering and management- Dhanpat Rai and sons, New Delhi
2. N D Vohra -Quantitative techniques in management- TMH, New Delhi

REFERENCE BOOKS

1. LS Srinath -PERT and CPM principles and applications -Eeast West Press Pvt Ltd. New Delhi
2. Dr.Deepak Kumar Battachariya-Industrial Management- Vikas Publishing
3. S K Hajra Choudhury, Nir jhar Roy, A K Hajra Choudhury -Production Management- Media Promoters and publishers pvt Ltd, Mumbai
4. L M Deshmukh -Industrial safety management - TMH New Delhi
5. Dr. A K Singh – Entrepreneurship Development and Management –Laxmi Publications

COURSE TITLE : INDUSTRIAL TRAINING/ INDUSTRIAL VISIT / COLLABORATIVE WORK /SPOKEN TUTORIAL
COURSE CODE : 5009
COURSE CATEGORY : P
DAYS / SEMESTER : 14
CREDITS : 2

General Outcome:

GO	On completion of the study of this course the students will be able:
1	To provide an industrial exposure in tune with the curriculum.
2	To familiarize industrial standards, safety aspects, organizational structure.
3	To improve employability of students.
4	To provide training on industrial relevant topics.

Guidelines:

The students need to undergo any of the four options mentioned in the course title for successful award of credit for the program, subject to the evaluation criteria mentioned below.

Industrial Training:

The students need to undergo 10 days full time industrial training on Government, Quasi Government or Public limited industries. Students of Diploma in Biomedical Engineering can opt for Super/multi specialty hospitals in addition to the above mentioned industries. On successful completion of the training students need to submit certificate of completion mentioning days of their attendance to the Head of the Department. It is required to submit bonafide report of the training at the end of the course and shall be evaluated internally.

Evaluation criteria:

1. Attendance (based on feedback from the industry) : 30%
2. Involvement (based on feedback from the industry) : 30%
3. Viva (as part of internal evaluation at the institute) : 20%
4. Bonafide record : 20%

Industrial Visit:

The concept of industrial visit is to encourage students to interact with nearby industries. The students need to be assigned with specific task that need interaction with the industry. For example, students of Diploma in Chemical Engineering in batches of five can be sent to the nearby industry to collect details regarding effluent treatment. Industrial visit to Small, medium or large scale industries accompanied by faculty members can also be encouraged. In such case one faculty from each branch can be assigned as advisor for the visit. The advisor can identify appropriate industry and co-ordinate the visit. At least four

industries should to be visited for successful completion of the course. The visit can be spanned conveniently within the semester. Evaluation is based on the report submitted by the accompanied faculty along with the evaluation criteria mentioned below. It is required to submit bonafide report of the visit at the end of the course and shall be evaluated internally.

Evaluation criteria:

1. Attendance ((evaluated by the advisor) : 30%
2. Involvement (evaluated by the advisor) : 30%
3. Viva (as part of internal evaluation at the institute) : 20%
4. Bonafide record : 20%

Collaborative Work:

Academic departments can collaborate with industries of repute by way of taking up consultancy, testing or assembling work. One faculty can be assigned as coordinator. The students need to consult or visit the collaborative industry as part of the course. It is required to submit bonafide report at the end of the collaborative work and shall be evaluated internally. It is to be ensured that the collaborating industry is selected based on their repute in the segment. Collaborative works are not allowed with academic or industrial training providers.

Evaluation criteria:

1. Attendance (evaluated by the advisor) : 30%
2. Involvement (evaluated by the advisor) : 30%
3. Viva (as part of internal evaluation at the institute) : 20%
4. Bonafide record : 20%

Spoken Tutorial

Students can optionally go for spoken tutorial provided Ministry of Human Resource Development, Govt. of India for successful completion of the course. Students can go for at least one course provided as part of spoken tutorial. The students need to submit completion certificate with mention of their grade.

Evaluation criteria:
Evaluation shall be made based on certification of the programme.

COURSE TITLE : INDUCTION MACHINES
COURSE CODE : 5031
COURSE CATEGORY : A
PERIODS/WEEK : 5
PERIODS/SEMESTER : 65
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Principle of Transformer	16
2	Testing of Transformer And Instrument Transformers	16
3	Principle and Construction of Three Phase Induction Motors	16
4	Testing and Speed Control of Induction Motors	17
Total		**65**

Course Outcome:

Sl.	Sub	**On completion of this course the student will be able:**
1	1	To comprehend the working principle of transformers.
	2	To understand the constructional details of transformer
	3	To understand the performance of the transformer
2	1	To comprehend the various methods of testing of transformer.
	2	To comprehend different types of three phase transformers
	3	To understand the operation and use of instrument transformer
3	1	To comprehend the working principle of induction motors.
	2	To comprehend the constructional details of different three phase induction motors.
	3	To understand the performance of the induction motors.
4	1	To comprehend the testing methods of three phase induction motors
	2	To understand the different types of starters used for starting three phase induction motors.
	3	To comprehend the speed control of induction motors.
	4	To understand the Electrical braking in induction motors

