VIII SEMESTER DETAILED SYLLABUS

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – VIII

POWER SYSTEM OPERATION AND CONTROL(Core Course)

Course Code	**18EE81**	CIE Marks	40
Number of Lecture Hours/Week	3:0:0	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives:

- To describe various levels of controls in power systems and the vulnerability of the system.
- To explain components, architecture and configuration of SCADA.
- To explain basic generator control loops, functions of Automatic generation control, speed governors and mathematical models of Automatic Load Frequency Control
- To explain automatic generation control, voltage and reactive power control in an interconnected power system.
- To explain reliability and contingency analysis, state estimation and related issues.

Module-1

Introduction: Operating States of Power System, Objectives of Control, Key Concepts of Reliable Operation, Preventive and Emergency Controls, Energy Management Centers. R1

Supervisory Control and Data acquisition (SCADA): Introduction, components, application in Power System, basic functions and advantages. Building blocks of SCADA system, components of RTU, communication subsystem, IED functional block diagram. R2

Classification of SCADA system: Single master–single remote; Single master–multiple RTU; Multiple master–multiple RTUs; and Single master, multiple submaster, multiple remote. R2

Module-2

Automatic Generation Control (AGC): Introduction, Schematic diagram of load frequency and excitation voltage regulators of turbo generators, Load frequency control (Single area case), Turbine speed governing system, Model of speed governing system, Turbine model, Generator load model, Complete block diagram of representation of load frequency control of an isolated power system, Steady state analysis, Control area concept, Proportional plus Integral Controller. T1

Module-3

Automatic Generation Control in Interconnected Power system: Two area load frequency control, Optimal (Two area) load frequency control by state variable, Automatic voltage control, Load frequency control with generation rate constraints (GRCs), Speed governor dead band and its effect on AGC, Digital LF Controllers, Decentralized control. T1

Module-4

Control of Voltage and Reactive Power: Introduction, Generation and absorption of reactive power, Relation between voltage, power and reactive power at a node, Methods of voltage control: i. Injection of reactive power, Shunt capacitors and reactors, Series capacitors, Synchronous compensators, Series injection. ii Tap changing transformers. Combined use of tap changing transformers and reactive power injection, Booster transformers, Phase shift transformers, Voltage collapse. T3

Module-5

Power System Security: Introduction, Factors affecting power system security, Contingency Analysis, Linear Sensitivity Factors, AC power flow methods, Contingency Selection and Ranking. T2

State estimation of Power Systems: Introduction, Linear Least Square Estimation. T2

Course Outcomes: At the end of the course the student will be able to:

- Describe various levels of controls in power systems, architecture and configuration of SCADA.
- Develop and analyze mathematical models of Automatic Load Frequency Control.
- Develop mathematical model of Automatic Generation Control in Interconnected Power system
- Discuss the Control of Voltage , Reactive Power and Voltage collapse.
- Explain security, contingency analysis, state estimation of power systems.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2 full questions (with a maximum of three sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

Text Book

1	Modern Power System Analysis	D. P. Kothari	McGraw Hill	4th Edition, 2011
2	Power Generation Operation and Control	Allen J Wood etal	Wiley	2nd Edition,2003
3	Electric Power Systems	B M Weedy, B J	Wiley	4th Edition, 2012

Reference Books

1	Computer-Aided Power System Analysis	G. L. Kusic	CRC Press	2nd Edition.2010
2	Power System SCADA and Smart Grid	Mini S Thom and John D. McDonald	CRC Press	2015
3	Power System Stability and Control	Kundur	McGraw Hill	8th Reprint, 2009

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING
CHOICE BASED CREDIT SYSTEM (CBCS) AND OUTCOME BASED EDUCATION (OBE)
SEMESTER – VIII

FACTS AND HVDC TRANSMISSION (PROFESSIONAL ELECTIVE)

Course Code	18EE821	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives:

- To discuss transmission interconnections, flow of Power in an AC System, limits of the loading capability, dynamic stability considerations of a transmission interconnection and controllable parameters.
- To explain the basic concepts, definitions of flexible ac transmission systems and benefits from FACTS technology.
- To describe shunt controllers, Static Var Compensator and Static Compensator for injecting reactive power in the transmission system in enhancing the controllability and power transfer capability.
- To describe series Controllers Thyristor-Controlled Series Capacitor (TCSC) and the Static Synchronous Series Compensator (SSSC) for control of the transmission line current.
- To explain advantages of HVDC power transmission, overview and organization of HVDC system.
- To describe the basic components of a converter, the methods for compensating the reactive power demanded by the converter.
- Explain converter control for HVDC systems, commutation failure, control functions.

