CURRICULUM FOR THE SIXTH SEMESTER OF THREE-YEAR DIPLOMA COURSE IN ELECTRICAL ENGINEERING

Study Scheme 6th semester of Electrical Engineering

Code	Subjects	Classes per week			Total Hours	Credits			Total credits L+T+P
		L	T	P		L	T	P	
EEPC601	Power system protection	3	0	0	3	3	0	0	3
EEPC602	Power system protection Lab	0	0	2	2	0	0	1	1
***	Elective – IV	3	0	0	3	3	0	0	3
***	Elective - IV Lab	0	0	2	2	0	0	1	1
***	Open Elective – II	3	0	0	3	3	0	0	3
EEPC603	Simulation	0	0	4	4	0	0	2	2
EESL604	Seminar	0	0	2	2	0	0	1	1
EEMP605	Major Project	0	0	16	16	0	0	8	8
		09	0	26	35*	09	0	13	22

***: The Extra Classes shall be managed during project hours/supplementary classes.**

***: The Students have to choose Elective-IV from the common pool of program electives given at the end of the curriculum for Electrical Engineering and Open-Elective-II from the common pool of open electives given at the end of the curriculum for Electrical Engineering**. Furthermore for the lab courses of program electives, it is mandatory that the lab course chosen is the corresponding lab course of the chosen program elective only i.e if a student opts Indutrial Drives as Program Elective , then he/she has to also chose Industrial Drives Lab course as well.*

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPC601	Course Title: POWER SYSTEM PROTECTION
Semester: 6th	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identified competency through various teaching-learning experiences. Maintain switchgear and protection schemes used in electrical power systems.

COURSE CONTENT

1. Basics of Protection

1.1. Necessity functions of the protective system.
1.2. Normal and abnormal conditions.
1.3. Types of faults and their causes.
1.4. Protection zones and backup protection
1.5. Short circuit fault calculations in lines fed by generators through transformers
1.6. Need of current limiting reactors and their arrangements.

2. Circuit Interruption Devices

2.1. Isolators- Vertical break, Horizontal break, and Pantograph type.
2.2. Arc formation process, methods of arc extinction (High resistance and Low resistance), Arc voltage, Recovery voltage, Re-striking voltage, RRRV.
2.3. HT circuit breakers (Sulphur-hexa Fluoride (SF6), Vacuum circuit breaker) – Working, construction, specifications, and applications.
2.4. L.T. circuit breakers (Air circuit breakers (ACB)), Miniature circuit breakers (MCB), Moulded case circuit breakers (MCCB), and Earth leakage circuit breakers (ELCB)) Working and applications.
2.5. Selection of LT and HT circuit breakers (ratings).

3. Protective Relays

3.1. Fundamental quality requirements: Selectivity, Speed, Sensitivity, Reliability, Simplicity, Economy.
3.2. Basic relay terminology- Protective relay, Relay time, Pick up, Reset current, current setting, Plug setting multiplier, Time setting multiplier.
3.3. Protective relays: Classification, working principle, construction, and Operationof – Electromagnetic (Attracted armature type, Solenoid type, Watt-hour meter type) relay, Thermal relay.
3.4. Block diagram and working of Static relay (Introduction Only)
3.5. Overcurrent relay-Time current characteristics.
3.6. Distance relaying- Principle, operation of Definite distance relays.

3.7. Directional relay: Need and operation.
3.8. Operation of current and voltage differential relay.

4. Protection of Alternator and Transformer

4.1 Alternator Protection: Faults, Differential protection over current, earthfault, overheating, and field failure protection.
4.2 Reverse power protection.
4.3 Transformer Protection: Faults, Differential, over current, earth fault, overheating protection, Limitations of differential protection.
4.4 Buchholz relay: Construction, operation, merits and demerits.

5. Protection of Bus-bars and Transmission Lines

5.1 Over Voltages: Causes of Overvoltages
5.2 Protection against Overvoltages. Lightening arresters(Rod Gap, Horn Gap,Thyrite Type) and Overhead Ground Wires.
5.3 Bus bar protection: Differential and Fault bus protection.
5.4 Transmission line: Over current, Distance, and Pilot wire protection (Brief Idea)

COURSE OUTCOME:

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

- Identify various types of faults in the power system.
- Select suitable switchgear for different applications.
- Test the performance of different protective relays.
- Maintain protection systems of alternators and transformers.
- Maintain protection schemes for motors and transmission lines.
- Maintain protection schemes for the power system against over-voltages.

RECOMMENDED BOOK:

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

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (hrs)	Marks Allotted (%)
1.	7	15
2.	10	20
3.	10	20
4.	9	20
5.	12	25
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPC602	Course Title : POWER SYSTEM PROTECTION LABORATORY
Semester: 6th	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identified competency through various teaching-learning experiences. Maintain switchgear and protection schemes used in electrical power systems.

COURSE CONTENT

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

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICALENGINEERING	
Course code: EEPC603	Course Title: SIMULATION
Semester: 6th	Credits: 2
Hours per week: 4 (L:0 T:0 P:4)	

Software Applications in Electrical Engg.

1. PSPICE
2. PSIM
3. Matlab
4. Kiel

LIST OF PRACTICALS:

1. Introduction to Simulation and Matlab Programming.
2. Simulation of diode characteristics
3. Simulation of Zener Diode Characteristics
4. Simulation of half-wave rectifier
5. Simulation of full wave Rectifier.
6. Simulation of Transistor Characteristics

RECOMMENDED BOOKS:

1. E. Balaguruswamy, "Object Oriented Programming with C++," Tata McGraw Hill, New Delhi.
2. Marc E. Herinter, "Programming in MATLAB," Thomson Learning.
3. David Kuncicky, "MATLAB Programming", Pearson Education, New Delhi.
4. R K Bansal, "MATLAB and Its Application in Engineering," Pearson Education, New

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EESL604	Course Title: Seminar
Semester: 6th	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

Students will have the opportunity to deliver one or two seminars aimed at enhancing their presentation skills, deepening their understanding of specific topics, and fostering collaboration between academia and industry. These seminars will provide a platform for students to showcase their knowledge, research abilities, and innovative thinking to industry professionals and fellow students. The seminars will be structured as follows:

1. Seminar Topic Selection:

- Students will choose topics relevant to current trends, emerging technologies, or challenges in the field of computer engineering.
- Topics may include artificial intelligence, cybersecurity, data science, Internet of Things (IoT), cloud computing, or any other area of interest within the domain of computer engineering.

2. Preparation Phase:

- Students will conduct in-depth research on their chosen topic, gathering information from academic journals, industry reports, and reputable online sources.
- They will create comprehensive presentation materials, including slides, diagrams, and multimedia content to support their seminar.

3. Practice Sessions:

- Prior to the seminar, students will participate in practice sessions to refine their presentation skills, receive feedback from peers and instructors, and ensure clarity and coherence in their delivery.

4. Seminar Delivery:

- On the designated day, students will deliver their seminars in front of an audience comprising industry professionals, faculty members, and fellow students.
- Each seminar will typically last 20-30 minutes, followed by a question-and-answer session to facilitate discussion and exchange of ideas.

5. Feedback and Evaluation:

- Following each seminar, participants will provide constructive feedback to the presenter, highlighting strengths and areas for improvement.
- Faculty members and industry experts will evaluate the content, delivery, and overall effectiveness of the seminar, providing valuable insights for student development.

6. Reflection and Learning:

After completing their seminars, students will reflect on their experiences, identifying lessons learned, challenges overcome, and areas for future growth. They will document their reflections in their industrial training reports, integrating insights gained from the seminar experience into their overall learning journey.

By participating in these seminars, students will not only enhance their communication and presentation skills but also deepen their understanding of key concepts and issues in electrical engineering. Moreover, the interaction with industry professionals will provide valuable networking opportunities and industry insights, enriching their overall educational experience.

COURSE EVALUATION:

Evaluation of students' performance during the seminar presentations will be conducted by industry experts(if available) and faculty members. The assessment criteria will focus on various aspects of the seminar, including content, delivery, engagement, and overall effectiveness. Here's a draft of how students' performance will be evaluated:

1. **Content (40% of total evaluation):**
   - Relevance: The extent to which the seminar topic is pertinent to the field of computer engineering.
   - Depth of Research: The thoroughness and depth of the student's research on the chosen topic.
   - Clarity of Concepts: The ability to explain complex concepts clearly and concisely.
   - Originality and Innovation: The presentation of fresh insights or innovative perspectives on the topic.
2. **Delivery (30% of total evaluation):**
   - Organization: The logical structure and flow of the presentation, including introduction, main points, and conclusion.
   - Visual Aids: The effectiveness of visual aids (e.g., slides, diagrams) in enhancing understanding and engagement.
   - Verbal Communication: The clarity, articulation, and pace of the student's speech.
   - Body Language: The use of appropriate gestures, eye contact, and overall confidence during the presentation.
3. **Engagement (20% of total evaluation):**
   - Audience Interaction: The student's ability to engage the audience through questions, anecdotes, or interactive elements.
   - Interest Generation: The degree to which the presentation captures and maintains the audience's interest throughout.
   - Relevance to Audience: The alignment of the content with the audience's background and interests.
4. **Overall Effectiveness (10% of total evaluation):**
   - Impact: The overall impact of the seminar in terms of stimulating discussion, raising awareness, or inspiring further inquiry.
   - Time Management: The ability to manage time effectively and cover the key points within the allotted time frame.

Each evaluator will assign scores based on these criteria, and the final evaluation will be a weighted average of the scores given by all evaluators and will necessarily give each evaluated student the feedback on his/her performance, highlighting strengths and areas for improvement.

A complete compiled report for the same is to be submitted by the concerned evaluator to the concerned HOD/Principal for record and reference.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEMP605	Course Title: Major Project
Semester: 6th	Credits: 8
Hours per week:1 6 (L:0 T:0 P:16)	

Project work aims at developing skills in the students whereby they apply the knowledge and skills gained through the course to solve a practical problem undertaken as a project work. The students have different aptitudes and strengths.Project work, therefore, should match the strengths of students. For this purpose, studentsshould be asked to identify the type of project work they would like to execute. It is also essential that the faculty of the respective departments have a brainstorming session to identify suitable project assignments. The project assignment can be an individual assignment or a group assignment. There should not be more than three students if the project work is given to a group. The students should identify themselves or be given project assignments at least two to three months in advance. The project work identified in collaboration with industry/field organizations should be preferred.

Each teacher is expected to guide the project work of 5-6 students at a time. The project assignments may consist of the following:

a) Projects related to the repair and maintenance of machine parts
b) Estimating and costing projects
c) Design of components/ parts/jigs/fixtures
d) Projects related to quality control
e) Project work related to increasing productivity
f) The project connected with work-study
g) Projects relating to the erection, installation, calibration, and testing
h) Projects related to wastage reduction
i) Projects related to energy audit

For Students of Electrical Engineering Diploma Programme the project work can begrouped under the following four groups. Several projects have been mentioned under each section. A student should take at least two projects, which should notbe from the same group.