Specific Outcome:

MODULE I: Principle of Transformer

1.1.0 To explain the working principle of transformer
1.1.1 To illustrate the concept of ideal transformer

1.2.0 To describe the construction of a single phase transformer

1.3.0 To derive the emf equation of transformer
1.3.1 To define the voltage and current transformation ratio
1.3.2 To describe the effect of voltage and frequency variation in transformers
1.3.3 To illustrate the transformer on no load
1.3.4 To illustrate the transformer on load
1.3.5 To illustrate the effect of resistance and leakage reactance of transformer
1.3.6 To draw the phasor diagram of transformer on load
1.3.7 To determine the equivalent resistance and reactance of transformer referred to both Primary and secondary

MODULE II: Testing of Transformer and Instrument Transformers

2.1.0 To draw the equivalent circuit of transformer
2.1.1 To state the voltage regulation of transformer
2.1.2 To identify the losses in a transformer
2.1.3 To define the transformer efficiency
2.1.4 To describe pre determination of efficiency and regulation of a transformer
2.1.5 To determine the regulation and efficiency of a transformer by direct loading
2.1.6 To solve the simple problems to determine efficiency and regulation
2.1.7 To define all day efficiency

2.2.0 To explain the construction of three phase transformer
2.2.1 To identify and draw the three phase transformer connections
2.2.2 To describe the formation of three phase transformer by using two single phase transformers
2.2.3 To describe three phase to two phase and vice versa
2.2.4 To explain why tertiary winding is required
2.2.5 To describe magnetostriction effect and its implications
1.3.0 To illustrate parallel operation of transformers
1.3.1 To illustrate the auto transformer construction
1.3.2 To derive the equation of saving of copper in autotransformer
1.3.3 To describe the construction and working of instrument transformer

1.3.4 To give the rating of transformer
1.3.5 To explain the different cooling methods of transformer

MODULE III: Principle and Construction of Three Phase Induction Motors

3.1.0 To explain the principle of operation of three phase induction motor

1.2.0 To describe the construction of three phase induction motor

2.1.0 To define the slip of three phase induction motor
2.1.1 To solve the simple problems to find slip
2.1.2 To explain the rotor emf, rotor current and power factor
2.1.3 To draw the torque- slip and torque-speed curve
2.1.4 To explain the effect of change in supply voltage on starting torque
2.1.5 To explain the effect of change in supply voltage on torque and slip
2.1.6 To differentiate full load torque and maximum torque
2.1.7 To differentiate starting torque and maximum torque
2.1.8 To draw and explain the current- speed characteristics
2.1.9 To illustrate the different losses of three phase induction motor
2.1.10 To explain the efficiency of three phase induction motor
2.1.11 To draw power flow diagram
2.1.12 To explain power stages in three phase induction motor
2.1.13 To solve the problem to find torque and efficiency of three phase induction motor
2.1.14 To define rotor torque and synchronous watt
2.1.15 To explain the different factors for determination of torque
2.1.16 To draw and explain equivalent circuit of induction motor
2.1.17 To explain the phasor diagram of induction motor

MODULE IV: Testing and Speed Control of Induction Motors

4.1.0 To describe the no-load and blocked rotor test of induction motor
4.1.1 To explain the different methods for measuring slip
4.1.2 To draw and explain circle diagram
4.1.3 To draw the performance curves of induction motor
4.1.4 To explain the factors governing the performance of induction motor
4.1.5 To describe high torque cage motors
4.1.6 To describe the equivalent circuit of double cage motor
4.1.7 To specify the ratings and types of enclosures of three phase induction motor

4.2.0 To describe the starting of squirrel cage induction motor
4.2.1 To describe the starting of slip ring induction motor
4.3.0 To illustrate the following speed control of induction motor

- **I.** Kramer system of speed control
- **II.** Leblanc system of speed control
- **III.** Scherbius system of speed control

4.4.0 To describe the electrical braking of poly phase induction motors

CONTENT DETAILS

MODULE I

Transformer –principle of operation-ideal transformer-practical transformer-construction of single phase transformer. Emf equation – problems. Transformation ratio. Transformer on no load- ideal and practical. Transformer on load. Resistance and leakage reactance- equivalent resistance and reactance as referred to both primary and secondary- problems. Vector diagram on load at various power factor.

MODULE II

Equivalent circuit of transformer. Regulation. Losses and efficiency- condition for maximum efficiency- problems. Testing of transformer- polarity test – O C & S C test. Pre-determination of efficiency and regulation. Parallel operation. Three phase transformer- construction. Transformer connections - banking of transformer- Cooling of transformer. Auto transformer. Instrument transformer.

