8) Knowledge of how to organize, scope, plan, do and act within a project thesis.
9) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
10) Demonstrate the implementation of a major project work.

SEMESTER-VI

Sl. No.	Category	Code No.	Course Title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Programme core course-21	EEPC-601	Building Electrification	3	0	0	3	3
2	Programme core course-22	EEPC-602	Building Electrification Laboratory	0	0	2	2	2
3	Programme elective course-4 (Any One to be selected)	EEPE-603/A	Communication Technologies	3	0	0	3	3
		EEPE-603/B	Electric Vehicles					
		EEPE-603/C	Industrial Drives					
4	Humanities and Social Science course-5	HS-604	Entrepreneurship and Start-up's	3	1	0	4	4
5	Open elective-2	(Any one to be selected from Annexure-II)		4	0	0	4	4
6	Mandatory Course-2	AU-606	Indian Constitution	2	0	0	2	0
7	Major Project	EEPR-607	Major Project	0	0	6	6	3
8	Seminar	EESE-608	Seminar	2	0	0	2	1
Total				**17**	**1**	**8**	**26**	**20**

Building Electrification

Course Code	EEPC-601
Course Title	Building Electrification
Number of Credits	3 (L: 3, T: 0, P:0)
Prerequisites	NIL
Course Category	PC

Course Outcomes:-

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

1) Select accessories, wires, cables and wiring systems for electrification..(K-3 level)
2) Design electrical wiring installation system for residential unit.(K-4 level)
3) Design proper illumination scheme for residential unit.(K-4 level)
4) Prepare wiring layouts on wiring board.(K-3 level)
5) Locate and diagnose faults in electrical wiring installation(K-3 and 4 level).
6) Do proper earthing for building electrification(K-3 level).

Course Contents:-

Module- 1: Wiring Tools and Accessories

Number of class hours: 06(Six) Hrs

Suggestive Learning Outcomes: Students will be able to:

1. to define and discuss the classification of electrical accessories.
2. To describe and demonstrate the different types of switch, holders, socket outlets and plugs and other modular accessories.

Detailed content of the unit:-

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.

Classification of electrical accessories- controlling, holding, safety, outlet

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, intermediate, 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-barchamber.Wooden/ mica boards, Moulded/ MS Concealed boxes of different sizes. Modular accessories.

Module- 2: Electrical Wires and Underground Cables

Number of class hours: 06(Six) Hrs

Suggestive Learning Outcomes: Students will be able to:

1. to define and discuss the classification of conductors and cables.
2. to describe and demonstrate the wire jointing methods,cable jointing and laying methods.
3. To discuss the classification of cables.
4. To demonstrate the factors determining selection of electric cables.

Detailed content of the unit:-

Conductors: - wire, cable, bus bar, stranded conductor, cable, armouredcable, flexible cable, solid conductor, PVC wires, CTS wire, LC wire, FR (Fire retardant) wire, Size of wire according to BIS. Tools used for measurement of wire size, Wire jointing methods.

Classification of cables, low tension, high tension, and extra high tension cables, solid, oil filled and gas filled type

Cable insulation materials –vulcanized rubber (VIR), polyvinyl chloride (PVC), cross linked polythene (XLPE), impregnated paper, Selection of suitable cable size and type from standard data

Cable jointing methods, Cable laying methods.

Factors determining selection of electric cables.

Module- 3: Wiring Methods and wiring layout

Number of class hours: 06(Six) Hrs

Suggestive Learning Outcomes: Students will be able to:

1. describe and demonstrate the Conduit wiring
2. Define the factors determining the selection of wiring methods.
3. Design, working and drawing of various electrical circuits.

Detailed content of the unit:-

Factors determining the selection of wiring methods.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 con- duit wiring (Surface/Concealed). Conduit wiring accessories, BIS rules for Metal and PVC conduit wiring.Comparison of various wiring systems. General BIS rules for domestic installations.