Module-1

FACTS Concept and General System Considerations: Transmission Interconnections, Flow of Power in an AC System, What Limits the Loading Capability? Power Flow and Dynamic Stability Considerations of a Transmission Interconnection, Relative Importance of Controllable Parameters, Basic Types of FACTS Controllers, Brief Description and Definitions of FACTS Controllers, Checklist of Possible Benefits from FACTS Technology, In Perspective: HVDC or FACTS.

Module-2

Static Shunt Compensators: Objectives of Shunt Compensation - Midpoint Voltage Regulation for Line Segmentation, End of Line Voltage Support to Prevent Voltage Instability, Improvement of Transient Stability. Methods of Controllable Var Generation –Thyristor controlled Reactor (TCR) and Thyristor Switched Reactor (TSR), Thyristor Switched Capacitor (TSC).Operation of Single Phase TSC – TSR. Switching Converter Type Var Generators, Basic Operating Principles, Basic Control Approaches.
Static VAR Compensators: SVC and STATCOM, the Regulation Slope. Comparison between STATCOM and SVC, V –I and V –Q Characteristics, Transient stability**,** Response Time.

Module-3

Static Series Compensators: Objectives of Series Compensation, Concept of Series Capacitive Compensation, Voltage Stability, Improvement of Transient Stability. GTO Thyristor-Controlled Series Capacitor, Thyristor-Switched Series Capacitor, Thyristor-Controlled Series Capacitor, The Static synchronous Series Compensator, Transmitted Power Versus Transmission Angle Characteristic.

Module-4

Development of HVDC Technology: Introduction, Advantages of HVDC Systems, HVDC System Costs, Overview and Organization of HVDC Systems, HVDC Characteristics and Economic Aspects.
Power Conversion: 3-Phase Converter, 3-Phase Full Bridge Converter, 12-Pulse Converter.

Module-5

Control of HVDC Converter and System: Converter Control for an HVDC System, Commutation Failure, HVDC Control and Design, HVDC Control Functions, Reactive Power and Voltage Stability.

Course Outcomes: At the end of the course the student will be able to:

- Discuss transmission interconnections, flow of Power in an AC System, limits of the loading capability, dynamic stability considerations of a transmission interconnection and controllable parameters.
- Explain the basic concepts, definitions of flexible ac transmission systems and benefits from FACTS technology.

• Describe shunt controllers, Static Var Compensator and Static Compensator for injecting reactive power in the transmission system in enhancing the controllability and power transfer capability.
• Describe series Controllers Thyristor-Controlled Series Capacitor (TCSC) and the Static Synchronous Series Compensator (SSSC) for control of the transmission line current.
• Explain advantages of HVDC power transmission, overview and organization of HVDC system.
• Describe the basic components of a converter, the methods for compensating the reactive power demanded by the converter.
• Explain converter control for HVDC systems, commutation failure, control.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems	Narain G Hingorani, Laszlo Gyugyi	Wiley	1st Edition, 2000
2	HVDC Transmission: Power Conversion Applications in Power Systems	Chan-Ki Kim et al	Wiley	1st Edition, 2009
Reference Books				
1	Thyristor Based FACTS Controllers for Electrical Transmission Systems	R. Mohan Mathur, Rajiv K. Varma	Wiley	1st Edition, 2002

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CHOICE BASED CREDIT SYSTEM (CBCS) AND OUTCOME BASED EDUCATION (OBE)
SEMESTER – VIII

ELECTRICAL ESTIMATION AND COSTING (PROFESSIONAL ELECTIVE)

Course Code	18EE822	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives:

- To discuss the purpose of estimation and costing.
- To discuss market survey, estimates, purchase enquiries, tenders, comparative statement and payment of bills and Indian electricity act and some of the rules.
- To discuss distribution of energy in a building, wiring and methods of wiring, cables used in internal wiring, wiring accessories, fittings and fuses.
- To discuss design of lighting points and its number, total load, sub-circuits, size of conductor.
- To discuss different types of service mains and estimation of power circuits.
- To discuss estimation of overhead transmission and distribution system and its components.
- To discuss main components of a substation, their graphical representation and preparation of single line diagram of a substation.