MODULE III

Three phase induction motor-production of rotating magnetic field- construction – principle of operation –slip- problems. Torque equation - problems. Torque – slip characteristics. Starting torque-full load torque- maximum torque- problems. Losses and efficiency- power stages- problems. Equivalent circuit- vector diagram.

MODULE IV

Testing of 3 phase induction motors- direct load test- no load and blocked rotor test. Slip measurement. Circle diagram – predetermination of performance and maximum quantities. Double cage rotor - equivalent circuit of double cage motor. Starting of induction motors. Speed control of induction motor. Application of induction motor

TEXT BOOKS

1. BL Theraja. Electrical technology. Vol- II: S Chand & co.
2. J.B. Gupta. Theory & Performance of Electrical Machines: S. K. Kataria & Sons

COURSE TITLE : POWER ELECTRONICS
COURSE CODE : 5032
COURSE CATEGORY : A
PERIODS/WEEK : 4
PERIODS/SEMESTER : 52
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Power electronics components and Commutation techniques	13
2	Convertors and inverters	13
3	Electric drives	13
4	Regulated power supply	13
Total		**52**

Course Outcome:

Sl.	Sub	**On completion of this course the student will be able:**
1	1	To comprehend different types of power electronics components.
2	1	To understand convertor circuits.
	2	To understand inverter.
3	1	To understand chopper.
	2	To understand Electric Drives
4	1	To understand various types of regulated power supplies.

Specific Outcome:

MODULE I Power electronics components and Commutation techniques

1.1.1 To explain the structure and characteristics of UJT and its application.
1.1.2 To describe the structure and operation of N-channel JFET with its characteristics.
1.1.3 To describe the structure and operation of P-channel JFET with its characteristics.
1.1.4 To distinguish between JFET and BJT.

1.1.5 To list the applications of BJT.
1.1.6 To explain the operation of MOSFET.
1.1.7 To differentiate JFET, MOSFET, and IGBT.
1.1.8 To describe the operation of DIAC.
1.1.9 To describe the operation of TRIAC.
1.1.10 To explain the structure of SCR.
1.1.11 To explain the characteristics of SCR.
1.1.12 To describe the terms – holding current, latching current, turn on time and turn off time
1.1.13 To explain the different methods of turning on of SCR- resistance triggering, voltage triggering, dv/dt
triggering gate triggering.
1.1.14 To understand the commutation technique
1.1.15 To explain the natural commutation.
1.1.16 To explain the forced commutation.
1.1.17 To explain the gate turn off method.

MODULE II Convertors and inverters

2.1.1. To describe the principles of phase control.
2.1.2 To describe single phase half wave converter with R load.
2.1.3 To describe single phase half wave converter with RL load and freewheeling diode.
2.1.4 To describe single phase full wave converter with resistive load.
2.1.5 To describe single phase full wave converter with RL load and freewheeling diode.
2.1.6 To describe fully controlled bridge converter with resistive load.
2.1.7 To describe fully controlled bridge converter with RL load and freewheeling diode.

2.2.1 To explain the principle of DC chopper.
2.2.2 To explain the constant frequency and variable frequency method.
2.2.3 To describe the classification of inverters.
2.2.4 To describe series inverter.
2.2.5 To describe parallel inverter.
2.2.6 To describe inverter- half bridge inverter.
2.2.7 To describe inverter- full bridge inverter.
2.2.8 To explain three phase bridge inverter.

MODULE III Electric drives

3.1.1 To explain Single phase semi converter DC drives.
3.1.2 To explain Single phase full converter DC drives.
3.1.3 To explain Single phase dual converter DC drives.

3.2.1 To explain Speed control of single phase Induction motor.
3.2.2 To explain Speed controls of three phase Induction motor.
3.2.3 To explain Stator voltage control.
3.2.4 To explain Stator frequency control.
3.2.5 To explain v/f control.
3.2.6 To explain solid state control of a typical fan regulator.
3.2.7 To explain the concept of induction cooking system control.

MODULE IV Regulated power supply

4.1.1 To explain the operation of buck converter.
4.1.2 To explain the boost converter.
4.1.3 To differentiate between buck and boost converter.
4.1.4 To explain the principle of the servo stabilizer.
4.1.5 To draw the block diagram of static servo stabilizer.

4.2.1 To describe the principle of Pulse Width Modulation.
4.2.2 To study the SMPS.
4.2.3 To draw the block diagram of SMPS.
4.2.4 To distinguish between linear power supply and SMPS.
4.2.5 To explain the operation of UPS.
4.2.6 To list the classification of UPS.
4.2.7 To describe ONLINE UPS.
4.2.8 To describe OFFLINE UPS.
4.2.9 To describe line interactive UPS.
4.2.10 To describe the specification of UPS.
4.2.11 To explain the testing methods of UPS.