Report for all the four projects should be prepared and will give a seminar. The same will be assessed for internal and external assessment.

NOTE: Anyone from each section:

SECTION A

Electrical Machines and Equipment:

- Design and Construction of a small transformer (100 VA to 1 kVA)
- Construction of hot air blower
- Design and Fabrication of Automatic curtain operator
- Fabrication of Automatic Star-Delta starter
- Construction of Automatic Water level controller
- Construction of Choke for fluorescent tubes
- Design and construction of fan regulators (inductance type)
- Design and construction of fan regulators (Resistance type)
- Design and construction of loading rheostats
- Design and construction of Desert coolers/room coolers
- Rewinding of single-phase Electric Motor up to 1 HP
- Rewinding of motors of 3 phases up to 5 HP
- Design and construction of Geyser
- Rewinding of motors of small domestic appliances(exhaust fan/ceiling fan)
- Erection/installation and commissioning of rotating electrical machine
- Fault detection and repair of electrical/electronic instruments
- Design and assembly of contactor control circuits for various applications

SECTION B

Electrical Power:

- Drawing, estimating and costing of electrical installation of the institution from supplier's pole to the institution distribution board.
- Drawing, estimating, and costing of electrical installation of a workshopwith several electrically operated appliances/machines.
- To study the laying of underground distribution cable for a small colony starting from the main distribution pole
- To study the erection of a five pole span overhead line for a small distance for the distribution of electrical energy. To energize it and prepare a list of material and cost estimates.
- Energy audit for the workshop of your institution and to suggest remedies to have low Electricity Bill
- To provide a service connection to a consumer's premises for domestic purposes
- To survey the load of a given area in a small village colony, calculate the effective load, and determine the cables/conductors sizes for the proposed distribution system.
- Designing of light and fan scheme for an institutional or commercial building

- To study the augmentation of a nearby pole-mounted substation
- To prepare a proposal for the substation of your institution, calculating thetotal load (estimating and costing)

SECTION C

Electronics Based Projects:

Fabrication of:

- Voltage Stabilizer for refrigerator, air-conditioner
- Emergency light using SCR
- Power amplifier
- Low-cost intercom for home
- Analog computer
- Regulated power supply (+ 12V and + 6V) using 7812, 7912 and 7806, 7906
- Automatic battery charger using SCR
- Digital Clock
- FM Radio Receiver
    - Burglar Alarm
- Fabrication of UPS
- Automatic street light/dressing table light
- Mosquito Repeller
- Inverter circuit 500 watt/1 KVA.
- Solid State Control of Traffic Lights

SECTION D

Fabrication and Testing of:

- Inverter/Emergency light circuit using power transistors
- SCR-based automatic battery charger
- SCR-operated illumination controller
- SCR-operated automatic water level controller
- SCR-based speed controller for DC shunt motor
- Three-phase full wave rectifier using power diodes
- Timer circuit using 555-IC
- SCR-controlled rectifier circuit
- The speed control circuit of the DC shunt motor using SCR
- Inverting and non-inverting amplifiers using OP AMP(741)
- Comparator circuits using OP AMP (741)
- Project using PLC
- Project relating to Microprocessor
- Project relating to Microcontroller

Note: The quality of the end product and process adopted by the students in its execution should be considered along with other parameters while evaluating the students.

Important Notes

1. The general guidelines given in the curriculum of evaluation of Major Project should be followed for evaluation purpose.
2. It is also proposed that two students or two projects, which are rated best be given merit certificates at the time of the annual day of the institute. It would be better ifspecific nearby industries were approached for instituting such awards.

It is suggested that the institute organize an annual exhibition of the project items prepared by the students and invite leading Industrial organizations to such an exhibition. It is also suggested that two students or two projects, which are rated best be given merit certificates at the time of the annual day of the institute and if possible specific industries be approached for instituting such awards.

CURRICULUM
OF
CORE/PROGRAM ELECTIVE SUBJECTS
AND
OPEN ELECTIVES
FOR
THREE-YEAR DIPLOMA COURSE
IN
ELECTRICAL ENGINEERING

The student has to choose amongst the following list of electives for the core/program elective subjects and open electives to be chosen in 5th and 6th Semester. Furthermore for the lab courses of program electives, it is mandatory that the lab course chosen is the corresponding lab course of the chosen program elective only i.e. if a student opts Industrial Drives as Program Elective, then he/she has to also choose Industrial Drives Lab course as well.

LIST OF CORE/PROGRAM ELECTIVE SUBJECTS TO BE OFFERED IN 5TH AND 6TH SEMESTER FOR ELECTRICAL ENGINEERING				
S.NO.	**Course Code**	**Subject Name**	**Corresponding Elective Course-Code**	**Corresponding Elective Subject Name**
1	**EEPE01**	Industrial Drives	**EEPE02**	Industrial Drives Lab
2	**EEPE03**	Communication Technologies	**EEPE04**	Communication Technologies Lab
3	**EEPE05**	Electrical Vehicles	**EEPE06**	Electrical Vehicles Lab
4	**EEPE07**	Illumination Practices	**EEPE08**	Illumination Practices Lab
5	**EEPE09**	Control Systems	**EEPE10**	Control Systems Lab
6	**EEPE11**	Building Electrification	**EEPE12**	Building Electrification Lab
7	**EEPE13**	Solar Power Technologies	**EEPE14**	Solar Power Technologies Lab
8	**EEPE15**	Wind Power Technologies	**EEPE16**	Wind Power Technologies Lab
9	**EEPE17**	Bio Mass and Micro-Hydro Power Plants	**EEPE18**	Bio Mass and Micro-Hydro Power Plants Lab
10	**EEPE19**	Electric Traction	**EEPE20**	Electric Traction Lab

LIST OF OPEN ELECTIVE SUBJECTS TO BE OFFERED IN 5TH AND 6TH SEMESTER FOR ELECTRICAL ENGINEERING		
S.No.	**Course Code**	**Subject Name**
1	**EEOE01**	**Generic Skills and Entrepreneurship Development**
2	**EEOE02**	**Disaster Management**
3	**EEOE03**	**Project Management**
4	**EEOE04**	**Internet of Things**
5	**EEOE05**	**Economic Policies in India**
6	**EEOE06**	**E-Commerce**
7	**EEOE07**	**Basics of Management**
8	**EEOE08**	**Cyber Crimes and Laws**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE01	Course Title: INDUSTRIAL DRIVES
Program-Elective	Credits: 3
Hours per week: 3 (L: 3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry- identified competency through various teaching-learning experiences:

- Maintain electric AC and DC Drives.

COURSE CONTENT

1. Electric Drives

1.1 Need of Electric Drives,
1.2 Functional Block diagrams of an electric drive.
1.3 DC Motors (Brief Review of the following)
  a. Series, Shunt, and compound DC motors.
  b. Universal motor
  c. Permanent magnet motor
  d. DC servo motor
  e. Moving coil motor
  f. Torque motor.
1.4 Starting and Braking of DC Motors

2. AC Motors (Brief Review of the following)

2.1 Single-phase AC Motors
  i. Resistance split-phase motors
  ii. Capacitor run motors
  iii. Capacitor start motors
  iv. Shaded pole motors
2.2 Three-phase Induction Motors
  i. Squirrel cage Induction motor
  ii. Slip ring Induction Motor
  iii. Starting methods of Induction Motor
  iv. Braking methods of Induction Motor

3. DC Drives

3.1 Single-phase SCR Drives
  a) Half wave converter
  b) Full wave converter
  c) Semi converter
  d) Dual converter
3.2 Three-Phase SCR Drives

a) Half wave converter
b) Full wave converter
c) Semi converter
d) Dual converter

3.3 Speed control methods of DC series Motor
3.4 Chopper Controlled DC Drives
3.5 Maintenance procedure.
3.6 Reversible SCR Drives.

4. AC Drives

4.1 Stator voltage control
4.2 Variable Frequency Control
4.3 Voltage Source Inverter Control
4.4 Current Source Inverter Control
4.5 Rotor Resistance Control
4.6 The maintenance procedure for AC drives
4.7 Sequences of stages & drives required in each stage for the following applications: a) Textile mills, b) Steel rolling mills, c) Paper mills, d) Sugar mills

COURSE OUTCOMES

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

- Select relevant DC motors for various electric drive applications.
- Select relevant AC motors for various electric drive applications.
- Maintain DC Drives.
- Maintain AC Drives.

RECOMMENDED BOOKS:

1. Electric Machines, P.S. Bimbhra, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-86173- 294)
2. Fundamentals of Electrical Engineering by Saxena, S.B Lal; Dasgupta, K.,Cambridge University Press Pvt. Ltd., New Delhi, ISBN: 9781107464353
3. A Text Book of Electrical Technology Vol-II, by Theraja, B. L.; Theraja, A. K., S. Chand and Co. Ramnagar, New Delhi, ISBN:9788121924405
4. Basic Electrical Engineering by Mittle, V.N.; Mittle, Arvind, McGraw Hill Education,Noida, ISBN: 9780070593572
5. Power Electronics, Sen P.C., Mcgraw-Hill Publishing CompanyLimited, New Delhi. ISBN:9780074624005
6. Fundamentals of Electrical Drives, Dubey Gopal K., Second Edition, Narosa Publishing House, New Delhi.ISBN:9788173194283
7. Electrical Drives Concepts and Applications, Subrahmanyam, Vedam, Mcgraw-Hill Publishing CompanyLimited, New Delhi.ISBN:9780070701991
8. Power Electronic Systems Theory and Design, by Agrawal, Jai P., Pearson Education, Inc. ISBN 9788177588859.
9. Design and Testing of Electrical Machines, Deshpande M.V., PHI Publication, ISBN: 9788120336452 10. Pillai, S.K., A first course on Electrical Drives, Wiley Eastern Ltd. New Delhi, ISBN :13: 978- 0470213995

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	9	20
2.	9	20
3.	15	30
4.	15	30
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE02	Course Title: INDUSTRIAL DRIVES LABORATORY
Program Elective	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry- identifiedcompetency through various teaching-learning experiences:

- Maintain electric AC and DC Drives.