Module-1

Principles of Estimation: Introduction to Estimation and Costing, Electrical Schedule, Catalogues, Market Survey and Source Selection, Recording of Estimates, Determination of Required Quantity of Material, Labour Conditions, Determination of Cost Material and Labour, Contingencies, Overhead Charges, Profit, Purchase System, Purchase Enquiry and Selection of Appropriate Purchase Mode, Comparative Statement, Purchase Orders, Payment Of Bills, Tender Form, General Idea about IE Rule, Indian Electricity(IE) Act and IE Rules -29,30,45,46,47,50,51,54,55,77 and79.

Module-2

Wiring: Introduction, Distribution of energy in a Building, PVC Casing and Capping, Conduit Wiring, Desirabilities of Wiring. Types of cables used in Internal Wiring, Multi Strand Cables, Voltage Grading and Specification of Cables.

Wiring (continued): Main Switch and Distribution Board, Conduits and its accessories and Fittings. Lighting Accessories and Fittings, Types of Fuses, Size of Fuse, Fuse Units, Earthing Conductor.

Internal Wiring: General rules for wiring, Design of Lighting Points (Refer to Seventh Chapter of the Text Book), Number of Points, Determination of Total Load, Number of Sub –Circuits, Ratings Main Switch and Distribution Board and Size of Conductor. Current Density, Layout.

Module-3

Service Mains: Introduction, Types, Estimation of Underground and Overhead Service Connections. Design and Estimation of Power Circuits: Introduction, Important Considerations Regarding Motor Installation Wiring, Input Power, Input Current to Motors, Rating of Cables, Rating of Fuse, Size of Condit, Distribution Board Main Switch and Starter.

Module-4

Estimation of Overhead Transmission and Distribution Lines: (Review of Line Supports, Conductor Materials, Size of Conductor for Overhead Transmission Line, Types of Insulators) [No Question Shall be Set From the Review Portion].

Cross Arms, Pole Brackets and Clamps, Guys and Stays, Conductors Configuration Spacing and Clearances, Span Lengths, Lightning Arrestors, Phase Plates, Danger Plates, Anti Climbing Devices, Bird Guards, Beads of Jumpers, Muffs, Points to be Considered at the Time of Erection of Overhead Lines, Erection of Supports, Setting of Stays, Fixing of Cross Arms, Fixing of Insulators, Conductor Erection. Repairing and Jointing of Conductors, Dead End Clamps, Positioning of Conductors and Attachment to Insulator s, Jumpers, Tee-Offs, Earthing of Transmission Lines, Guarding of Overhead Lines, Clearances of Conductor From Ground, Spacing Between Conductors, Important Specifications.

Module-5

Estimation of Substations: Main Electrical connection, Graphical Symbols for Various Types of Apparatus and Circuit Elements on Substation main Connection Diagram, Single Line Diagram of Typical Substations, Equipment for Substation, Substation Auxiliaries Supply, Substation Earthing.

Course Outcomes: At the end of the course the student will be able to:

- Discuss wiring methods, cables used, design of lighting points and sub-circuits, internal wiring, wiring accessories and fittings, fuses and types.
- Discuss estimation of service mains and power circuits.
- Discuss estimation of overhead transmission and distribution system its components.
- Discuss types of substation, main components and estimation of substation.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook				
1	A Course in Electrical Installation Estimating and Costing	J. B. Gupta	Katson Books	9th Edition, 2012

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING
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SEMESTER – VIII

BIG DATA ANALYTICS IN POWER SYSTEMS (PROFESSIONAL ELECTIVE)

Course Code	18EE823	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course objectives:

- To define big data and to explain big data application and analytics to power systems.
- To explain the role of big data in smart grid communications and optimization of big data in electric power systems.
- To explain security methods for the infrastructure communication and data mining methods for theft detection in power systems.
- To explain the application of unit commitment method in the control of smart grid.
- To explain protection algorithm for transformer based on data pattern recognition.

Module-1

Introduction: Big Data, Future Power Systems.
Big Data Application and Analytics in a Large - Scale Power System: Introduction, General Applications of Big Data, Algorithms for Processing Big Data, Application of Big Data in Power Systems.

Module-2

Role of Big Data in Smart Grid Communications: Introduction, The Grid Modernization, The Grid Interconnection with the Internet of Things, Data Traffic Pattern in a Smart Grid Environment, The Massive Flow of Information in a Smart Scenario ,The Volume of Generated Data in a Smart Distribution System: A Case of Study.
Big Data Optimization in Electric Power Systems: Introduction, Background, Scientometric Analysis of Big Data, Big Data and Power Systems, Optimization Techniques Used in the Big Data Analysis.