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, Series parallel circuit, Master switch control circuit, Different lighting circuit using - Intermediate switch, Call bell circuit using bell indicator, Design of wiring circuits according to user's requirement

Module- 4: Residential Building Electrification

Number of class hours: 08(Eight) Hrs

Suggestive Learning Outcomes: Students will be able to:

1. describe and demonstrate the Interpretation of electrical installation plan and electrical diagrams, electrical symbols as per IS: 732. Electrical installation for residential building as per part I section 9 of NEC-2011. Wiring and circuit Schematic diagram according to IS: 2042(Part-I)-1962: multiline and single line representationDefine specifications of Three Phase Transformers.
2. describe and discuss the Difference between residential and industrial load.
3. Design and draw, estimatethe costing of a residential installation having maximum 5 KW load.
4. Test wiring installation as per IS: 732-1982, test earth continuity path.

Detailed content of the unit:-

Domestic Dwellings/Residential Buildings: reading of Civil Engineering building drawing, Interpretation of electrical installation plan and electrical diagrams, electrical symbols as per IS: 732.Electrical installation for residential building as per part I section 9 of NEC-2011. Wiring and circuit Schematic diagram according to IS: 2042(Part-I)-1962: multiline and single line representation.

Difference between residential and industrial load, rules/requirements related to lighting load followed in electrical installations, Positioning of equipment.

Lighting and power circuits: Light and fan circuit, Power circuit

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

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

Testing of wiring installation as per IS: 732-1982: Insulation resistance - between earth and conductors, between conductors, polarity test of single pole switches. Testing of earth continuity path.

Residential building Service Connectiontypes- Underground and overhead. Calculation of Material required for service connection.

Module- 5: Protection of Electrical Installation

Number of class hours: 06(Six) Hrs

Suggestive Learning Outcomes: Students will be able to:

1. describe and demonstrate the Fuse, Miniature circuit Breaker (MCB).
2. Discuss the Methods of earthing as per IS 3043: 1987 and their procedure- Driven pipe, pipe and plate earthing, modern methods of earthing.

Detailed content of the unit:-

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

Miniature circuit Breaker (MCB)-Construction, Principle rating and uses, Earth Leakage Circuit Breaker (ELCB)-Construction, Principle rating and uses.

System and equipment earthing and its requirements, Earth, earth electrode, earth current, earth terminal, earthing wire, earthing lead, fault current, leakage current, Measurement of earth resistance using earth tester, Methods of reducing earth resistance,Methods of earthing as per IS 3043: 1987 and their procedure- Driven pipe, pipe and plate earthing, modern methods of earthing.

References:-

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Building Electrification Laboratory

Course Code	EEPC-602
Course Title	Building ElectrificationLaboratory
Number of Credits	1 (L:0, T:0, P:2)
Prerequisites	NIL
Course Category	PC

Course Outcomes:-

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

1) Select accessories, wires, cables and wiring systems for electrification..(K-3 level)
2) Design electrical wiring installation system for residential unit.(K-4 level)
3) Design proper illumination scheme for residential unit.(K-4 level)
4) Prepare wiring installation on a board.(K-3 level)
5) Design 2 BHK residential installation scheme (K-4 level).
6) Do proper earthing for building electrification(K-3 level).

Course Content:-

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.
11. Test wiring installation using megger.

Note: A minimum of 10(ten) or more practical need to be performed.

Communication Technologies

Course Code	EEPE-603/A
Course Title	Communication Technologies
Number of Credits	3 (L:3, T:0, P:0)
Prerequisites	Nil
Course Category	ProgramElective (PE)

Course objectives: After completing the course, the students will be able to-

CO1: Demonstrate the processes of analog and pulse modulation (K2)
CO2: Identify the advantages of digital modulation over analog modulation (K3)
CO3: Identify guided and unguided media for data communication (K3)
CO4: Demonstrate the basic principles of fiber optic communication(K2)
CO5: Distinguish network topologies and networking devices(K4)

Module 1: (8hrs): Data Communication and Modulation

Learning Outcomes:-

Students will be able to

1) Demonstrate the types of communication system.
2) Illustrate the analog communication systems (AM, FM and PM).
3) Compare pulse modulation with AM and FM.