CONTENT DETAILS

MODULE I

Power electronic components - characteristics of UJT and its application- construction & operation of N - channel and P-channel construction & operation of JFET with characteristics- JFET comparison with BJT-MOSFET -Differentiate JFET,MOSFET, and IGBT-Symbols, operations and characteristics of di, tri, SCR – constructional features – operation – transistor analogy – characteristics – definitions -holding current – latching current - turn on time – turn off time-different methods of turn on and turning off SCR - snubber circuits for the protection of SCR.

MODULE II

Converter & Inverter circuits - Half and full wave control circuit - single phase-half wave converter with R,RL load and freewheeling diode, full wave and bridge converters with R , RL load and freewheeling diode -3 phase bridge converter with R, RL load and freewheeling diode -DC chopper circuits - Principles of operation - control of chopping periods – variable frequency control –constant frequency control – principle of operation with wave forms Inverters: - Requirements of Practical inverters - single phase series inverter –parallel inverters

MODULE III

Electric Drives - principle and working of the following-Single phase semi converter DC drives-Single phase full converter DC drives-single phase dual converter DC drives- speed control of single phase Induction motor -speed control of three phase Induction motor-stator voltage control-stator frequency control-stator voltage& frequency control

MODULE IV

Power Supplies - Principle of Servo stabilizer (Block Diagram approach)-Principle of Pulse Width Modulation - SMPS (Block Diagram approach)-Compare linear power supply and SMPS - classification of U.P.S-Online, Offline-specification-operation of buck & boost converter (block diagram).

REFERENCE

1. P. S. Bimbra. Power Electronics*:* Khanna publishers
2. Dr. B.R. Gupta *V&* Singhal. Power Electronics*:* S. K. Kataria & Sons
3. Biswanath Paul*.* Industrial Electronics *and* Control : PHI Learning Pvt. Ltd
4. S.K. Bhattacharya. Fundamentals of Power Electronics: Vikas Publication House Pvt Ltd

COURSE TITLE : ADVANCED ELECTRICAL MEASUREMENTS AND INSTRUMENTATION
COURSE CODE : 5033
COURSE CATEGORY : E
PERIODS/WEEK : 4
PERIODS/SEMESTER : 52
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Transducers	13
2	Special Purpose Measuring Instruments	13
3	Bio Medical Instruments	13
4	Industrial Instrumentation	13
Total		**52**

Course Outcome:

Sl.	Sub	**On completion of this course the student will be able:**
1	1	To understand various types of transducers used in electrical measurements.
2	1	To understand special purpose measuring instruments
3	1	To understand different measuring instruments used in medical field.
4	1	To understand the application of controllers and transducers in instrumentation.

Specific Outcome:

MODULE I Transducers

1.1.1 To define transducer.
1.1.2 To describe the classification of transducers
1.1.3 To compare mechanical and electrical transducers
1.1.4 To describe variable resistance transducers-strain gauges.
1.1.5 To describe variable inductance transducers - LVDT & RVDT
1.1.6 To describe variable capacitance transducers
1.1.7 To describe magnetic transducers-magneto resistive & hall effect transducers
1.1.8 To describe piezo electric transducers
1.1.9 To describe principle and application of photo electric transducers.

MODULE II Special Purpose Measuring Instruments

2.1.1 To describe the working of the digital frequency meter with block diagram
2.1.2 To describe electronic type energy meter
2.1.3 To describe analog multi meter with block diagram
2.1.4 To describe digital multi meter with block diagram
2.1.5 To describe power quality analyzer with block diagram
2.1.6 To explain the working of digital storage oscilloscope
2.1.7 To explain the working of function generator with block diagram
2.1.8 To explain the working of x-y recorders with block diagram .

MODULE III Bio Medical Instruments

3.1.1 To describe invasive method of blood pressure measurements.
3.1.2 To describe non invasive method of blood pressure measurements
3.1.3 To describe the measurement of body temperature
3.1.4 To describe ECG recorders
3.1.5 To describe the basic principle of measurement of EEG.
3.1.6 To describe the working of EEG recorders
3.1.7 To illustrate the application of ECG recorders.
3.1.8 To describe the magneto encephalo graph recorders
3.1.9 To list the applications of MEG recorder.
3.1.10 To describe electro mayography recording (EMGR) principle
3.1.11 To write the application of EMGR

MODULE IV Industrial Instrumentation

4.1.1 To describe the fundamentals and importance of instrumentation.

4.1.2 To explain the types of instruments.
4.1.3 To describe selection of instruments and its performance.
4.1.4 To describe measurement of temperature.
4.1.5 To describe the measurement of pressure.
4.1.6 To describe the measurement of moisture content.
4.1.7 To describe the measurement of velocity and flow.
4.1.8 To describe the measurement of force and torque
4.1.9 To describe the measurement of emissivity.
4.1.10 To describe the measurement of viscosity
4.1.11 To describe the measurement of color.
4.1.12 To describe the measurement of spectro-photometry, chromatography and NIR.
4.1.13 To describe the measurement with biosensors.
4.1.14 To describe the measurement of Basic concept of process controls.
4.1.15 To explain the types of control and their application.
4.1.16 To describe the measurement & concept of automatic control.
4.1.17 To list the types of automatic control measurements.