LIST OF PRACTICALS:

1. Dismantle the given DC / AC motor and identify its different parts
2. Control the speed of the DC Motor using armature voltage control and field current control method
3. Measure the output voltage of the chopper for resistive load by varying the frequency and
   /or duty cycle of a chopper.
4. Control the speed of the three-phase squirrel cage induction motor using the stator voltage control method.
5. Observe the effect on the speed of the given D.C. separately excited motor by varyingvoltage using a step-down chopper.
6. Control the speed of the given separately excited motor by changing the firing angle of SCR using single phase semi converter and single phase full converter. Also, measure the speed.
7. Control the speed of the given three-phase induction motor by varying frequency and plot the graph between speed and frequency
8. Demonstrate High power SCR/power device and Heat sink and write their specifications and rating.
   a. Control the speed of single-phase capacitor split-phase induction motor using DIAC –TRIAC circuit.
   b. Identify different parts and assemble the given DC motor.
   c. Identify different parts and assemble the given AC motor.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE03	Course Title: COMMUNICATION TECHNOLOGIES
Program Elective	Credits: 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry-identifiedcompetency through various teaching-learning experiences:

- Use relevant data communication techniques.

COURSE CONTENT

1. Data Communication and Modulation

1.1 Block diagram of communication system
1.2 Types of communication systems: synchronous and asynchronous, simplex,half-duplex, Full duplex, serial and parallel communication
1.3 Classification of communication technique: AM, FM, & PM based ondefinition, waveform, bandwidth, modulation index
1.4 Modulation and demodulation: Block diagram of AM, FM, and PM
1.5 Pulse Modulation: Block diagram for waveform generation of PAM, PWM& PPM, working principle, advantages, disadvantages, and applications.
1.6 Advantages of pulse modulation over AM and FM.

2. Digital Modulation Techniques

2.1 Digital Communication: Block diagram and working principle, waveforms, strength, and limitations
2.2 Sampling process Nyquist sampling theorem, quantization process, quantization error, quantization noise
2.3 PCM: Block diagram, working principle, waveforms, advantages, disadvantages, application of PCM.
2.4 Principle of ASK, PSK, FSK. Application of ASK, PSK, FSK

3. Data Communication Media

3.1 Baud rate, Bit rate, types of errors in data communication, and error correction techniques.
3.2 Types of communication media and frequency band of operation
3.3 Guided media: Cable-twisted pair cable, co-axial cable, fiber opticcable.
3.4 Unguided media: Microwave communication, Infrared communication.

4. Fibre Optics

4.1 Introduction to Fiber-optic communication. Strength and limitations of fiber optic system
4.2 Light propagation through cable: Mode of propagation, index profile
4.3 Fibre optic cables: cable construction, fiber optics cable modes, single mode,

step-index fiber, multimode index fiber, multimode graded index fiber, fiber cable losses.

4.4 Light source and Detector: Light emitting diode (LED), Photo Transistor, Laser diode, optocoupler.

5. Data Communication Protocols and Interfacing Standard

5.1 OSI (Open Systems Interconnection) Reference model
5.2 Introduction to protocol, FTP, SMTP, TCP/IP, UDP
5.3 LAN standards. Introduction to IEEE Standards for LAN and GPIB
5.4 RS-232 standard: Introduction and working principle
5.5 Network topologies, introduction star, ring, tree, bus, mesh, hybrid
5.6 Basic functions of networking devices: modem, switches, routers, repeaters, hubs, bridges, gateway.

6. Advanced-Data Communication

6.1 Introduction to Wi-Fi and Wi-Max
6.2 Bluetooth architecture and its layers,
6.3 Universal serial bus (USB) architecture.
6.4 Bluetooth and USB

COURSE OUTCOMES

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

- Identify the different types of data communication equipment and techniques.
- Use relevant digital modulation techniques.
- Interpret the specifications of the data communication media.
- Maintain the fiber optics networks for data communication.
- Use the OSI model and relevant data communication protocols.
- Maintain a wireless network environment.

RECOMMENDED BOOKS:

1. Electronic Communication System, Wayne Tomasi, Prentice Hall of India, ISBN 13:9780130494924
2. Practical Industrial Data Communications, Reynders D., Steve Macky, Wright Edvin, Newnes publication, ISBN 10:07506639523
3. Electronic Communication System, George F. Kennedy, Barnard Davis, Tata McGraw Hill, ISBN 13:9780074636824 Electrical Engineering Curriculum Structure 186
4. Data Communication & Networking, Forouzan B.A., McGraw Hill Education; 5 edition ISBN13: 0073376226-978
5. Principles of Digital communication systems and computer networks. Prasad K.V.K.K., , Dreamtech press, New Delhi, ISBN 13:9788177223620
6. Computer Networks Tanenbaum, Andrew S.David J. Wetherall, Pearson; edition ISBN 13:9788121924252
7. Text Book of Communication Engineering, Kumar A., Umesh Publication, ISBN 13:978818114160 8. A. Kumar, D. Manjunath, Joy Kuri, Communication Networking, Academic Press Publication ISBN 13:9780124287518
8. Electronic Communication & Data Communication, Hemant Kumar Garg, Soni

Manish, University Book House Private Ltd., ISBN 13:9788181980717
9. Optical Fiber Systems: Technology, Design, and Applications Kao, Charles K., Published by McGraw-Hill Inc., US ISBN 13: 9780070332775.
10. Fiber Optic Communication System by Agrawal, Govind P., Wiley; 4 edition ISBN :13 9780470505113
11. Optical communications essentials. Keiser, Gerd, McGraw-Hill, New Delhi- 2003, ISBN13:9780071412049

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allot-ted (Hrs)	Marks Allot-ted(%)
1.	9	20
2.	9	20
3.	6	10
4.	9	20
5.	6	10
6.	9	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE04	Course Title:COMMUNICATION TECHNOLOGIES LAB
PROGRAM ELECTIVE	Credits: 1
Hours per week: 2 (L: 1 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry-identifiedcompetency through various teaching-learning experiences:

- Use relevant data communication techniques.

LIST OF PRACTICALS:

1. Measure the modulation index of amplitude- modulated and frequency-modulated waves and observe the effect of modulating signals.
2. Test Pulse Amplitude Modulation (PAM), Pulse Width Modulation, PulsePosition,and Pulse Code Modulation signals
3. Test Amplitude, Frequency, and Phase Shift Keying Signals
4. Plot the V-I Characteristics of a given Infra-Red Light Source(IR-LED)
5. Test UTP/STP cable in straight and crossover mode and by line tester.
6. Plot the V-I Characteristics of the given Light Source(LED) and detector(photo transistor)
7. Use OFT trainer Kit given 1mm. Diameter Plastic optical fiber at 650 nm todetermine the
8. Numerical Aperture (NA).
9. Install and configure TCP/IP protocol.
10. Perform the transfer of files from PC to PC using Windows
11. Perform the transfer of a file from one PC to another PC using Serial port RS-232
12. Establish Wireless Communication between five computers using wireless LAN.
13. Establish Bluetooth communication using 4G mobile and laptop.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE05	Course Title: ELECTRIC VEHICLES
PROGRAM ELECTIVE	Credits: 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry-identified competencythrough various teaching-learning experiences:

- Maintain electric vehicles

COURSE CONTENT

1. Introduction to Hybrid Electric Vehicles

1.1 Evolution of Electric vehicles
1.2 Advanced Electric drive vehicle technology Vehicles-Electric vehicles (EV),Hybrid Electric drive (HEV), Plug-in Electric vehicle (PIEV),
1.3 Components used Hybrid Electric Vehicle
1.4 Economic and Environmental Impacts of Electric Hybrid Vehicles
1.5 Parameters affecting Environmental and economic analysis
1.6 Comparative study of vehicles for economic environmental aspects

2. Dynamics of hybrid and Electric vehicles

2.1 General description of vehicle movement
2.2 Factors affecting vehicle motion- Vehicle resistance, tire ground adhesion, rolling resistance, aerodynamic drag, equation of grading resistance, dynamic equation
2.3 Drive train configuration, Automobile power train, classification of vehicle power plant
2.4 Performance characteristics of IC engine, electric motor, need of gear box
2.5 Classification of motors used in Electric vehicles
2.6 Basic architecture of hybrid drive trains, types of HEVs
2.7 Energy saving potential of hybrid drive trains
2.8 HEV Configurations-Series, parallel, Series-parallel, complex.

3. DC-DC Converters for EV and HEV Applications

3.1 EV and HEV configuration based on power converters
3.2 Classification of converters –unidirectional and bidirectional
3.3 Principle of step-down operation Boost and Buck-Boost converters
3.4 Principle of Step-Up operation Two quadrant converters; multi quadrant converters

4. DC-AC Inverter & Motors for EV and HEVs

4.1 DC-AC Converters
4.2 Principle of operation of half-bridge DC-AC inverter (R load, R-L load)
4.3 Single phase Bridge DC-AC inverter with R load, R-L load
4.4 Electric Machines used in EVs and HEVs, principle of operation, working &control

5. Batteries

5.1 Overview of batteries
5.2 Battery Parameters, Advantages, Applications and Charging Method of Lithium Ion Batteries
5.3 Control system for EVs and HEVs, overview, electronic control unit ECU
5.4 Regenerative braking in EVs

COURSE OUTCOMES

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

- Interpret the salient features of Hybrid electric vehicles.
- Interpret the Dynamics of hybrid and Electric vehicles
- Maintain the DC-DC converters in EV applications.
- Maintain the DC-AC converters in EV applications
- Select the batteries for EV applications.

RECOMMENDED BOOKS:

1. Electric & Hybrid Vehicles A.K. Babu, Khanna Publishing House, New Delhi(Ed.2018)
2 Hybrid Vehicles and the Future of Personal Transportation. Fuhs, A. E., CRC Press,
2. Electric and Hybrid Vehicles: Power Sources, Models, Sustainability,Infrastructure And The Market, Gianfranco, Pistoia Consultant, Rome, Italy,
3. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, Ehsani, M. CRC Press
4. Electric and Hybrid Electric Vehicles Husain, I., CRC Press
5. Modern Electric Vehicle Technology, Chan C. C. and K. T. Chau, Oxford SciencePublication,
6. Automotive Transmissions: Fundamentals, Selection, Design and Application,Lechner G. and H. Naunheimer, Springer
7. Power Electronics: Circuits, Devices and Applications Rashid, M. H., 3rd edition,Pearson,
8. Power Electronics: Devices, Circuits and Industrial Applications, Moorthi, V. R.Oxford University Press
9. Electric motor drives: modeling, analysis, and control, Krishnan, R. Prentice Hall
10. Analysis of electric machinery. Krause, O. P.; C. Wasynczuk, S. D. Sudhoff, IEEE Press

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	9	20
2.	15	30
3.	6	10

4.	9	20
5.	9	20
To-tal	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE06	Course Title: ELECTRIC VEHICLES LABORATORY
Program Elective	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry- identifiedcompetency through various teaching-learning experiences:

- Maintain electric vehicles

LIST OF PRACTICALS:

1. Develop a block diagram of the Electric vehicle and identify parts
2. Case study- Compare a minimum of four vehicles for economic and environmentalanalysis
3. Develop a schematic diagram of a hybrid electric vehicle and identify the components fluorescent lamp.
4. Prepare a report on Plug-in Electric vehicles by visiting a charging station
5. Collect specifications of converters and inverters used for Electric vehicles, asingle lamp controlled by two switches
6. Diagnose, repair, and maintain battery used in electric vehicle
7. Prepare test procedure for equipment used in Electric vehicle
8. List safety procedures and schedule for handling HEVs and EVs.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE07	Course Title: ILLUMINATION PRACTICES
Program Elective	Credits: 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry-identifiedcompetency through various teaching-learning experiences:

- Design illumination schemes and associated electrification of buildings.