Detailed content of the unit:-

Block diagram of communication system. Types of communication system: synchronous and asynchronous, simplex, half-duplex, Fullduplex, serial and parallel communication. Classification of communication technique: AM, FM, & PM on the basis of definition, waveform,bandwidth, modulation index, Modulation and demodulation: Block diagram of AM, FM and PM.Pulse Modulation: Block diagram for waveform generation of PAM,PWM& PPM, workingprinciple, advantages, disadvantages and applications.Advantages of pulse modulation over AM and FM.

Module 2: (8hrs)Digital Modulation Techniques:

Learning Outcomes:-

Students will be able to

1) Demonstrate the sampling process.
2) Illustrate PCM with working principle, advantages and applications.
3) Summarize the principle of ASK, PSK and FSK.

Detailed content of the unit:-
Digital Communication: Block diagram and working principle, waveforms, strength and limitations. Sampling process Nyquist sampling theorem, quantization process, quantization error, quantizationNoisePCM: Block diagram, working principle, waveforms, advantages, disadvantages, applicationof PCM.Principle of ASK, PSK, FSK. Application of ASK, PSK, FSK.

Module 3: (8 hrs): Data Communication Media

Learning Outcomes:-
Students will be able to
1) Explain the terms like baud rate, bit rate, forward error correction techniques.
2) Identify the types of communication media and frequency band of operation.
3) Select appropriate guided and unguided media for data communication.

Detailed content of the unit:-
Baud rate, Bit rate, types of errors in data communication and error correction techniques.Types of communication media and frequency band of operation.Guided media: Types of cable-twisted pair cable, co-axial cable, fiber optic cable.Unguided media: Microwave communication, Infrared communication.

Module 4: (8hrs)Fiber Optics

Learning Outcomes:-
Students will be able to
1) Demonstrate the basic principles of fiber optic communication.
2) Compare single mode fiber with multimode fiber.
3) Illustrate the application of LED, Photo Transistor, Laser diode, optocoupler as Light source and Detector.

Detailed content of the unit:-

Introduction to Fiber optic communication.Strength and limitations of fiber optic system. Light propagation : reflection, refraction, Snell's law. Light propagation through cable: Mode of propagation, index profile. Fibre optic cables: cable construction, fibre optics cable modes, single mode, step index fibre,multimode index fibre, multimode graded index fibre, fibre cable losses.Light source and Detector: Light emitting diode (LED), Photo Transistor, Laser diode, optocoupler.

Module 5: (8hrs)Data Communication Protocols and Interfacing Standard

Learning Outcomes:-

Students will be able to

1) Explain OSI reference model.
2) Illustrate IEEE standards for LAN, GPIB and RS-232.
3) Identifybasic networking devices.

Detailed content of the unit:-

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

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ELECTRIC VEHICLES

Course Code :	EEPE-603/B
Course Title :	ELECTRIC VEHICLES
Number of Credits	3 (L:3, T:0, P:0)
Prerequisites	NIL
Course Category	PE

Course Outcomes:

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

a) Interpret the salient features of Hybrid electric vehicles.
b) Interpret the Dynamics of hybrid and Electric vehicles
c) Maintain the DC-DC converters in EV applications
d) Maintain the DC-AC converters in EV applications

Course Contents:

Module – I(Salient features of Hybrid electric vehicles.)

Number of Class hours: 8 hours

Suggestive Learning Outcome: Students would be able to

1. Know Evolution of Electric vehicles
2. Get Knowledge on Components used Hybrid Electric Vehicle
3. Know Comparative study of vehicles for economic, environmental aspects

Detailed content of the unit:-

Introduction to Hybrid Electric Vehicles, Evolution of Electric vehicles, Advanced Electric drive vehicle technology Vehicles-Electric vehicles (EV), Hybrid Electric drive (HEV), Plug in Electric vehicle (PIEV), Components used Hybrid Electric Vehicle Economic and environmental impacts of Electric hybrid vehicle Parameters affecting Environmental and economic analysis, Comparative study of vehicles for economic, environmental aspects

Module – II (Dynamics of hybrid and Electric vehicles)

Number of Class hours: 8 hours

Suggestive Learning Outcome: Students would be able to Know

1. General description of vehicle movement
2. Factors affecting vehicle motion
3. Basic architecture of hybrid drive trains