Module-3

Security Methods for Critical Infrastructure Communications: Introduction, Effects of Successful Communication System Threats, General Communication System Operations, Industrial Control Networks and Operations, High-Level Communication System Threats, Cyber Threats and Security. **Data - Mining Methods for Electricity Theft Detection:** Introduction, Transmission and Distribution System Losses, Electricity Theft Methods, Data Mining and Electricity Theft, Issues and Directions in Electricity Theft-Related Data-Mining Research.

Module-4

Unit Commitment Control of Smart Grids: Introduction, Renewable Energy Resources, The Unit Commitment Problem, A Multi-agent Architecture, Illustrative Example.

Module-5

Transformer Differential Protection Algorithm Based on Data Pattern Recognition: Big Data and Power System Protection, Methods for Differential Protection Blocking, Principal Component Analysis, Curvilinear Component Analysis (CCA), PCA Applied to Discriminate Between Inrush and Fault, Currents in Transformers, Application of the CCA as a Base for a Differential Protection System Under Study, Results.

Course outcomes:

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

- Discuss role of big data and machine-learning methods applicable to power systems and in particular to Smart Grid communications.
- Discuss optimization methods which are suitable for big data models in power systems.
- Discuss various cyber security issues, electricity theft detection and mitigation that exist in IoT-enabled future power systems.
- Discuss renewable energy planning concerns associated with planned future power systems that have high renewable penetration.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook				
1	Big Data Analytics in Future Power Systems	Ahmed F. Zobaa and Trevor J. Bihl	CRC Press	2019.

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SEMESTER – VIII

POWER SYSTEM PLANNING (PROFESSIONAL ELECTIVE)

Course Code	18EE824	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives:

• To discuss primary components of power system planning namely load furcating, evaluation of energy resources, provisions of electricity Act and Energy Conservation Act.
• To explain planning methodology for optimum power system expansion, various types of generation, transmission and distribution.
• To explain forecasting of anticipated future load requirements of both demand and energy by deterministic and statistical techniques using forecasting tools.
• To discuss methods to mobilize resources to meet the investment requirement for the power sector.
• To perform economic appraisal to allocate the resources efficiently and take proper investment decisions
• To discuss expansion of power generation and planning for system energy in the country
• To discuss evaluation of operating states of transmission system, their associated contingencies and determination of the stability of the system for worst case conditions
• To discuss principles of distribution planning, supply rules, network development and the system studies.
• To discuss reliability criteria for generation, transmission, distribution and reliability evaluation and analysis.
• To discuss grid reliability, voltage disturbances and their remedies.
• To discuss planning and implementation of electric –utility activities designed to influence consumer uses of electricity.
• To discuss market principles and the norms framed by CERC for online trading and exchange in the interstate power market.

Module-1

Power System: Planning Principles, Planning Process, Project Planning, Power Development, National and Regional Planning, Enterprise Resources Planning, Planning Tools, Power Planning Organisation, Scenario Planning.

Electricity Forecasting: Load Requirement, System Load, Electricity Forecasting, Forecasting Techniques, Forecasting Modelling, Spatial – Load Forecasting, Peak Load - Forecast, Reactive – Load Forecast, Unloading of a System.

Module-2

Power-System Economics: Financial Planning, Techno – Economic Viability, Private Participation, Financial Analysis, Economic Analysis, Transmission, Rural Electrification Investment, Total System Analysis, Credit - Risk Assessment.

Generation Expansion: Generation Capacity and Energy, Generation Mix, Clean Coal Technologies Renovation and Modernisation of Power Plants.

Module-3

Transmission Planning: Transmission Planning Criteria, Right – of – Way, Network Studies, High – Voltage Transmission, HVDC Transmission, Conductors, Sub – Stations, Power Grid, Reactive Power Planning, Energy Storage.

Module-4

Distribution: Distribution Deregulation, Planning Principles, Electricity – Supply Rules, Criteria and Standards, Sub – Transmission, Basic Network, Low Voltage Direct Current Electricity, Upgradation of Existing Lines and Sub – Stations, Network Development, System Studies, Urban Distribution, Rural Electrification.

Reliability and Quality: Reliability Models, System Reliability, Reliability and Quality Planning, Functional Zones, Generation Reliability Planning Criteria, Transmission Reliability Criteria, Distribution Reliability, Reliability Evaluation, Grid Reliability, Quality of Supply.

Module-5

Demand-Side Planning: Demand Response, Demand – Response Programmes, Demand– Response Technologies, Energy Efficiency, Energy - Economical Products, Efficient – Energy Users, Supply – Side Efficiency, Energy Audit.