CONTENTS

MODULE – I

Transducer – classification – comparison – strain gauges- LVDT- RVDT- capacitive transducers- magnetic transducers – magneto resistive – Hall Effect transducers - Piezo electric transducers - photo electric transducers – principle and applications.

MODULE – II

Working with block diagram of Digital frequency meters – electronic energy meter- analog multimeter – digital multimeter – power quality analyzer – digital storage oscilloscope - function generator – X- Y recorders.

MODULE - III

Blood pressure measurement – invasive and non invasive method - Measurement of body temperature - Principle and application of ECG recorders – EEG recorders – magneto encephalo graph (MEG) recorders- electro mayography recorders-applications

MODULE- IV

Importance of instrumentation – selection of instruments - Measurement of temperature – moisture content – velocity and flow – force and torque – emissivity- viscosity – color – spectrophotometry – chromatography – NIR - Bio sensors – concepts of process control.

REFERENCE BOOKS:

1. Beckwith , Thomas G and Lewis B.K.Mechanical Measurements: Adison, Wesely Longman.
2. Donald P. Eckman. Industrial instrumentation*:* Wiley Eastern Ltd*.*
3. Krishnaswamy.K. Industrial instrumentation:New age publications.
4. R. S. Sirohi, H. C. Radha Krishna.Mechanical Measurements: Newage International

COURSE TITLE : ELECTRICAL ENGINEERING MATERIALS
COURSE CODE : 5034
COURSE CATEGORY : E
PERIODS/WEEK : 4
PERIODS/SEMESTER : 52
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Conducting Materials	13
2	Semiconducting Materials.	13
3	Magnetic Materials.	13
4	Insulating Materials	13
Total		**52**

Course Outcome:

Sl.	Sub	**On completion of this course the student will be able:**
1	1	To comprehend different types of conducting materials.
2	1	To comprehend different types of semi conducting materials.
3	1	To comprehend different types of magnetic materials
4	1	To comprehend different types of insulating materials.

Specific Outcome:

MODULE I Conducting Materials

1.1.1 To list the electrical properties of conducting materials.
1.1.2 To list the mechanical properties of conducting materials.
1.1.3 To list the specifications of conducting materials.

1.1.4 To list out the properties of ;

i. Silver.
ii. Copper.
iii. Aluminum.

1.1.5 To identify the materials and alloys for high conductivity.
1.1.6 To explain the application of conducting materials.
1.1.7 To identify the materials of high resistivity.
1.1.8 To describe the application of high resistivity materials.
1.1.9 To identify the metals used for heavy duty metal contacts and fuses.
1.1.10 To identify the trade names of commonly used conductors.
1.1.11 To describe various types of resistors used in electronics.

MODULE II Semiconducting Materials.

2.1.1 To list the general properties of semiconducting materials.
2.1.2 To explain various types of semiconducting materials.
2.1.3 To describe the energy band diagram.
2.1.4 To describe covalent band.
2.1.5 To explain intrinsic and extrinsic semi conductor.
2.1.6 To explain majority and minority carriers.
2.1.7 To describe the doping process.
2.1.8 To identify P type, N type semiconductor.
2.1.9 To illustrate PN junction and its characteristics.
2.1.10 To give the application of semiconducting materials.
2.1.11 To identify the various types of diodes, transistors, IC etc.

MODULE III Magnetic Materials.

3.1.1 To state definitions of terms in magnetism.
3.1.2 To distinguish classifications of magnetic materials.
3.1.3 To explain BH curve.
3.1.4 To list out applications of magnetic materials.
3.1.5 To describe cyclic magnetization and magnetostriction.
3.1.6 To identify ferro-magnetic materials.
3.1.7 To identify soft magnetic materials.
3.1.8 To differentiate hard and soft magnetic materials.
3.1.9 To illustrate the properties of low carbon steel.
3.1.10 To illustrate the properties of CRGO.
3.1.11 To illustrate the properties of ferrites.

3.1.12 To list out applications of ferrites.
3.1.13 To identify the various types of inductors used in electronics.
3.1.14 To identify the various types of small transformers used in electronics.

MODULE IV Insulating Materials

4.1.1 To list the general properties of insulating materials.
4.1.2 To list out the classification of insulating material
4.1.3 To identify the structure composition and application of fibrous insulating materials.
4.1.4 To describe the effect of temperature and moisture on insulating materials.
4.1.5 To explain impregnating materials.
4.1.6 To describe the properties and application of ;
   i. Ceramics and mica.
   ii. Glass.
   iii. Asbestos.
   iv. Synthetic insulating material.
   v. Liquid insulating materials.
   vi. Transformer oil.
   vii. Gas insulating materials.
4.1.7 To describe dielectric materials.
4.1.8 To explain polarization techniques.
4.1.9 To explain the application of dielectric materials.
4.1.10 To identify the various types of capacitors used in electrical and electronics engineering fields.