Detailed content of the unit:-

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

Module – III (Various types of Converters for EV and HEV Applications)

Number of Class hours: 8 hours

Suggestive Learning Outcome: Students would be able to Know

1. DC-DC Converters for EV and HEV applications
2. Boost and Buck- Boost converters
3. Two quadrant and multi quadrant converters

Detailed content of the unit:-

DC-DC Converters for EV and HEV Applications,EV and HEV configuration based on power converters, Classification of converters –unidirectional and bidirectional, Principle of step down operation, Boost and Buck- Boost converters Principle of Step-Up operation Two quadrant converters; multi quadrant converters

Module – IV (Various types of DC-AC Inverter and Electric Machines used in EVs and HEVs)

Number of Class hours: 8 hours

Suggestive Learning Outcome: Students would be able to know

1. Principle of operation of half bridge DC-AC inverter (R load, R-L load)
2. Single phase Bridge DC-AC inverter with R load, R-L load
3. Electric Machines used in EVs and HEVs

Detailed content of the unit:-

DC-AC Inverter & Motors for EV and HEVs, DC-AC Converters ,Principle of operation of half bridge DC-AC inverter (R load, R-L load), Single phase Bridge DC-AC inverter with R load, R-L

load, Electric Machines used in EVs and HEVs, principle of operation, working & control Permanent magnet motors, their drives, switched reluctance motor Characteristics and applications of above motors

Module – V(Batteries,Fuel cells and Super Capacitors andControl system for EVs and HEVs)

Number of Class hours: 8 hours

Suggestive Learning Outcome: Students would be able to Know

1. Overview of batteries.
2. Fuel cells, super capacitors
3. Control system for EVs and HEVs

Detailed content of the unit:-

Batteries ,Overview of batteries ,Battery Parameters, types of batteries Battery Charging, alternative novel energy sources-solar photovoltaic cells, fuel cells, super capacitors, flywheels Control system for EVs and HEVs, overview, Electronic control unit ECU Schematics of hybrid drive train, control architecture,Regenerative braking in EVs .

References:

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INDUSTRIAL DRIVES

Course Code	EEPE-603/C
Course Title	Industrial Drives
Number of Credits	3 (L:3, T:0, P:0)
Prerequisites	EEPC307, EEPC405
Course Category	PE

Course Outcomes: -

After completing the course student will be ableto:-

1 Identify the relevant electric drive for the required speed torque characteristics(K-3 Level).
2 Describe the functioning of DC drive using converters (K-3 level).
3 Explain the functioning of DC drive using choppers (K-3 level).
4 Describe the functioning of AC drives (K-3 level).
5 Explain the microcontroller-based systems for motor control (K-3 level).

Course Content:-

Module- 1:Basics of Electric Drives

Number of class hours: 04(Four) Hrs

Suggestive Learning Outcomes:

1 To be able to describe the block diagram of the given type of electric drive.
2 To be able to state the selection criteria for the given types of electric drives.
3 To be able to determine the power rating for the given load curve by equivalent current, torque and power methods.
4 To be able to select the relevant motor on the basis of given duty cycles with justification.
5 To be able describe with sketches the characteristics of the given type of motor(s).
6 To be able to describe the procedure to maintain the given type of electric motor.

Detailed content of the unit: -

Need of Electric Drives, Functional Block diagrams of an electric drives, Types and Choice of electric drives, Parts of the electrical drive-source, power modulator, electric motor and control unit.Motor Duty class: Classification- continuous, short time, intermittent period.Motor power rating for continuous, short time and intermittent duty, equivalent torque current, and power

method for fluctuating and intermittent loads (simple numerical).Speed-torque characteristics of DC motor, Braking of DC motorSpeed-torque characteristics of AC motor, Braking of AC motor.

Module- 2: DC Drive using converters

Number of class hours: 07(seven) Hrs

Suggestive Learning Outcomes:

1 To be able to explain with sketches the operation of the given type of single-phase SCR converter.
2 To be able to explain with sketches the operation of the given type of three-phase SCR converter.
3 To be able to give the effect of power factor variation in the given type of SCR motor drive.
4 To be able to describe the procedure to maintain the given type of DC drive using converter.