COURSE CONTENT

1. Fundamentals of illumination
- 1.1 Basic illumination, Terminology, Laws of illumination
- 1.2 Polar curves, polar curve: its meaning and applications for designing thelamp.
- 1.3 Concept of Photometry, Measurement of illumination
- 1.4 Lighting calculation method, Lumens or light flux method,

2. Types of lamps
- 2.1 Incandescent lamps, ARC lamps – AC and DC arc lamps, Fluorescent lamp
- 2.2 Types of other lamps: Mercury vapor lamp, Sodium vapour lamp, Halogen Lamps, Neon Lamps. Neon Sign Tubes.
- 2.3 LED lamps, CFL, Lasers
- 2.4 Selection Criteria for lamps

3. Illumination Control and Control Circuits
- 3.1 Purpose of lighting control and Dimmer,
- 3.2 Working principle and operation of Dimmer
- 3.3 Electronic Dimmer: working principle and operation
  - a. Thyristor operated dimmer
  - b. Triac operated dimmer
- 3.4 Methods used for light control Control circuits: a single lamp controlled by a switch or two switches.
- 3.5 Single Lamp control by two-point method,

4. Illumination for Interior Applications
- 4.1 The standard for various locations of Interior Illumination
- 4.2 Design considerations for Interior location of residences (2 BHK),
- 4.3 Illumination scheme for different Interior locations of Residential unit

5. Illumination for Interior Applications
- 5.1 Street Lighting (Latest Technology),
- 5.2 Railway Lighting

COURSE OUTCOMES

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

- Select relevant lamps for various applications considering illumination levels
- Select the lighting accessories required for the selected wiring scheme.
- Design relevant illumination schemes for interior applications.

- Design Illumination schemes for various applications
- Design Illumination schemes for various outdoor applications.

RECOMMENDED BOOKS:

1. Applied Illumination Engineering, Lindsey, Jack L., The Fairmont Press Inc.
2. Lighting Engineering: Applied Calculations Simons, R. H., Bean, Robert;Architectural Press ISBN: 0750650516.
3. Handbook of Applied Photometry by Casimer M Decusatis, Springer, ISBN 1563964163.
4. Handbook of Industrial Lighting, Butterworths, Lyons Stanley, Butterworths
5. Lighting Control Technology and Applications Simpson Robert S, Focal Press
6. Energy Management in Illuminating Systems Kao Chen, CRC Press

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	10	20
2.	15	30
3.	10	20
4.	8	20
5.	5	10
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE08	Course Title: ILLUMINATION PRACTICES LABORATORY
Program Elective	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry-identifiedcompetency through various teaching-learning experiences:

- Design illumination schemes and associated electrification of buildings.

LIST OF PRACTICALS:

1. Conduct illumination level assessment in the workplace using a lux meter.
2. Fit the given lamp in the selected mounting.
3. Interpret the polar curves of the given type of lamp and verify it using the lux meter.
4. Measure the illumination output of different lamps (Incandescent, Fluorescent, CFL, LED) and compare it with their wattage.
5. Build an electronic dimmer – Part I
6. Build another type of electronic dimmer – Part II
7. Build a single lamp control circuit for a two-point method

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE09	Course Title: Control system
Program Elective	Credits: 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course has been designed so that students may learn to Build and test the different types of Control Systems for Process Applications.

COURSE CONTENT

1. Basics of Control System:

1.1 Introduction, Definitions. Classification of Control Systems with examples. Open loop systems, Closed loop systems: Comparison of open and closed loop control systems.
1.2 Concept of feedback in control system
1.3 Time lag, dead time, Hysteresis
1.4 Block Diagrams
1.5 Introduction to Block Diagram representation, properties, Advantages and disadvantages of Block Diagram,
1.6 Block diagrams for open loop and closed loop control system
1.7 Simple or canonical Form of Closed Loop System,
1.8 Rules for Block Diagram Reduction (simple), Procedure to solve block diagramreduction problems

2. Laplace transform and Transfer function:

2.1 Laplace transform definition, procedure to find Laplace transform, properties, Inverse Laplace transform, importance and applications
2.2 Definition Advantages and disadvantages of the transfer function, Procedures to determine the transfer function of a control system, Impulse Response, Poles and zeros of transfer Function, Characteristics equation of transfer function

3. Signal flow graph representation:

3.1 Introduction of Signal Flow Graph, Properties of Signal Flow Graph,Terminology used in Signal Flow Graph,
3.2 Methods to obtain Signal Flow Graph from system equations & BlockDiagram, Masons Gain Formula (brief idea)

4. Time response analysis of the control system

4.1 Definition of type and Order of System
4.2 Standard test inputs,
4.3 Steady State Analysis, Steady-state errors, and error constants, Derivation of Steady State Error, Time Response of the first-order system to step input, Time Response of the second-order system to step input

5. Stability Analysis by Routh- Hurwitz Criteria

4.4 Characteristic equation
4.5 Stability of control system
4.6 Necessary Conditions
4.7 Routh-Hurwitz Criteria for Stability.

COURSE OUTCOMES

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

- Learn the basics of control systems, including open/closed loop systems, feedback, and time-related factors.
- Cover Laplace transform, transfer functions, signal flow graphs, and time response analysis.
- Provide knowledge on stability analysis using Routh-Hurwitz criteria.
- Develop skills in block diagram reduction, system type/order analysis, and steady-state error determination.

RECOMMENDED BOOKS:

1. Control System Engg by I.J.Nagrath and M.Gopal, TMH
2. Control Systems: Principles and Design by M.Gopal, TMH
3. Control System Engg by Ogata, PHI
4. Automatic Control System by BC Kuo, Prentice Ha
5. Linear Control System by B.S.Manke, Khanna publication
6. Feed back Control Systems by Dr. S D. Bhide & Barapte, Tech maxPublication.
7. Control Systems Engineering by S.K. Bhattacharya, Pearson Education.
8. Automatic Control system by Syed Hasan Saeed, S.K. Kataria &Sons.

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	4	10
2.	10	20
3.	12	20
4.	6	15
5.	10	20
6.	6	15
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE10	Course Title: Control System LAB
Program Elective	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course has been designed so that students may learn to Build and test the differenttypes of Control Systems for Process Applications.

LIST OF PRACTICALS:

1 Identify various blocks of a given open loop system.
2 Identify various blocks of a given closed-loop system
3 Convert an open loop system into a closed loop and observe the difference in outputusing a control simulator.
4 To study the torque-speed characteristics of an AC servo motor, determine its parameters, and evaluate its transfer function.
5 To study the open and closed- loop step response of first order simulated linear systems.

INSTRUCTIONAL STRATEGY

1. Visit to Industries.
2. Use Free Simulators Software for teaching / learning activities.
3. Show Video/Animation Films relevant to Automation & Control Systems.

PROGRAM:THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE511	**Course Title : BUILDING ELECTRIFICATION**
Program Elective	**Credits: 3**
Hours per week: 3 (L:3 T:0 P:0)	

Course objectives:

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

- Design electrical installation systems in building complexes.

Course contents:

1. Wiring Tools and Accessories

1.1 Various tools required for wiring- screwdrivers, pliers, Try square, saws, hacksaw, chisel, hammers, mallet, rawl punch, hand drill machine, portable drilling machine, files, plumb bob, line thread, electricians knife, test lamp, tester and their BIS specifications, Application, care & maintenance of tools

1.2 Classification of electrical accessories- controlling, holding, safety, outlets

1.3 BIS symbols of following electrical accessories.

Switch – Their types according to construction such as surface switch, flush switch, and pull switch, rotary switch, knife switch, pendent switch, Main-switch (ICDP, ICTP). Their types according to working such as single pole, double pole, two-way, two-way centre off, interme- diate, series parallel switch

Holders- Their types such as bayonet cap lamp holder, pendent holder, batten lamp holder, angle holder, bracket holder, tube light holder, screw type Edison and goliath Edison lamp holder, swivel lamp holder.

Socket outlets and plugs- two pin, three-pin, multi pin sockets, two-pin and three-pin plug.

Others- Iron connector, adaptor, and ceiling rose, distribution box, neutral link, bus-bar chamber. Wooden/ mica boards, Moulded/ MS Concealed boxes of different sizes. Modular accessories.

2.Electrical Wires and Underground Cables

2.1 Conductors: - wire, bus bar, stranded conductor, cable, armoured cable, flexible cable, solid conductor, PVC wires, CTS wire, LC wire, FR (Fire retardant) wire, Size of wire according to BIS.

2.2 Tools used for measurement of wire size, Wire jointing methods.

2.3 Classification of cables: low tension, high tension, and extra high tension cables.

2.4 Selection of suitable cable size and type from standard data.

3. **Wiring Methods and wiring layout**

3.1 Factors determining the selection of wiring methods.

3.2 Classification of wiring methods.

PVC casing-capping wiring- wiring rules according to IS: 732-1983

Conduit wiring- Types of conduit, comparison between Metal and PVC conduit, types of conduit wiring (Surface/Concealed). Conduit wiring accessories, BIS rules for Metal and PVC conduit wiring.