CONTENT DETAILS

MODULE- I

Conductors-electrical properties – resistivity – conductivity - temp. coefficient-dielectric strength, Mechanical properties-ductility, malleability, tensile strength-properties of silver, copper, aluminum and alloys(brass, bronze)-applications - Properties of High resistivity materials-low temperature co-efficient ,high melting point ,no tendency for oxidization , ductility - high mechanical strength – Tungsten – Carbon - Mercury – Nichrome – Eureka – Constantan – Platinum - applications - Materials used for heavy duty contacts-silver copper - copper cadmium. Trade names of commonly used conductors-ACSR, AAA etc.

MODULE- II

Semiconductors-general properties of semi conducting materials-Energy band diagram-covalent bond-intrinsic and extrinsic semi conductor- P and N type semi conducting materials-majority and minority

carriers-PN junction-applications -thermistors, photo conductive cells-photo voltaic cells- varistors-LED-LDR-Strain gauge- solar cells - components like diode – transistor – IC.

MODULE – III

Magnetic materials-General terms- permeability – absolute & relative permeability - flux , flux density, BH curve-curie point-classification- dia – para - ferro magnetic materials - examples-applications - magnetostriction-soft and hard magnetic materials, properties of - iron – silicon - CRGO – permalloy - ferrites-applications-components like inductors - transformers

MODULE- IV

Insulators-properties – visual – electrical – mechanical- thermal - chemical properties - Classification – based on operating temperature as per IS. Properties and application of fibrous material-impregnated fibrous-bitumen-wax-insulating liquid-enamel-varnish-ceramics-mica-asbestos-glass-rubber-synthetic resin-thermo-plast resin-Polyethylene-Teflon-PVC-Gas Insulating materials- air-Nitrogen-SF_6 - Die-electric materials - Polarization-applications-capacitors.

REFERENCES

1. P L Kapoor. A Textbook Of Electrical And Electronics Engineering Materials: Khanna publishers.
2. BASAK T K. Electrical engineering materials: Newage science.
3. S K BHATTACHARYA. Electrical and Electronic Engineering Materials: Khanna Publishers.

COURSE TITLE : RENEWABLE ENERGY SOURCES
COURSE CODE : 5035
COURSE CATEGORY : E
PERIODS/WEEK : 4
PERIODS/SEMESTER : 52
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Types of Renewable Energy Sources	13
2	Solar Energy	13
3	Wind Energy	13
4	Application of Power Electronics In Renewable Energy	13
Total		**52**

Course Outcome:

Sl.	Sub	**On completion of this course the student will be able:**
1	1	To understand the renewable energy sources.
	2	To understand the working of power plants using renewable energy
2	1	To comprehend the various methods of energy conversion from solar.
	2	To comprehend the solar power plants.
3	1	To comprehend the wind power plants.
	2	To comprehend the components in wind electrical systems.
4	1	To comprehend different controllers in co operated with PV system.
	2	To understand standalone and grid connected solar energy and wind energy system.

Specific Outcome:

MODULE I Types of Renewable Energy Sources

1.1.1 To explain different forms of non-conventional energy sources.
1.1.2 To describe the basics of solar, bio-gas, wind, tidal, geothermal energy sources.
1.1.3 To describe bio-gas conversion technologies.
1.1.4 To list the factors affecting bio digestion.
1.1.5 To describe the classifications of bio-gas plants.
1.1.6 To distinguish between dom and drum type plants.
1.1.7 To describe the methods for obtaining energy from biomass.
1.1.8 To explain the classification of biomass gasifiers.
1.1.9 To describe the geothermal resources.
1.1.10 To describe the hydrothermal resources.
1.1.11 To explain the methods of ocean, thermal power generation.
1.1.12 To explain open cycle OTEC system and closed or Anderson OTEC cycle.
1.1.13 To describe the basic principle of tidal power.
1.1.14 To explain chemical energy sources.
1.1.15 To explain the magneto hydro dynamic (MHD) power plants.

1.2.1 To describe the types of biogas plants.
1.2.2 To describe the vapour dominated power plant.
1.2.3 To describe the liquid dominated systems.
1.2.4 To compute simple problems related to geothermal plants.
1.2.5 To describe the inter connection in geothermal fossil systems.
1.2.6 To distinguish between geothermal preheat hybrid system and fossil superheat hybrid system.
1.2.7 To describe the application of geothermal energy.
1.2.8 To explain the schematic layout of tidal power house with a sketch.
1.2.9 To compute energy and power in simple single basin tidal system.
1.2.10 To describe the operation and classification of fuel cells.
1.2.11 To describe different types of fuel cells- hydrogen, fossil fuel, hydrocarbon fuel, alcohol fuel, hydrazine fuel.
1.2.12 To describe the open cycle MHD generation system.
1.2.13 To describe the closed cycle MHD generation system.