Electricity Market: Market Principles, Power Pool, Independent System Operator, Distribution SystemOperator, Power Markets, Market Rules, Bidding, Trading, Settlement System, Merchant Power, Differential Electricity, Congestion Management, Ancillary Services, Hedging, Smart Power Market.

Course Outcomes: At the end of the course the student will be able to:

- Discuss primary components of power system planning, planning methodology for optimum power system expansion and load forecasting.
- Understand economic appraisal to allocate the resources efficiently and appreciate the investment decisions
- Discuss expansion of power generation and planning for system energy in the country, evaluation of operating states of transmission system, their associated contingencies and the stability of the system.
- Discuss principles of distribution planning, supply rules, network development and the system studies
- Discuss reliability criteria for generation, transmission, distribution and reliability evaluation and analysis, grid reliability, voltage disturbances and their remedies
- Discuss planning and implementation of electric –utility activities, market principles and the norms framed.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook				
1	Electric Power Planning	A. S. Pabla	McGraw Hill	2nd Edition, 2016

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING
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SEMESTER – VIII

ELECTRICAL POWER QUALITY (PROFESSIONAL ELECTIVE)

Course Code	18EE825	CIE Marks	40
Teaching Hours/Week (L:T:P)	(3:0:0)	SEE Marks	60
Credits	03	Exam Hours	03

Course Learning Objectives:

- Review definitions and standards of common power quality phenomena.
- Understand power quality monitoring and classification techniques.
- Investigate different power quality phenomena causes and effects.
- Understand different techniques for power quality problems mitigation.
- Understand the various power quality phenomenon, their origin and monitoring and mitigation methods.
- Understand the effects of various power quality phenomenon in various equipment.

Module-1

Introduction: Power quality-voltage quality, power quality evaluation procedures term and definitions: general classes of power quality problems, transients, long duration voltage variation, short duration voltage variations, voltage imbalance, waveform distortion, power quality terms.

Module-2

Voltage sags and interruptions: Sources of sags and interruptions, estimating voltage sag performance, fundamental principles of protection, motor starting sags.
Transient over voltages: Sources of transient over voltages, principles of over voltages protection, utility capacitor switching transients.

Module-3

Transient over voltages: Fundamentals of harmonics: Harmonic distortion, voltage versus transients, harmonic indexes, harmonic sources from commercial loads, harmonic sources from Industrial loads, effects of harmonic distortion, intra harmonics.

Module-4

Applied harmonics: Harmonic distortion evaluations, principles for controlling harmonics, harmonic studies, devices for controlling harmonic distortion, harmonic filters, standards of harmonics.
Power Quality Benchmark: Introduction, benchmark process, power quality contract.

Module-5

Power quality benchmark: power quality state estimation, including power quality in distribution planning.
Distributed generation and quality: DG technologies, interface to utility system, power quality issues, interconnection standards.

Course Outcomes: At the end of the course the student will be able to:

- Define Power quality; evaluate power quality procedures and standards.
- Estimate voltage sag performance; explain principles of protection and Sources of transient over voltages.
- Identify various sources of harmonics, explain effects of harmonic distortion.
- Evaluate harmonic distortion, control harmonic distortion.
- Estimate power quality in distribution planning. Identify power quality issues in utility system.

Question paper pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook				

1	Electric Power Quality	Dugan, Roger C	McGraw-Hill	2003
Reference Books				
1	Electric Power Quality	G.T.Heydt	Stars in a circle publications	1991
2	Understanding power quality problems voltage sags and interruptions	Math H. J. Bollen.	IEEE Press	2000
3	Power quality in power systems and electrical machines	Ewald F Fuchs, Mohammad, A.S., Masoum	Academic Press, Elsevier	2009

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B.E. ELECTRICAL & ELECTRONICS ENGINEERING
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER -VIII

PROJECT WORK PHASE -II

Course Code	18EEP83	CIE Marks	40
Contact Hours/Week	02	SEE Marks	60
Credits	08	Exam Hours/Batch	03

Course objectives:

- To support independent learning and innovative attitude.
- To guide to select and utilize adequate information from varied resources maintaining ethics.
- To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- To develop interactive, communication, organisation, time management, and presentation skills.
- To impart flexibility and adaptability.
- To inspire independent and team working.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meeting deadlines.
- To instil responsibilities to oneself and others.
- To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas. ■

Project Work Phase - II: Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism.