3.3 Comparison of various wiring systems.

3.4 General BIS rules for domestic installations.

3.5 Design, working and drawing of following electrical circuits:

Simple light and fan circuits, Stair case wiring, Go-down wiring circuit,

Bedroom lighting circuit, Corridor lighting circuit,

4. **Residential Building Electrification**

4.1 Interpretation of electrical installation plan and electrical diagrams, electrical symbols.

4.2 Load assessment: Selection of size of conductor, Selection of rating of main switch and protective switch gear.

4.3 Design and drawing, estimation and costing of a residential installation having maximum 5 KW load; Sequence to be followed for preparing estimate; Calculation of length of wire and other materials, labour cost

4.4 Residential building Service Connection- types Underground and overhead.

4.5 Calculation of Material required for overhead service connection

5.Protection of Electrical Installation

5.1 Fuse in electric circuit: fuse element, current rating, minimum fusing current, fusing factor, Fuse material, Types of fuses –Re-wirable, cartridge fuses (HRC and LRC),

5.2 Miniature circuit Breaker (MCB)- Principle, rating and uses

5.3 Earth Leakage Circuit Breaker (ELCB)- Principle, rating and uses.

5.4 Brief idea about System and equipment earthing and its requirements,

6. Illumination in Residential Installation

6.1 Concept of Luminous flux, Luminous intensity, Lumen, Illumination or illuminance, Lux, Space-height ratio, utilization factor, depreciation factor, luminous efficiencies

6.2 Laws of Illumination-Inverse Square Law, Cosine Law

6.3 Factors affecting the illumination.

Course outcomes:

After the completion of the course, the student will be able to

a) Select accessories, wires, cables and wiring systems for electrification.
b) Design electrical wiring installation system for residential unit.
c) Design proper illumination scheme for residential unit.
d) Prepare wiring layouts on wiring board.
e) Locate and diagnose faults in electrical wiring installation.
f) Do proper earthing for building electrification

References:

1. Raina, K.B. and S.K.Bhattacharya, Electrical Design Estimating and Costing, New Age Interna- tional Ltd., New Delhi, ISBN 978-81-224-0363-3
2. Allagappan,N. S.Ekambarram, Electrical Estimating and Costing, New Delhi, ISBN-13: 9780074624784
3. Singh, Surjit, Electrical Estimating and Costing, Dhanpat Rai and Co. New Delhi, ISBN: 1234567150995
4. Gupta, J B: A Course in Electrical Installation Estimating and Costing, S K Kataria and Sons,New Delhi, ISBN:978-93-5014-279-0
5. Bureau of Indian Standard, IS: 732-1989, Code of practice for electrical wiring installation
6. Bureau of Indian Standard, SP 30 National Electrical Code 2010
7. Bureau of Indian Standard, SP 72 National Lighting Codes 2010
8. E-REFERENCES:-
   - http://nptel.ac.in/courses/108108076/1 , assessed on 18th January 2016
   - http://www.electrical4u.com, assessed on 18th January 2016
   - https://www.youtube.com/watch?v=A9KSGAnjo2U, assessed on 18th January 2016
   - http://www.electricaltechnology.org/2015/09, assesed on 30 Jan 2016
   - www.slideshare.net/bawaparam/made-by-paramassesed on 30 Jan2016
   - www.electricaltechnology.org/2013/09/electrical-wiring.html assessed on 16 March 2016.

UNIT WISE MARKS AND TIME DISTRIBUTION

UNIT	Time Allotted (hrs)	Marks Allocation (%)
1.	7	15
2.	5	15
3.	10	20
4.	12	20
5.	6	15
6.	8	15
	48	100

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE512	**Course Title : BUILDING ELECTRIFICATION LABORATORY**
Program Elective	**Credits: 1**
Hours per week: 2 (L:0 T:0 P:2)	

Course objectives:

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

- Design electrical installation systems in building complexes.

LIST OF PRACTICALS

1. Prepare series testing board.
2. Select the electric wire using measuring and testing instruments for particular applications.
3. Identify cables of different current ratings.
4. Prepare wiring installation on a board showing control of one lamp, one fan and one socket from one switch board in PVC surface conduit wiring system.
5. Prepare wiring installation on a board.
6. Control one lamp from two different places using PVC surface conduit wiring system.
7. Prepare wiring installation on a board. Control one lamp from three different places using PVC surface conduit wiring system.
8. Prepare wiring installation on a board.
9. Perform go-down wiring for three blocks using PVC casing capping.
10. Design 2 BHK residential installation scheme and estimate the material required. And draw the details required for installation on A4 size sheet.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE13	Course Title: SOLAR POWER TECHNOLOGIES
Program Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identifiedcompetency through various teaching-learning experiences. Maintain the efficient operation of various types of solar power technologies.

COURSE CONTENT

1. Solar Energy

1.1 Solar Map of India: Global solar power radiation
1.2 Different types of Solar water heaters: Construction, working, specifications,and installation of Solar Heating systems
1.3 Solar drying and different types of Solar cookers
1.4 Solar lighting.
1.5 Preventive maintenance of all of the above.

2. Concentrated Solar Power (CSP)

2.1 Concentrated Solar Power (CSP) plants or solar thermal electric systems
2.2 Parabolic Trough: Construction, working and specifications
2.3 Parabolic Dish: Construction, working and specifications
2.4 Preventive maintenance of all of the above

3. Solar PV Systems

3.1 Solar PV cell: Types of construction, working, Typical specifications of solar cells
3.2 Solar PV working principle: Series and parallel connections of solar modules
3.3 Solar Photovoltaic (PV) system: components layout and working.
3.4 Roof top and streetlight solar PV systems and typical specifications Maintenance of these systems

4. Solar PV Electronics

4.1 Solar Charge controllers: working and specifications,

4.2 Solar Inverters: working and specifications
4.3 Solar Power tracking: construction, working, tilt angle, solar radiation, I-V, P-V characteristics, maximum power point tracking (MPPT)

5. Solar PV Off-grid and Grid-Tied Systems

5.1 Solar off-grid systems: layout and specifications
5.2 Solar Grid-tied (on grid) systems: Working principle of grid-tied dc-acin-verter, grid synchronization, and active power export
5.3 Net metering: main features and working

COURSE OUTCOME

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

- Maintain the solar non-electric equipment.
- Maintain CSP plants
- Maintain solar PV systems.
- Maintain solar PV electronics and MPPT systems
- Maintain off-grid and on-grid solar power plants

RECOMMENDED BOOKS:

1. Solanki, Chetan Singh, - Solar Photovoltaics: Fundamentals, Technologies and Applications, PHI Learning, New Delhi, ISBN: 9788120351110
2. Solanki, Chetan Singh, - Solar Photovoltaic Technology and Systems - A Manual For Technicians, Trainers and Engineers, PHI Learning, New Delhi, ISBN: 9788120347113
3. Kothari, D.P. et aL. Renewable Energy Sources and Emerging Technologies, PHI
4. David M. Buchla, Thomas E. Kissell, Thomas L. Floyd, - Renewable Energy Systems, Pearson Education New Delhi, ISBN: 9789332586826
5. Rachel, Sthuthi, Earnest, Joshua; -Wind Power Technologies, PHI Learning 5. O.P. Gupta, Energy Technology, Khanna Publishing House, ISBN: 978-93-86173- 683

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (hrs)	Marks Allotted (%)
1.	9	20
2.	9	20
3.	10	20
4.	10	20
5.	10	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE14	Course Title : SOLAR POWER TECHNOLOGIES LABORATO-RY
Program Elective	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identifiedcompetency through various teaching-learning experiences. Maintain the efficient operation of various types of solar power technologies.

LIST OF PRACTICALS:

1. Dismantle and Assemble solar power heaters
2. Dismantle and Assemble the parabolic dish CSP plant.
3. Dismantle, Assemble, and Troubleshoot the solar PV system
4. Troubleshoot solar PV panels and arrays
5. Troubleshoot solar inverters
6. Troubleshoot solar off-grid systems
7. Troubleshoot solar net metering systems

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE15	Course Title: WIND POW-ERTECHNOLOGIES
Program Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identified competency through various teaching-learning experiences. Maintain large wind power plants and small wind turbines.

COURSE CONTENT

1. Wind Energy and Wind Power Plants

1.1 Wind power scenario in the world and India
1.2 Characteristics of Wind Energy: Wind movement, wind profile, roughness,effects of obstacles in wind path.
1.3 Types of Wind Power Plants (WPPs): Small and large wind turbines;
1.4 Horizontal and Vertical axis; Upwind and Downwind, One, Two, and Three blades; constant and variable Speed; Geared, Direct-Drive and Semi-Geared (Hybrid) WPPs; WECS, WEGs, WTs, WPPs,
1.5 WPP Tower Types: Lattice tubular steel, concrete, hybrid, ladders, cables.
1.6 WPP substation: Switchgear, transformers, inside layouts of Electricelectronic panels at the block level.

2. Construction and Working of Large Wind Power Plants

2.1 Wind Turbine Terminologies: Cut-in, cut-out, and survival wind speeds, Threshold wind speeds, rated power, nominal power, Wind Power Curve
2.2 Major parts and Functions of WPP: Rotor blades, hub, nacelle, tower, electric sub-station, nacelle layouts of Geared, Direct-Drive, and Semi-Geared WPPs, Main shaft, gearbox, electric generator, electronic control panels
2.3 Rotation principles: Drag and Lift principle, thrust, and torque of wind turbinerotor.
2.4 Different types of Sensors: Anemometer, wind vane, rpm sensors of main shaft and generator, temperature sensors of nacelle, gearbox, and generator; cable untwisting and vibration sensors.
2.5 Different types of Actuators: Electric and hydraulic pitching and yawingmechanisms, cable untwisting and braking mechanisms

3. Aerodynamic Control, Electric Generators and Grid Connection

3.1 Aerodynamic Control of WPPs: Stall Pitch and Active Stall.
3.2 Braking mechanisms of large WPPs.
3.3 Electric Generator Types: Working of Squirrel-Cage rotor Induction Generator(SCIG), Wound-Rotor Induction Generator (WRIG), Doubly-Fed Induction Generator (DFIG), wound rotor and permanent magnet synchronous generators.
3.4 Electric grid connection of WPPs: Local Impacts and system-wide impact

4. Construction and Working Small Wind Turbines

4.1 Types and working of different types of small wind turbines (SWT): Classification: Horizontal and Vertical axis, Upwind and Downwind, One, Two, and Three blades; Constant and Variable Speed; Direct-Drive and Geared; braking of SWTs
4.2 Parts of SWTs: Rotor, generator, gearbox, tower, electric control panel, tale vane, anemometer, wind vane, temperature, and rpm sensors.
4.3 Working SWTs: Direct-drive and Geared.
4.4 Electrical generators in SWTs: permanent magnet synchronous generators, induction generators
4.5 SWT towers: Lattice tubular type, hydraulic towers, ladders, cables,

5. Maintenance of Small Wind Turbines

5.1 Small wind turbine assembly.
5.2 Installation of different types of small wind turbines (SWT): tubular and lattice types.
5.3 SWT Routine maintenance: Tips; Preventive maintenance schedule of braking mechanisms, sensors; oiling and greasing related;
5.4 Common electrical and mechanical faults in SWTs

COURSE OUTCOME

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

- Identify the various types of wind power plants and their auxiliaries.
- Maintain the normal working of large wind turbines.
- Optimize the aerodynamic and electric control of large wind power plants.
- Troubleshoot the common faults of large wind power plants.
- Maintain the normal working of small wind turbines.
- Troubleshoot small wind turbines.