Detailed content of the unit: -

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

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

Reversible SCR Drives. Speed control method of DC series motor

Module- 3: DC Drives using choppers.

Number of class hours: 07(seven) Hrs

Suggestive Learning Outcomes:

1 To be able toexplain with sketches the operation of the given type of chopper circuit using SCR.
2 To be able to explain with sketches the operation of the given type of single-quadrant chopper drive with quadrant diagram.
3 To be able to explain with sketches the operation of the given type of two-quadrant chopper drive with quadrant diagram.
4 To be able to explain with sketches the operation of chopper controlled DC drive in solar and battery powered vehicles.
5 To be able to describe the procedure to maintain the given type of DC drive using chopper.

Detailed content of the unit: -

Basic chopper circuit using SCR. Classification based on output voltage and quadrant operation. Chopper Controlled DC Drives

a) Class A chopper drive.
b) Class B chopper drive.
c) Class C chopper drive.
d) Class D chopper drive.
e) Class E chopper drive.

Application of chopper control drive in Solar and battery powered vehiclesMaintenance procedure.

Module- 4: AC Drives

Number of class hours:07(seven) Hrs

Suggestive Learning Outcomes:

1 To be able toexplain with sketches the operation of three phase induction motor using the given type of control method.
2 To be able toexplain with sketches the operation of three phases induction motor using the given type of slip power recovery system.
3 To be able todescribe with sketches the working of the given type of solar powered pump drives.
4 To be able to describe the procedure to maintain the given type of AC drive.

Detailed content of the unit: -

- Stator voltage control
- Variable Frequency Control
- Voltage Source Inverter Control
- Current Source Inverter Control
- Rotor Resistance Control
- Slip Power Recovery
- Solar powered pump drives
- Maintenance procedure for AC drives
- Sequences of stages & drives required in each stage for following applications:
  a) Textile mills
  b) Steel rolling mills
  c) Paper mills
  d) Sugar mills

Module- 5:Advanced Techniques of Motor Control

Number of class hours:6(Six) Hrs

Suggestive Learning Outcomes:

1 To be able to explain with sketches the working of PLL control for the given type of DC motor.

2 To be able to explain with sketches the working of microprocessor control of the given type of AC/DC drive.
3 To be able to explain with sketches the working of microcontroller control of the given type of electric drive.
4 To be able to describe the procedure to maintain the given type of electric drive using microcontroller.

Detailed content of the unit: -

Microcontroller/ Microprocessor based control for drives.Phase locked loop control of DC motor.AC/DC motor drive using Microcomputer control.AC/DC motor drive using Microcontroller control.Synchronous Motor drives.Ratings & specifications of stepper motor.Stepper motor drives employing microcontroller (No programming)

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Justifications:

1. **Unit 1:-**

Topics excluded.
1) DC Motors, Motor Rating ; Series, Shunt and compound DC motors; Universal motor ; Permanent magnet motor ; DC servo motor ; Moving coil motor ; Torque motor
2) Starting and Braking of DC Motors
3) Brushless DC Motors for servo applications.
4) Maintenance procedure.

Justification: *These topics are already covered in EEPC-307 course.*

Topics included.

1) Need of Electric Drives, Functional Block diagrams of an electric drives,Types and Choice of electric drives, Parts of the electrical drive-source, power modulator, electric motor and control unit.
2) Motor Duty class: Classification- continuous, short time, intermittent period.
3) Motor power rating for continuous, short time and intermittent duty, equivalent torque current, and power method for fluctuating and intermittent loads (simple numerical).
4) Speed-torque characteristics of DC motor, Braking of DC motor
5) Speed-torque characteristics of AC motor, Braking of AC motor.

Justification: *These topics are the basics of Drives. Also, it will be a recap of the prerequisite courses.*

2. **Unit 2:-**

Topics excluded.