Revised Bloom's Taxonomy Level	L_3 – Applying, L_4 – Analysing, L_5 – Evaluating, L_6 – Creating

Course outcomes:

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

- Present the project and be able to defend it.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
- Habituated to critical thinking and use problem solving skills
- Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
- Work in a team to achieve common goal.
- Learn on their own, reflect on their learning and take appropriate actions to improve it. ■

CIE procedure for Project Work Phase - 2:

(i)Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the project work phase -2, shall be based on the evaluation of project work phase -2 Report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.

(ii) Interdisciplinary: Continuous Internal Evaluation shall be group wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable.

The CIE marks awarded for the project work phase -2, shall be based on the evaluation of project work phase -2 Report, project presentation skill and question and answer session in the ratio 50:25:25.The marks awarded for the project report shall be the same for all the batch mates.■

Semester End Examination

SEE marks for the project (60 marks)shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session) as per the University norms by the examiners appointed VTU.■

B.E. ELECTRICAL & ELECTRONICS ENGINEERING
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
SEMESTER -VIII

TECHNICAL SEMINAR

Course Code	18EES84	CIE Marks	100
Contact Hours/Week	02	SEE Marks	--
Credits	01	Exam Hours	--

Course objectives:

The objective of the seminar is to inculcate self-learning, face audience confidently, enhance communication skill, involve in group discussion and present and exchange ideas.
Each student, under the guidance of a Faculty, shall choose, preferably, a recent topic of his/her interest relevant to the Course of Specialization.

- Carryout literature survey, organize the seminarcontent in a systematic manner.
- Prepare the report with own sentences, avoiding cut and paste act.
- Type the matter to acquaint with the use of Micro-soft equation and drawing tools or any such facilities.
- Present the seminar topic orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit typed report with a list of references.

The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident. ■

Revised Bloom's Taxonomy Level	L_3 – Applying, L_4 – Analysing, L_5 – Evaluating, L_6 – Creating

Course outcomes:

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

- Attain, use and develop knowledge in the field of engineering and other disciplines through independent learning and collaborative study.
- Identify, understand and discuss current, real-time issues.
- Improve oral and written communication skills.
- Explore an appreciation of the self in relation to its larger diverse social and academic contexts.
- Apply principles of ethics and respect in interaction with others.■

Evaluation Procedure:
The CIE marks for the seminar shall be awarded (based on the relevance of the topic, presentation skill, participation in the question and answer session and quality of report) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three teachers from the department with the senior most acting as the Chairman.

Marks distribution for CIE of the course:
Seminar Report:50 marks
Presentation skill:25 marks
Question and Answer:25 marks.■

B. E. ELECTRICAL AND ELECTRONICS ENGINEERING
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – VII / VIII

INTERNSHIP

Course Code	**18EEI85**	CIE Marks	40
Number of Practical Hours/Week	--	SEE Marks	60
Credits	**03**	Exam Hours	03

Course Learning Objectives:

Internship provide students the opportunity of hands-on experience that include personal training, time and stress management, interactive skills, presentations, budgeting, marketing, liability and risk management, paperwork, equipment ordering, maintenance, responding to emergencies etc. The objective are further,

- To put theory into practice.
- To expand thinking and broaden the knowledge and skills acquired through course work in the field.
- To relate to, interact with, and learn from current professionals in the field.
- To gain a greater understanding of the duties and responsibilities of a professional.
- To understand and adhere to professional standards in the field.
- To gain insight to professional communication including meetings, memos, reading, writing, public. ■

Internship: Students under the guidance of internal guide/s and external guide shall take part in all the activities regularly to acquire as much knowledge as possible without causing any inconvenience at the place of internship.

Seminar: Each student, is required to

- Present the seminar on the internship orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit the report duly certified by the external guide.

The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident. ■

Course Outcomes: At the end of the course the student will be able to:

- Gain practical experience within industry in which the internship is done.
- Acquire knowledge of the industry in which the internship is done.
- Apply knowledge and skills learned to classroom work.
- Develop a greater understanding about career options while more clearly defining personal career goals.
- Experience the activities and functions of professionals.
- Develop and refine oral and written communication skills. ■

Continuous Internal Evaluation

CIE marks : 40 Marks

i. Successful completion of Internship training in an organization and certification from competitive authority-20 marks

ii. Presentation and report -20 Marks

(based on the quality of report and presentation skill, participation in the question and answer session by the student) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairman. ■

Semester End Examination

SEE marks – 60 Marks based on presentation skill, participation in the question and answer session by the student to the examiners appointed by the University. ■