MODULE II Solar Energy

2.1.1 To explain the solar radiation received on the earth's surface
2.1.2 To describe the solar radiation geometry
2.1.3 To describe the solar radiation measurements
2.1.4 To describe the principles of the conversion of solar radiation into heat

2.1.5 To explain solar collectors - focusing type& flat type
2.1.6 To describe various types of focusing collectors
2.1.7 To explain various types of solar energy storage systems
2.1.8 To describe the solar pond
2.1.9 To explain the applications of solar energy

2.2.1 To describe solar water heating
2.2.2 To describe solar space heating
2.2.3 To describe solar space cooling
2.2.4 To describe the thermal electric conversion of solar energy
2.2.5 To describe photo electric conversion energy
2.2.6 To describe solar distillation
2.2.7 To describe solar pumping
2.2.8 To describe agricultural and industrial process heat
2.2.9 To describe solar furnace
2.2.10 To describe solar cooking
2.2.11 To describe solar green houses

MODULE III Wind Energy

3.1.1 To describe the principles of wind energy conversions
3.1.2 To describe wind data and energy estimation
3.1.3 To describe basic components of wind energy conversion system
3.1.4 To describe the classification of WEC system
3.1.5 To describe the merit and demerits of WECs.

3.2.1 To explain wind energy collectors
3.2.2 To explain horizontal axis wind machines
3.2.3 To explain vertical axis wind machines
3.2.4 To distinguish between horizontal axial machines and vertical axial machines
3.2.5 To describe the components of wind electric systems
3.2.6 To list out the schemes for electric generation
3.2.7 To describe constant speed constant frequency system.
3.2.8 To describe variable speed constant frequency system.
3.2.9 To describe variable speed & variable frequency system
3.2.10 To describe the principle of induction generators.
3.2.11 To describe wind energy storage.
3.2.12 To explain various applications of wind energy.
3.2.13 To describe the environmental aspects of wind energy.

MODULE IV Application of Power Electronics In Renewable Energy

4.1.1 To explain the block diagram of solar PV system.
4.1.2 To describe the use of power conversion in PV application.
4.1.3 To describe boost converter.
4.1.4 To describe buck converter
4.1.5 To explain the concept of maximum power point tracking (MPPT).
4.1.6 To describe charge controller in P V system.
4.1.7 To describe block diagram of wind energy system.
4.1.8 To describe the use of power converter in wind energy application.
4.1.9 To describe -DC- converter.

4.2.1 To describe stand alone solar energy system.
4.2.2 To describe grid connected solar energy system.
4.2.3 To describe stand alone wind energy system.
4.2.4 To describe grid connected wind energy system.

CONTENTS

MODULE – I

Non conventional energy sources – solar – bio gas – wind – tidal – geo thermal – bio gas – conversion – factors effecting bio digestion – classification – dom and drum type – methods of energy extraction from biomass – classification of bio mass gasifiers. Resources - geo thermal – hydrothermal – vapour dominated and liquid dominated- problems related to geo thermal – interconnections geo thermal fossil systems – comparison – geo thermal preheat hybrid system- fossil superheat hybrid system – applications geo thermal – power generation – ocean thermal – open cycle OTEC- closed cycle OTEC. Tidel power – basic principle – schematic layout – single basin tidal system - Chemical energy – operation and classifications of fuel cells - hydrogen- fossil fuel- hydro carbon fuel- alcohol fuel – MHD power plants.

MODULE –II

Solar energy – solar radiation – measurements - solar energy conversion in to heat – solar collectors - focusing – storage systems – solar pond - Application of solar energy in heating - Thermal electrical conversion of solar energy. Photo electrical energy conversion – principle – construction of PV modules– storage.

MODULE - III

Wind energy conversion – components in WEC system- classification- comparison - merits and demerits - Wind electric generation – classifications – storage – application - Environmental aspects of wind energy.

MODULE – IV

Block diagram of solar electric system- power conversion PV system - charge controller – different types – maximum power point tracking (MPPT) - Block diagram of wind energy conversion system - power converter in wind energy. Standalone and grid connected system in solar and wind energy.

REFERENCE BOOKS

1. D.S. Chauhan**.** Non-Conventional Energy Resources: New age International
2. G.D. Rai*.* Non-conventional Energy Sources*:* Dhanpath Rai &Sons

COURSE TITLE : ELECTRONICS LAB
COURSE CODE : 5038
COURSE CATEGORY : A
PERIODS/WEEK : 6
PERIODS/SEMESTER : 78
CREDITS : 3

Course Objectives:

Sl.	Sub	**On completion of this course the student will be able:**
1	1	To know rectifier circuits.
	2	To get acquainted with amplifiers and oscillatory circuits.
	3	To get acquainted with digital circuits.
2	1	To comprehend with power electronics circuits.
	2	To comprehend regulator circuits.
	3	To understand speed control.
3	1	To comprehend battery charging .