1) Single phase AC Motors
   a) Resistance split phase motors
   b) Capacitor run motors
   c) Capacitor start motors
   d) Shaded pole motors

Three phase Induction Motors
   a) Squirrel cage Induction motor
   b) Slip ring Induction Motor
   c) Starting methods of Induction Motor
   d) Braking methods of Induction Motor

Determination of Motor RatingMaintenance procedure.

Justification: *These topics are already covered either in EEPC-405 course or in Unit-1.*

Topics included.

1) Single phase SCR Drives
a)Half wave converter
   b) Full wave converter
   c) Semi converter
   d) Dual converter

2) Three Phase SCR Drives
   a) Half wave converter
   b) Full wave converter
   c) Semi converter
   d) Dual converter

3) Reversible SCR Drives.

Justification: *These topics are taken out from the Unit-3.*

3. **Unit 3:-**

Topics excluded.

1) Single phase SCR Drives
a)Half wave converter
b) Full wave converter
c) Semi converter
d) Dual converter
2) Three Phase SCR Drives
a) Half wave converter
b) Full wave converter
c) Semi converter
d) Dual converter
3) Reversible SCR Drives. Speed control method of DC series motor

Justification: *These topics are already included in Unit-2.*

Topics included.
1) Basic chopper circuit using SCR
2) Classification based on output voltage and quadrant operation

Justification: *These topics are basics of chopper and chopper controlled DC drive.*

4. **Unit 4:-**

Topics excluded.
1) Starting and Braking of Induction motors.

Justification: *These topics are already included in Unit-1.*

Entrepreneurship and Start-ups

Course Code	:	HS 604
Course Title	:	Entrepreneurship and Start-ups
Number of Credits	:	4
Prerequisites (Course code)	:	None
Course Category	:	HS

CO1 Understand the basic concepts of Entrepreneurship and Startups.

CO2 Illustrate skills of discovering business ideas, visualizing and planning a business.

CO3 Analyze market and business risk for strategy development.

CO4 Demonstrate skills of organizational management.

CO5 Exhibit knowledge of financing methods, institutions and skills for communication of ideas.

Course Content:

Unit1-Introduction and Basics of Entrepreneurship and Start–Ups

Suggestive Learning Outcomes:

(1) Describe the Basic Elements of Entrepreneur and Entrepreneurship

(2) Distinguish between Entrepreneur, Manager and Intrapreneur

Content:

- Definitions, Traits of an entrepreneur, Factors influencing entrepreneurship, Types and Functions of Entrepreneurs, Need for promotion of entrepreneurship, Intrapreneur, Motivation
- Role of Entrepreneurs in Economic Development
- Similarities/differences between - Entrepreneur and Manager, Entrepreneur and Intrapreneur.

Unit2–Business Ideas and their implementation

Suggestive Learning Outcomes:

(1) Illustrate different Types of Business Planning and Business Structure
(2) Select specific Institutions Assisting Entrepreneur

Content:

- Discovering ideas
- Visualizing the business
- Business Plan, - Types of planning, Importance of planning, Steps in planning
- Types of Business Structures
- Institutions assisting entrepreneur

Unit3–**Idea to Start-up**

Suggestive Learning Outcomes:

(1) Identify Steps for Starting a SSI
(2) Predict the Target Market and Associated Risk

Content:

- Market analysis – Identifying the target market
- Competition evaluation and Strategy Development
- Steps for starting a small enterprise
- Risk analysis

Unit4–Management of Enterprise

Suggestive Learning Outcomes:

(1) Apply the Basic Accounting Concepts in Business
(2) Demonstrate Knowledge of Pricing, Positioning and Advertising of Products

Content:

- Recruitment and management of talent.
- Determinants of Price, Pricing methods in practice.
- Market Positioning, Advertising and Sales Promotion
- Accounting - Understanding basics of Transaction, Journal, Ledger, Cashbook, Trial Balance, Cost Sheet and Final Accounts through simple problems

Unit5-Financing and Communication of Ideas

Suggestive Learning Outcomes:

(1) Exhibit Knowledge of various Financial Institutions and Financing Methods
(2) Illustrate Business Ideas through Communication Skills

Content:

- Financial Institutions
- Financing methods available for start-ups in India
- Communication of Ideas to potential investors–Investor Pitch