RECOMMENDED BOOKS:

1. Hau, Erich: Wind Turbines Springer-Verlag, Berlin Heidelberg, Germany, ISBN:978-3-642- 27150-2

2. Rachel, Sthuthi, Earnest, Joshua; -Wind Power Technologies, PHI Learning, NewDelhi, ISBN: 978-93-88028-49- E-book 978-93-88028-50-9
3. Gipe, Paul: Wind Energy Basics, Chelsea Green Publishing Co; ISBN: 978-1603580304
4. Wizelius, Tore, Earnest, Joshua - Wind Power Plants and Project Development, PHILearning, New Delhi, ISBN:978-8120351660
5. Bhadra, S.N., Kastha, D., Banerjee, S, Wind Electrical Systems installation; Ox-fordUniversity Press, New Delhi, ISBN: 9780195670936
6. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi (ISBN:978-93-86173- 683)

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allot-ted(hrs)	Marks Allotted (%)
1.	10	20
2.	10	20
3.	10	20
4.	9	20
5.	9	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICALENGINEERING	
Course code: EEPE16	Course Title: WIND POWER TECHNOLOGIES LABORATORY
Program Elective	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identifiedcompetency through various teaching-learning experiences. Maintain large wind power plants and small wind turbines.

LIST OF PRACTICALS (ANY TEN)

1. Identify the specified items of a wind farm after watching the video clip.
2. After watching the video clips, identify the specified parts inside the nacelle of a large wind power plant.
3. Check the performance of the temperature and vibration sensor used in 125/150 kW WPPs.
4. Check the performance of the SCIG.
5. Check the performance of the PMSG.
6. Check the performance of the hydraulic and electric pitch actuator and yaw actuator used in 125/150 kW WPPs.
7. Check the performance of the contactless RPM sensors used in WPPs
8. Troubleshoot the anemometer and wind vane
9. Check the generator performance of SWTs.
10. Identify the parts of a direct-drive SWT
11. Identify the parts of a geared SWT
12. Assemble/Dismantle a direct-drive SWT
13. Assemble/Dismantle a geared SWT
14. Check the performance of direct-drive SWT
15. Check the performance of geared SWT
16. Simulate faults in the small wind turbine trainer
17. Troubleshoot direct-drive SWT
18. Troubleshoot geared SWT

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEPE17	Course Title: BIOMASS AND MICRO-HYDROPOWER PLANTS
Program Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identifiedcompetency through various teaching-learning experiences. Maintain the efficient operation of various types of Biomass and Micro hydropower plants.

COURSE CONTENT

1 Basics of Biomass-based Power Plants

1.1 Properties of solid fuel for biomass power plants: bagasse, wood chips, rice husk, municipal waste
1.2 Properties of liquid and gaseous fuel for biomass power plants: Jatropha, bio-diesel gobar gas
1.3 Layout of a Bio-chemical based (e.g., biogas) power plant
1.4 Layout of a Thermo-chemical-based (e.g., Municipal waste) power plant
1.5 Layout of an Agro-chemical (e.g. bio-diesel) power plant
1.6 Selection of biomass power plants

2 Biomass Gasification Power Plants

2.1 The basic principle to convert Agriculture and forestry products and wood processing remains (including rice husks, wood powder, branches, offcuts, corn straws, rice straws, wheat straws, cotton straws, fruit shells, coconut shells, palm shells, bagasse, corncobs) into combustible gas.
2.2 General Construction and working of a typical gasifier
2.3 Power generating in gas engine
2.4 Strengths and limitations of Agriculture and forestry products gasifier
2.5 Preventive maintenance steps for different types of biomass gasifiers.

3. Different Types of Gasifiers

3.1 Construction and working of the following types of gasifiers
3.2 Rice Husk Gasification Power Plant and their specifications
3.3 Straw Gasification Power Plant and their specifications
3.4 Bamboo Waste, Bamboo Chips Gasification Power Plant and their specifications
3.5 Coconut shell, coconut peat, coconut husk, Gasification Power Plant and their specifications

3.6 Bagasse/Sugar Cane Trash Gasification Power Plant and their specifications

3.7 Gobar gas plant and its specifications. Breakdown maintenance of biomass power plant at the module level.

4. Micro-hydro Power Plants

4.1 Locations of micro-hydro power plant
4.2 The energy conversion process of the hydropower plant.
4.3 Classification of hydro power plant: High, medium, and low head.
4.4 General Layouts of typical micro-hydro power plant.
4.5 Strengths and limitations of micro-hydro power plants

5. Different types of Micro-hydro power plants

5.1 Construction and working of High head – Pelton turbine and their specifications
5.2 Construction and working of Medium head – Francis turbine and theirspecifications
5.3 Construction and working of Low head – Kaplan turbine and theirspecifications
5.4 Preventive and breakdown maintenance of micro-hydro power plants Safe Practices for micro-hydro power plants

COURSE OUTCOME

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

- Select the relevant biomass power plant
- Undertake the preventive maintenance of different types of biomass gasifiers
- Undertake the breakdown maintenance of different types of biomass gasifiers
- Maintain the optimized working of large wind power plants
- Maintain the optimized working of small wind turbines.
- Maintain the optimized working of micro hydro power plants.

RECOMMENDED BOOKS:

1. Khoiyangbam, R S Navindu; Gupta and Sushil Kumar; Biogas Technology Towards Sustainable Development; TERI, New Delhi; ISBN: 9788179934043
2. David M. Buchla; Thomas E. Kissell; Thomas L. Floyd - Renewable Energy Systems, Pearson Education New Delhi, ISBN: 9789332586826,
3. Kothari, D.P. et al.: Renewable Energy Sources and Emerging Technologies, PHI
4. Rachel, Sthuthi, Earnest, Joshua; -Wind Power Technologies, PHI Learning
5. O.P. Gupta, Energy Technology, Khanna Publishing House, ISBN: 978-93-86173-683

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allot-ted(hrs)	Marks Allot-ted(%)
1.	10	20
2.	10	20
3.	10	20
4.	10	20
5.	8	20
To-tal	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code:EEPE18	Course Title: BIOMASS AND MICRO-HYDROPOW-ERPLANTS LABORATORY
Program Elective	Credits: 1
Hours per week: 2 (L:0 T:0 P:2)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identified competency through various teaching-learning experiences. Maintain the efficient operation of various types of Biomass and Micro-hydro powerplants.

LIST OF PRACTICALS:

1. Identify different components of a typical Biomass power plant.
2. Identify different biomass resources and evaluate their energy potential.
3. Determine the carbon content of solid biomass.
4. Dismantle / Assemble the Biogas power plant.
5. Identify the components of the high head / medium head/ low head micro hydro power plant.
6. Assemble a high head/ medium head/ low head micro hydro power plant.
7. Undertake preventive maintenance of the high head /medium head / low head micro hydro power plant.
8. Check the performance of the Pelton wheel micro hydro power plant.

PROGRAM: THREE YEARS DIPLOMA PROGRAMS IN ELECTRICAL ENGINEERING	
Course code: EEPE19	Course Title: ELECTRIC TRACTION
Program Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help students attain industry-identifiedcompetency through various teaching-learning experiences. Maintain electric traction systems.

COURSE CONTENT

1. Basics of Traction

1.1 General description of Electrical Traction system in India.
1.2 Advantages and Disadvantages of Electric Drive, Diesel Electric Drive, BatteryDrive
1.3 Problems associated with AC traction Systems and remedies for it.
1.4 Voltage balance, current balance, production of harmonics, induction effects.
1.5 Metro rail system features

2. Power Supply Arrangements

2.1 Constituents of supply system: -
2.2 Substation: layout, list of equipment and their functions; feeding post: list of equipment and their functions; Feeding and sectioning Arrangements
2.3 Sectioning and paralleling post-sub-sectioning and Paralleling post-sub-sectioning post
2.4 Elementary section
2.5 Major equipment at the substation
2.6 Miscellaneous equipment at the control post or Switching station

3 Overhead Equipment

3.1 Different types of overhead equipment
3.2 Pentagonal OHE Catenary Construction
3.3 Different Types of Catenaries according to Speed Limit
3.4 OHE Supporting Structure, Cantilever assembly diagram
3.5 Overhead system- Trolley collector, Bow collector, Pantograph Collector
3.6 Types and construction of pantograph

4 Electric Locomotive

4.1 Classification and Nomenclature of Electric Locomotive
4.2 Block diagram of AC locomotive
4.3 Power Circuit of AC Locomotive

4.4 Equipment (List and Function only) used in the auxiliary circuit of AC Locomotive
4.5 Loco bogie classification according to wheel arrangements

5 Traction Motors and Train Lighting

5.1 Desirable characteristics of traction motor.
5.2 Types of motors used for traction with their characteristics and features
5.3 Control of motors used for traction and methods to control
5.4 Requirements of braking, types of braking: Electric braking, Regenerative braking
5.5 Systems of train lighting, Single battery, double battery parallel block system

6 Signaling and Supervisory Control (Introduction Only)

6.1 Requirements of signalling systems
6.2 Types of signals, track circuits
6.3 Advantages of remote control
6.4 Systems of remote control

COURSE OUTCOME:

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

- Interpret the traction layout and its systems
- Maintain the power supply arrangements.
- Maintain the function of the overhead equipment for electric traction
- Maintain the different components of the electric locomotive.
- Maintain the traction motor and train lighting system
- Maintain the signalling and supervisory control systems

RECOMMENDED BOOKS:

1. Utilization of Electric Power & Electric Traction G.C. Garg, Khanna BookPublishing Co., New Delhi (ISBN: 978-93-86173-355) Revised Ed. 2018
2. Utilization of Electric power and traction Gupta J.B., S.K.Kataria and Son,
3. Art and Science of Utilization of Electrical Energy Partab H., Dhanpat Rai and Co,'
4. Modern Electric Traction, Partab H., Dhanpat Rai and Co,
5. Suryanarayana N.V., New Age International Publishers, Reprint 2010
6. Utilization of electrical energy Open Shaw Taylor, Orient Longman Ltd.

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (hrs)	Marks Allotted (%)
1.	8	20
2.	10	20
3.	9	20
4.	9	20
5.	9	15
6.	3	5
To-tal	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING		
Course code: EEPE20	Course Title :	ELECTRIC TRACTION LABORATORY
Program Elective	Credits: 1	
Hours per week: 2 (L:0 T:0 P:2)		

COURSE OBJECTIVE:

This course aims to help students attain industry-identifiedcompetency through various teaching-learning experiences. Maintain electric traction systems.

LIST OF PRACTICALS:

1. Dismantle a traction motor
2. Assemble a traction motor
3. Troubleshoot a traction motor
4. Visit the installation of the electric-traction train lighting system, identifysystem components, and prepare a report.
5. Visit the electric-traction loco shed, investigate the working of each section& prepare a report.
6. Visit the Traction Substation or feeding post (for layout and OHE)and write a report.
7. Visit the Railway Station (for signalling and train lighting) and write areport on the visit.
8. Draw the traction substation Layout on the drawing sheet and prepare a report.
9. Draw the Pentagonal OHE Catenary, different Catenaries according to the speed limit, OHE supporting structure on the drawing sheet, and prepare a report.
10. Draw the Power Circuit of AC Locomotive on the drawing sheet and prepare a report.