LIST OF EXPERIMENTS

- Safety Precautions.

1. To draw standard circuit symbols of Electronic devices.
2. To identify various components (Resistor, Inductor, Capacitors, Diodes, Transistors, Digital ICs Thyristors) and write down their specifications.
3. To assemble the following rectifiers using diodes and determine ripple factor with and without filter.
    i. Half wave rectifier.
    ii. Full wave rectifiers.(Centre tapped and bridge)
4. To assemble a single stage amplifier and determine its gain.
5. To assemble following oscillators using transistors and measure output parameters.
    i. RC phase shift oscillator.

   ii. Astable multi vibrator.
   iii. Bi-stable multi vibrator.
6. To assemble the following digital circuits using Gates and verify their truth table.
   i. Half adder.
   ii. Full adder.
   iii. Subtractor.
7. To assemble a DC regulated power supply using zener diode and Regulator ICs.
8. To assemble a relaxation oscillator using UJT.
9. To assemble a fan regulator using thyristors.
10. To assemble an emergency LED lamp.
11. To assemble a speed controller for DC motor using thyristors.
12. To assemble a battery charger using thyristors.

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COURSE TITLE : AC MACHINES LAB -1
COURSE CODE : 5039
COURSE CATEGORY : A
PERIODS/WEEK : 6
PERIODS/SEMESTER : 78
CREDITS : 3

Course Outcome:

Sl.	Sub	**On completion of this course the student will be able:**
	1	To understand the losses of transformer.
	2	To analyze the performance of transformer.
	3	To understand the characteristics of three phase motors
	4	To analyze the performance of three phase motors

LIST OF EXPERIMENTS

1. To collect name plate data of AC machines and identification of power supply controls in the laboratory.
2. To conduct polarity test on Single phase transformer.
3. To determine efficiency and regulation of a transformer by direct loading at various power factors.
4. To pre-determine efficiency and regulation of a transformer by direct loading at various power factors & to plot output v/s efficiency and PF v/s regulation.
5. To conduct OC and SC tests on a single phase transformer to determine values of equivalent circuit parameters and to draw equivalent circuits referred to primary and secondary.
6. To form a transformer bank of three single phase transformer in star-delta mode and determine efficiency at various loads.
7. To dismantle and assemble a slip ring induction motor and identify parts.
8. To dismantle and assemble DOL, Star-delta starters and starter for slip ring induction.
9. To conduct polarity test on three phase Induction motor.
10. To run a three phase induction motor by a TPDT switch in star and in delta and measure line and phase currents, line and phase voltages in both cases.
11. To conduct no load test on a three phase induction motor and separate no load losses.
12. To conduct no load and blocked rotor tests on a three phase induction motor, determine values of equivalent circuit parameters & to draw equivalent circuit and circle diagram.
13. To conduct load test on a three phase induction motor and to plot performance characteristics.

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COURSE TITLE : PROJECT WORK AND SEMINAR
COURSE CODE : 6009
COURSE CATEGORY : A
DAYS / SEMESTER : 90
CREDITS : 0

PART I - SEMINAR

The student should be able:
1. To have an exposure to an innovative area of Technology/Information.
2. To develop presentation skills.
3. To develop creative interaction among listeners.
4. To learn to appreciate your peers and give positive feedback.

Topic Selection:
1. Select topics related to Industry/Technology/allied area, but not part of the curriculum.
2. Repetition of topics not permitted.

Presentation:
Presentation shall be for at least 15 minutes. Presentation is to be made with audio visual aids.

Report:

A rough report of the seminar shall be submitted at least 3 working days before presentation. The fair report shall be submitted within one week after the presentation.

The report shall include:
1. Abstract
2. Actual content
3. Reference

PART II – PROJECT WORK

1. To develop design of a multi storeyed building.
2. To implement structural planning. And site planning
3. To enhance team spirit and creative talents for achieving a goal.

Selection of Project:
1. Select programme related project which has relevance to today's industry, preferably with a social relevance.
2. Suggested type of Projects :
    a. Providing technical service to industry
    b. Entrepreneurship development
3. Project should be feasible at Diploma level and economically viable
4. Only projects which can be developed by the Diploma students need be selected. Support of external agencies not permitted

Guidelines for Project Work:

1. Suitable batches may be formed with 3 – 5 students per batch
2. The programme of the project work should be monitored at least once a week and progress may be documented
3. Involvement of each student should be ensured

Format for the preparation of Project work :

1. Cover Page as per format
2. Acknowledgement
3. Certificate of the Project Guide
4. Synopsys of the Project
5. Main Report
    - Objective & Scope of the Project
    - Theoretical Background
    - Definition of Problem
    - Methodology adopted, System Implementation & Details
    -Hardware/Software/Machinery/Equipment/used