SUGGESTED LEARNING RESOURCES:

S.No.	Title of Book	Author	Publication
1.	The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K & S Ranch ISBN–978-0984999392
2.	The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN–978-0670921607
3.	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN–978-0755388974
4.	Entrepreneurship	Alpana Trehan	Dreamtech PressISBN: 978-93-5004-026-3
5	Marketing and Sales Management	D C Kapoor	S Chand and Company Ltd. ISBN: 81-219-2430-8
S.No.	**Title of Book**	**Author**	**Publication**
6	Business Economics	H L Ahuja	S Chand and Company Ltd. ISBN: 81-219-1791-3
7	Financial Accounting (Principles and Practice)	Jawahar Lal & Seema Srivastava	S Chand Publishing
8	Accounting for Management	N.P. Srinivasan & Sakthivel Murugan	S Chand Publishing

9	Marketing	Harsh V Verma and Ekta Duggal	Oxford University Press ISBN: 0-19-945910-X
10	Marketing (Asian Edition)	Paul Baines, Chris Fill, Kelly Page and Piyush K. Sinha	Oxford University Press
11	Entrepreneurship	Rajeev Roy	Oxford University Press ISBN: 0-19-807263-5
12	Entrepreneurship Development	Kumar S Anil	New Age Publishers
13	Human Resource Management	Uday Kumar Haldar and Juthika Sarkar	Oxford University Press
14	Fundamentals of Entrepreneurship	S K Mohanty	Prentice Hall of India Private Limited ISBN: 81-203-2867-1
15	Entrepreneurship Development	S Skhanka	S Chand and Company Ltd. ISBN: 81-219-1801-4

SUGGESTED SOFTWARE/LEARNINGWEBSITES:

a. https://www.fundable.com/learn/resources/guides/startup
b. https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate- structure/
c. https://www.finder.com/small-business-finance-tips
d. https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/

Indian Constitution

Course Code	:	AU-606
Course Title	:	Indian Constitution
Number of Credits	:	0 (L: 2, T:0; P:0)
Prerequisites	:	None
Course Category	:	AU

Course Outcomes:

CO1. Illustrate Preamble, Basic Structure, Fundamental Rights and Duties of Indian Constitution(K3).

CO2. Discuss the Structure of The Indian Union Government (K2).

CO3. Memorize the Role andPower of Governor, Chief Minister and Council ofMinisters and explain the role of State Secretariat (K2).

CO4. Describe the role of Local Administration (K2).

CO5. Explain the Role andFunctioning of Election Commission (K2).

Detailed Course Content:

Unit 1 – The Constitution – Introduction

Number of Class hours:06

Learning Outcomes:

1. Describe the History of the Making of the IndianConstitution (K2)
2. Illustrate Preamble and the Basic Structure of Indian Constitution (K3)
3. Illustrate the Fundamental Rights and Duties set by Indian Constitution (K3)

Detailed content of the unit:

1. The History of the Making of the IndianConstitution
2. Preamble and the Basic Structure, and itsinterpretation
3. Fundamental Rights and Duties and theirinterpretation
4. State PolicyPrinciples

Unit 2 – Union Government

Number of Class hours:06

Learning Outcomes:

1. Discuss the Structure of the IndianUnion Government (K2).
2. Memorize the Role and Power of President, Prime Minister and Council of Ministers of India (K1)
3. Explain the role of Lok Sabha and RajyaSabha (K2)

Detailed content of the unit:

1. Structure of the IndianUnion
2. President – Role andPower
3. Prime Minister and Council ofMinisters
4. Lok Sabha and RajyaSabha

Unit 3 – State Government

Number of Class hours:06

Learning Outcomes:

1. Memorize the Role and Power of Governor, Chief Minister and Council ofMinisters of a state(K1)
2. Explain the role of StateSecretariat (K2)

Detailed content of the unit:

1. Governor – Role andPower
2. Chief Minister and Council ofMinisters
3. StateSecretariat

Unit 4 – Local Administration

Number of Class hours:06

Learning Outcomes:

1. Describe the role of District Administration (K2)
2. Explain the role of MunicipalCorporation (K2)
3. Discuss the role of Zila Panchayat (K2)

Detailed content of the unit:

1. DistrictAdministration
2. MunicipalCorporation
3. Zila Panchayat

Unit 5 – Election Commission

Number of Class hours:06

Learning Outcomes:

1. Explain the Role andFunctioning of Election Commission (K2)
2. Classify the role and functioning of Chief ElectionCommissioner and State Election Commissioner (K2).