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEOE01	Course Title: GENERIC SKILLS AND ENTREPRENEURSHIP DEVELOPMENT
Open Elective	Credits: 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

Generic Skills and Entrepreneurship Development is one of the courses from the "Human Science" subject area. Generic skills have emerged as an important component of employability skills, enabling an individual to become and remain employable over a lifetime and lead a happy and prosperous life. Entrepreneurship development aims at developing a conceptual understanding for setting-up one's business venture/enterprise. This aspect of Human Resource Development has become equally important when wage employment prospects have become meager.

Both the subject areas are supplementary to each other, and soft skills are required to be developed in diploma pass outs for enhancing their employability and self-confidence.

COURSE CONTENT

1. Introduction to Generic Skills

1.1 Importance of Generic Skill Development (GSD)
1.2 Global and Local Scenario of GSD
1.3 Life Long Learning (LLL) and associated importance of GSD.

2. Managing Self

2.1 Knowing Self for Self Development
Self-concept, personality traits, multiple intelligences such as language, numerical, psychological, etc.

2.2 Managing Self - Physical
Personal grooming, Health, Hygiene, Time Management

2.3 Managing Self – Intellectual development
- Information Search: Sources of information
- Listening: Effective Listening
- Speaking: Effective Oral Communication
- Reading: Purpose of reading, different styles of reading, techniques ofsystematic reading;
- Note Taking: Importance and techniques of note-taking
- Writing: Correspondence - personal and business

2.4 Managing Self – Psychological
- Stress, Emotions, Anxiety-concepts, and significance (Exercises related to stress management)
- Techniques to manage the above

3. Managing in Team

3.1 Team - definition, hierarchy, team dynamics
3.2 Team- related skills- sympathy, empathy, co-operation, concern, leading andnegotiating, working well with people from culturally diverse backgrounds
3.3 Communication in the group - conversation and listening skills

4 Task Management

4.1 Task Initiation, Task Planning, Task execution, Task close out

5. Problem-Solving

5.1 Prerequisites of problem-solving meaningful learning, ability to apply knowledge in problem solving.

5.2 Different approaches for problem solving.

6. Entrepreneurship

6.1 Introduction

- Concept/Meaning and its need
- Competencies/qualities of an entrepreneur
- Entrepreneurial Support System, e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level.

6.2 Market Survey and Opportunity Identification (Business Planning)

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

6.3 Project Report Preparation

- Preliminary Project Report
- Techno-Economic Feasibility Report
- Exercises on Preparation of Project Report in a group of 3-4 students

INSTRUCTIONAL STRATEGY:

This subject will require a blend of teaching and learning methods, beginning with the lecture method. Some topics may be taught using question answers, assignments, case studies, or seminars. In addition, expert lectures may be arranged from within the institution or management organizations. Conceptual understanding of Entrepreneurship inputs by teachers and outside experts will expose the students to facilitate in starting one's business venture/enterprise. The teacher will discuss success stories and case studies with students, which will develop managerial qualities in the students. There may also be guest lectures by successful diploma-holding entrepreneurs and field visits. The students may also be provided with relevant text material and handouts.

RECOMMENDED BOOKS:

1. Generic skill Development Manual, MSBTE, Mumbai.
2. Lifelong learning, Policy Brief (www.oecd.org)
3. Lifelong learning in Global Knowledge Economy, Challenge for Developing Countries – World Bank Publication
4. Towards Knowledge Societies, UNESCO Paris Publication
5. Your Personal Pinnacle of Success by DD Sharma, Sultan Chand and Sons, New Delhi
6. Human Learning, Ormrod

7. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
8. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand andSons, New Delhi
9. Handbook of Small Scale Industry by PM Bhandari
10. Generic Skills and Entrepreneurship Development by Ishan Publishers(Ambala)
11. Generic Skills and Entrepreneurship Development by Poonam Goyal (GBD)-Punjab

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allot-ted(Hrs)	Marks Allotted (%)
1.	3	5
2.	10	20
3.	8	15
4.	5	10
5.	5	10
6.	17	40
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEOE 02	Course Title: Disaster Management
Open Elective	Credits: 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

The following are the objectives of this course:

- To learn about various types of natural and man-made disasters.
- To know pre- and post-disaster management for some of the disasters.
- To know about various information and organizations in disaster management in India.
- To get exposed to technological tools and their role in disaster management.

COURSE CONTENT

1. Understanding Disaster

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity – Disaster and Development, and disaster management

2. Types, Trends, Causes, Consequences, and Control of Disasters

Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters

3. Disaster Management Cycle and Framework

Disaster Management Cycle – Paradigm Shift in Disaster Management. Pre-Disaster –Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System, Preparedness, Capacity Development, and Awareness. During Disaster – Evacuation – Disaster Communication – Search and Rescue

– Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, HyogoFramework of Action.

4. Disaster Management in India

Disaster Profile of India – Mega Disasters of India and Lessons Learnt. Disaster Management Act 2005 – Institutional and Financial Mechanism, National Policy on Disaster

Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter- Governmental Agencies

5. Applications of Science and Technology for Disaster Management

Geo-informatics in Disaster Management (RS, GIS, GPS, and RS). Disaster Communication System (Early Warning and Its Dissemination). Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions, Structural and Non-Structural Mitigation of Disasters S&T Institutions for Disaster Management in India.

COURSE OUTCOMES

After completing this course, students will be:

- Acquainted with basic information on various types of disasters
- Knowing the precautions and awareness regarding various disasters
- Decide the first action to be taken under various disasters
- Familiarised with the organization in India which are dealing with disasters
- Able to select IT tools to help in disaster management

RECOMMENDED BOOKS:

1. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
2. Bhandani, R. K., An overview on natural & man-made disasters and theirreduc-tion, CSIR, New Delhi
3. Srivastava, H. N., and Gupta G. D., Management of Natural Disasters indevelop-ing countries, Daya Publishers, Delhi
4. Alexander, David, Natural Disasters, Kluwer Academic London
5. Ghosh, G. K., Disaster Management, A P H Publishing Corporation
6. Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt.Ltd.

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	5	10
2.	15	30
3.	10	20
4.	9	20
5.	9	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEOE03	Course Title: PROJECT MANAGEMENT
Open Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

- To develop the idea of the project plan, from defining and confirming the project goals and objectives to identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

COURSE CONTENT

1. Concept of a project:

1.1 Classification of projects
1.2 Importance of project management
1.3 The project life cycle
1.4 Establishing project priorities (scope-cost-time)
1.5 Project priority matrix
1.6 Work breakdown structure.

2. Capital budgeting process:

2.1 Planning, Analysis, Selection, Financing, Implementation, Review. Generation and screening of project ideas, market and demand analysis, and Demand forecasting techniques. Market planning and marketing research process-Technical analysis

3. M Financial estimates and projections:

3.1 Cost of projects, means of financing, estimates of sales and production, cost of production, working capital requirement, and its financing-profitability projected cash flow statement and balance sheet. Break-even analysis.

4. Basic techniques in capital budgeting:

4.1 Non-discounting and discounting methods: payback period, accounting rate of return, net present value, Benefit cost ratio, internal rate of return. Project risk. Social cost-benefit analysis and economic rate of return. Non-financial justification of projects.

5. Project administration:

5.1 Progress payments, expenditure planning, project scheduling, network planning, use of Critical Path Method (CPM), schedule of payments and physical progress, time-cost trade-off. Concepts and uses of PERT cost as a

Function of time, Project Evaluation, and Review Techniques/cost mechanisms. Determination of least cost duration. Post-project evaluation. Introduction to various Project management softwares.

COURSE OUTCOME:

At the end of the course, the student will be able to:

- Understand the importance of projects and their phases.
- Analyze projects from marketing, operational, and financial perspectives.
- Evaluate projects based on discount and non-discount methods.
- Develop network diagrams for the planning and execution of a given project.
- Apply crashing procedures for time and cost optimization.

RECOMMENDED BOOKS:

1. Project planning,analysis, selection, implementation, and review – Prasanna Chandra – Tata McGraw Hill
2. Project Management – The Managerial Process – Clifford F. Gray & Erik W.Larson- McGraw Hill
3. Project management – David I Cleland - McGraw Hill International Edition, 1999.
4. Project Management – Gopala Krishnan – McMillan India Ltd.
5. Project Management – Harry-Maylor-Pearson Publication

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted(hrs)	Marks Allotted(%)
1.	08	15
2.	08	20
3.	08	20
4.	08	15
5.	16	30
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEOE04	Course Title: Internet of Things
Open Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry-identifiedcompetency through various teaching-learning experiences:

COURSE CONTENT

1. Introduction to the Internet of Things

1.1. Define the term "Internet of Things."
1.2. State the technological trends that have led to IoT
1.3. Describe the impact of IoT on society.

2. Design Consideration of IoT

2.1 Enumerate and describe the components of an embedded system.
2.2 Describe the interactions of embedded systems with the physical world.
2.3 Name the core hardware components most commonly used in IoT devices.

3. Interfacing by IoT devices

3.1 Describe the interaction between software and hardware in an IoT device.
3.2 Explain the use of networking and basic networking hardware.
3.3 Describe the structure of the Internet.

COURSE OUTCOME:

At the end of the course, the student will be able to:

- Understand the concept of the Internet of Things (IoT) and its impact on society.
- Analyze the design considerations of IoT systems, including embedded system components and hardware.
- Demonstrate knowledge of interfacing IoT devices, including software-hardware interactions, networking principles, and Internet structure.

RECOMMENDED BOOKS:

1. Internet of Things: Raj Kamal McGraw Hill Education; First edition (10 March 2017) ISBN: 978-9352605224

2. Internet of Things: A Hands-On Approach Arsheep Bahge and Vijay Madisetti Orient Blackswan Private Limited - New Delhi; First edition (2015) ISBN: 978-8173719547

SUGGESTED SOFTWARE/LEARNING WEBSITES:

1. https://www.raspberrypi.org/blog/getting-started-with-iot/
2. https://www.arduino.cc/en/IoT/HomePage
3. https://www.microchip.com/design-centers/internet-of-things
4. https://learn.adafruit.com/category/internet-of-things-iot
5. http://esp32.net/

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (hrs)	Marks Allotted (%)
1.	10	20
2.	18	40
3.	20	40
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING	
Course code: EEOE05	Course Title: ECONOMIC POLICIES IN INDIA
Open Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to familiarize the students of different streams withthe basic concepts, structure, problems, and issues concerning the Indian economy.

COURSE CONTENT

1 **Basic features and problems of the Indian Economy**:

1.1. Economic History of India; Nature of Indian Economy, Demographic Features and Human Development Index.
1.2. Problems of Poverty, Unemployment, Inflation, income inequality, Black money in India.