Detailed content of the unit:

1. Role andFunctioning of Election commission
2. Chief ElectionCommissioner
3. State ElectionCommission

Suggested Learning Resources:

S. No.	Title of Book	Author	Publication
1.	Ethics and Politics of the	Rajeev Bhargava	Oxford University Press, New Delhi,

	In- dian Constitution		2008
2.	The Constitution of India	B.L. Fadia	Sahitya Bhawan; New edition (2017)
3.	Introduction to the Consti-tution of India	DD Basu	Lexis Nexis; Twenty-Third 2018 edition

Suggested Software/Learning Websites:

a. https://www.constitution.org/cons/india/const.html
b. http://www.legislative.gov.in/constitution-of-india
c. https://www.sci.gov.in/constitution
d. https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/

MAJOR PROJECT - II

Course Code	CEPR-607
Course Title	Major Project
Number of Credits	3 (L: 0, T: 0, P: 6)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

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

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

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

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

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

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

Course Content:-

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

1) Develop sound knowledge about the domain of the project work.
2) Perform detailed study about various components of a project.
3) Learn to be an important member of a team for successful execution of a project work.
4) Study about methodologies and professional way of documentation and communication related to project work.
5) Develop idea about problem formulation, finding the solution of a complex engineering problem.
6) Develop project report as per the suggested format to communicate the findings of the project work.
7) Acquire the skill of effective oral communication to the fellow engineers and people in the society at large.
8) Knowledge of how to organize, scope, plan, do and act within a project thesis.
9) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
10) Demonstrate the implementation of a major project work.

Seminar

Course Code	EESE-608
Course Title	Seminar
Number of Credits	1 (L: 0, T: 0, P: 1)
Prerequisites	Nil
Course Category	Seminar

Course Outcome:-

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

C.O.1: Demonstrate a thorough and systematic understanding of a seminar topic (K2).

C.O. 2: Identify the methodologies and professional way of documentation and communication (K3).

C.O.3: Demonstrate the ability to construct a report consistent with expectations of the topic, including an appropriate organization, style, voice, and tone (K3).

C.O.4: Develop the ability to follow discussions, oral arguments, and presentations, noting main points or evidence and tracking through different comments given by the audience (K3).

C.O.5: Developthe communication skill as a speaker (K3).

Course Content:-

The seminar topics may be any aspect of the science and technology, entrepreneurship or any contemporary social issues to be solved by specific branch of engineering and technology (For example, Water logging problems in a particular city may be a seminar topic for Civil Engineering Students) must be approved by the instructor in advance.

The course should have the following-

1) Practice speaking in front of a scientific audience.
2) Explore topics in detail.
3) Research topics and organize presentations.
4) To improve as speakers, each student will receive feedback from the fellow students and the instructor.
5) PowerPoint, Key Note or overheads are acceptable media for Visual aids. Visual aids should look professional and be readable in the entire room; use spell check and proofread for typographical errors.
6) Students have to submit a hard copy contains detailed outline (4-5 pages) of their presentation and also a brief abstract (one or two paragraphs; **250 words max.**) describing their presentation.
7) Each student will give 20-minute presentations followed by 3 minutes of question-answer session.

Proposal Seminar Format for Students:

- Introduce yourself.
- Give an introduction and background information on your topic. What relevant research has been performed previously?
- State the problem(s) that remain unanswered.
- Clearly state your objectives and give the specific hypotheses you wish to test.
- Describe the methodology you will use to test your hypotheses. Be sure you fully understand your chosen methods. Give reasons why you chose these methods over other approaches.
- Present any data you have collected thus far.
- Describe what remains to be done, and what you expect to find.

Explain the significance of your findings (or potential future findings).

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