2 **Sectoral Composition of Indian Economy**:

2.1 Issues in the Agriculture sector in India
2.2 Land reforms
2.3 Green Revolution and agriculture policies of India

3 **Industrial development,**

3.1 Small-scale and cottage industries
3.2 Industrial Policy, Public Sector in India
3.3 Service sector in India.

4 **Economic Policies**:

4.1 Economic Planning in India, Planning commission v/s NITI Aayog
4.2 Five-Year Plans, Monetary Policy in India, Fiscal Policy in India
4.3 Center-state Finance Relations
4.4 Finance commission in India. LPG policy in India

5 External sector in India: -

5.1 India's foreign trade value, composition and direction
5.2 India's Balance of payment since 1991, FDI in India
5.3 Impact of Globalization on Indian Economy, WTO and India.

COURSE OUTCOME:

At the end of the course, the student will be able to:

- Understand Indian economics policy, planning strategies

- It will enable students to comprehend theoretical and empirical development across countries and regions for policy purposes

RECOMMENDED BOOKS:

1. Indian Economy by Dutt Rudder and K.P.M Sundaram (2017), S Chand &Co. Ltd. New Delhi.
2. Indian Economy and –Its Development Experience. Mishra S.K & V.K Puri (2017).Himalaya Publishing House.
3. Indian Economy, Singh, Ramesh, (2016): Tata-McGraw Hill Publications, New Delhi.
4. March of the Indian Economy, Dhingra, I.C., (2017): Heed Publications Pvt. Ltd.
5. Evolution of the Indian Economy Karam Singh Gill, (1978): Evolution of the Indi-anEconomy, NCERT, New Delhi
6. Kaushik Basu (2007): Oxford University Press.

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (hrs)	Marks Allot-ted (%)
1.	08	15
2.	10	20
3.	10	20
4.	10	25
5.	10	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICALENGINEERING	
Course code: EEOE06	Course Title: E-Commerce
Open Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to familiarize the students of different streams with thebasic concepts, structure, problems, and issues related to E-Commerce.

COURSE CONTENT

1. Electronic Commerce

1.1 Overview, Definitions, Advantages And Disadvantages of E-commerce,
1.2 Threats of E-commerce, Managerial Prospective,
1.3 Rules and Regulations for controlling E-commerce,
1.4 Cyber Laws.

2. Technology

2.1 Relationship Between E-Commerce and Networking,
2.2 Different Types of Networking for E-commerce, Internet, Internet and Extranet, EDI System Wireless
2.3 Application Protocol: Definition, Hand Held Devices, Mobility and Commerce, Mobile computing, Wireless Web, Web Security, Infrastructure Requirement for E-Commerce.

3. Business Models of E-Commerce and E-Strategy

3.1 Overview, Strategic Methods for developing E-commerce, Business - to - Business (B2B), Business - to - Consumer (B2C), Consumer - to - Consumer (C2C), Consumer - to - Business (C2B), Business - to - Government (B2G)
3.2 Government - to - Business (G2B), Government - to - Citizen (G2C)
3.3 Four C's (Convergence, Collaborative Computing, Content Management and Call Center), Payment through card system,
3.4 E-Cheque, E-Cash, E-Payment Threats and protections.

4. E-Marketing, Scam and Risk of E-Commerce

4.1 Overview, Security for E-commerce, Security Standards, Fire-

wall,Cryptography, Key Management, Password system,

4.2 Digital certificates, Digital signatures, Home-Shopping, E-Marketing, Tele- Marketing.

COURSE OUTCOME

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

- Distinguish between E-commerce and Commerce
- Know the rules of E-commerce
- Know the relationship between E-commerce and the Internet
- Know the modes of E-commerce

RECOMMENDED BOOKS:

1. E-Commerce – M. M. Oka- EPH
2. Electronic Bharat – TMH Commerce- Technologies & Application – Bhaskar
3. E-Commerce, McGraw Hill: Strategy Technologies and Applications – Tata

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UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (hrs)	Marks Allotted (%)
1.	12	25
2.	12	25
3.	12	25
4.	12	25
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICALENGINEERING	
Course code: EEOE07	Course Title: BASICS OF MANAGEMENT
Open Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

This course aims to help the student attain the following industry-identified competency through various teaching-learning experiences:

The diploma holders are generally expected to take up middle-level managerial positions; their exposure to basic management principles is essential. Topics like Structure of Organization, Leadership, Motivation, Ethics, and Values, Customer Relationship Management (CRM), Legal Aspects of Business, Total Quality Management (TQM), and Intellectual Property Rights (IPR) etc. have been included in the subject to provide elementary knowledge about these management areas.

COURSE CONTENT

1. Principles of Management

1.1 Introduction, definition, and importance of management.
1.2 Functions of Management
1.3 Concept and Structure of an organization,
1.4 Hierarchical Management Structure

2. Work Culture

2.1 Introduction and importance of Healthy Work Culture in an organization
2.2 Components of Culture
2.3 Importance of attitude, values, and behavior Science – Individual and group behavior
2.4 Professional ethics – Concept and need of Professional Ethics

3. Leadership and Motivation

3.1 Leadership
- Definition and Need of Leadership
- Qualities of a good leader
- Manager vs. leader

3.2 Motivation
- Definition and characteristics of motivation
- Factors affecting motivation
- Maslow's Need Hierarchy Theory of Motivation

3.3 Job Satisfaction

4. Legal Aspects of Business

4.1 Introduction and Need Labour Welfare Schemes
4.2 Wage payment: Definition and types
4.3 Incentives: Definition, need, and types
4.4 Minimum Wages Act 1948

5. Management Scope in Different Areas

5.1 Human Resource Development
- Introduction and objective
- Manpower Planning, recruitment, and selection
- Performance appraisal methods

5.2 Material and Store Management
- Introduction, functions, and objectives of material management
- Purchasing: definition and procedure
- Just in time (JIT)

5.3 Financial Management – Introduction
- Elementary knowledge of Income Tax, Sale Tax, Excise duty, Custom duty,Provident Fund

6. Miscellaneous topics

6.1 Customer Relationship Management (CRM)
- Definition and Need
- Types of CRM
- Customer satisfaction

6.2 Total Quality Management (TQM)
- Inspection and Quality Control

- Concept of Quality Assurance
- TQM

6.3 Intellectual Property Rights (IPR)

- Introduction, definition, and its importance
- Infringements related to patents, copyright, trademark

INSTRUCTIONAL STRATEGY

It is observed that diploma holders generally take up middle-level managerial positions; therefore, their exposure to basic management principles is essential. Accordingly, students may be given a conceptual understanding of different functions related to management. Some topics may be taught using question answer, assignment or seminar method. The teacher will discuss success stories and case studies with students, which will develop appropriate managerial qualities in the students. In addition, expert lectures may also be arranged from within the institutions or from management organizations. Appropriate extracted reading material and handouts may be provided.

RECOMMENDED BOOKS:

1. Principles of Management by Philip Kotler TEE Publication
2. Principles and Practice of Management by Shyamal Bannerjee: Oxford and IBMPublishing Co, New Delhi.
3. Financial Management by MY Khan and PK Jain, Tata McGraw Hill PublishingCo., 7, West Patel Nagar, New Delhi.
4. Modern Management Techniques by SL Goel: Deep and Deep Publications PvtLimited, Rajouri Garden, New Delhi.
5. Management by James AF Stoner, R Edward Freeman, and Daniel R Gilbert Jr.: Prentice Hall of India Pvt Ltd, New Delhi.
6. Essentials of Management by H Koontz, C O' Daniel, McGraw Hill Book Company,New Delhi.
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by DD Sharma, Sultan Chand and Sons, New Delhi.
9. Intellectual Property Rights and the Law by Dr. GB Reddy.
10. Service Quality Standards, Sales & Marketing Department, Maruti Udyog Ltd.
11. Customer Relationship Management: A step-by-step approach, Mohamed & Sagadevan Oscar Publication, Delhi
12. Customer Relation Management, Sugandhi RK, Oscar Publication, Delhi.

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	9	20
2.	6	10
3.	9	20
4.	6	10
5.	9	20
6.	9	20
Total	**48**	**100**

PROGRAM: THREE YEARS DIPLOMA PROGRAM IN ELECTRICALENGINEERING	
Course code: EEOE08	Course Title: Cyber-crime and Laws
Open Elective	Credits : 3
Hours per week: 3 (L:3 T:0 P:0)	

COURSE OBJECTIVE:

To maintain an appropriate level of awareness, knowledge, and skill required to minimize the occurrence and severity of incidents related to cybercrimes, digital forensics and cyber law.

COURSE CONTENT

1. Introduction to Cyber Crimes and Digital Forensics:

1.1 Defining Cybercrime, Understanding the Importance of Jurisdictional Issues, Quantifying Cybercrime, Differentiating Crimes That Use the Net from Crimes That Depend on the Net, working toward a Standard Definition of Cybercrime, Categorizing Cybercrime, and Reasons for Cyber-crime. Ethical Hacking and its Phases. Overview of computer forensics and Investigative Techniques.

2. Types and Categories of Cyber Crimes:

2.1 Demystifying Computer/Cybercrime, Investigating Computer Crime and its categories, and Ethical Hacking phases in detail.

3. Computer Investigation Process:

3.1 The concept of cyber security, meaning, scope, and the framework, Collecting and preserving Evidence.

4. Constitutional & Human Rights Issues in Cyberspace:

4.1 Freedom of Speech and Expression in Cyberspace Right to Access Cyberspace – Access to Internet, Right to Privacy, Right to Data Protection.

5. Need of Cyber ACT and Cyber Laws:

5.1 The Indian Context, Need for a Cyber Act, Information Technology Act, Scope and further development, Information Technology Act (Amendment), Coverage of Cyber Security ad Cyber Crime Indian Cyber laws vs. Cyber laws of U.S.A. Similarities, Scope and Coverage, Effectiveness, Intellectual Property Rights (IPR).

COURSE OUTCOME:

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

- Understand basic concepts of cyber laws, ethical hacking, and variousinvestigation techniques
- Understand the various types of cybercrime.
- Understand the concept of cyber security and methods for Collecting and preserving
- Understand the definition of Freedom of Speech and Expression in Cyber-space
- Understand why cyber acts and laws are required.

RECOMMENDED BOOKS:

1. Computer Forensics: Cybercriminals, Laws, And Evidence, Marie - Helen Maras,Jones & Bartlett Learn, 1st Edition, 2011.
2. Computer Forensics: Investigating Network Intrusions and Cyber Crime, EC-CouncilPress Series, Cengage Learning, 2010.
3. Hacking Exposed: Network Security Secrets & Solutions, Stuart McClure, JoelSeatnbra V and George Kurtz, McGraw-hill, 2005
4. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi,(2012).
5. Cyber Forensics: From Data to Digital Evidence, Albert J. Mar-cella Jr.,Wiley,1st Edition, 2012

UNIT-WISE TIME AND MARKS DISTRIBUTION

Unit No.	Time Al-lotted (hrs)	Marks Allotted(%)
1.	14	30
2.	6	10
3.	6	10
4.	8	20
5.	14	30
Total	**48**	**100**