SUBJECT NAME – ELECTRICAL MACHINE -I **SUBJECT CODE- BTEEC302**

This course is mainly for Undergraduate Second Year Electrical engineering students, which will introduce and explain the fundamental concepts in the field of electrical engineering. The electrical machines are incorporated into the process of energy conversion in the generation, transmission, and consumption of electric power. In a power station, turbine generator converts the energy coming from the combustion of coal, natural gas, etc. Electric machines are devices capable of transforming any form of energy into electrical energy and vice versa. They are classified into three major groups: electric generators, electric motors and transformers. Starting from toasters to refrigerators, microwaves, washing machines, dishwashers, electrical chimneys, and many more appliances which are simple to use and made for the convenience of day-to-day activities use electricity to function.

COURSE OUTCOME

CO1	Summarize the basics of Single and Three Phase transformers
CO2	Develop the equivalent circuit and Phasor diagram of different machines and Analyse their performance using the equivalent circuit.
CO3	Understand the concepts of D.C. Machines, construction, armature reaction and characteristics
CO4	Learn about, parallel operation, tap-changing of three phase transformers and origin of production of harmonics in a machine and its importance.
CO5	Identify possible applications of different machines.
CO6	Categorize different phenomena occurring in DC machines and AC three phase machines.

SUBJECT NAME – ELECTRICAL MACHINE -I LAB

The Electrical Machines Laboratory is designed to support the theory study for Electromechanical Devices. The objective of this course is to supplement the theory with suitable practical experiments. They are electromechanical energy converters: an electric motor converts electricity to mechanical power while an electric generator converts mechanical power to electricity. The moving parts in a machine can be rotating (rotating machines) or linear (linear machines).

COURSE OUTCOME

CO1	Apply and Deduce the principles of Electrical Machines through laboratory experimental work
CO2	Connect the circuit to perform experiments, measure, analyze the observed data & come to a conclusion
CO3	Organize reports based on performed experiments with effective demonstration of diagrams and characteristics /graph
CO4	Demonstrate the starting & speed control of various AC & DC motors
CO5	Perform various tests, find efficiency & voltage regulation of electrical machines

Course Outcomes (CO) – Power System

Course Description:

The Power Systems is designed to provide students with a comprehensive understanding of electric power generation, transmission, distribution, and utilization. Power systems are the backbone of modern society, and this course covers the principles, components, analysis methods, and operational considerations of power systems, including renewable energy integration and smart grid technologies.

At the end of this course, students should be able to

CO1	Explain the principles and operation of various power generation technologies, including thermal, hydro, nuclear, and renewable energy sources.
CO2	analyze power transmission and distribution systems, including the calculation of transmission line parameters, losses, and voltage regulation.
CO3	Understand the importance of power system protection
CO4	practical skills through laboratory experiments and projects related to power system simulation
CO5	Describe the design and operation of distribution substations, transformers, and feeder systems.
CO6	Apply power flow analysis techniques to solve complex power system network equations.

SUBJECT NAME- ELECTRICAL & ELECTRONICS MEASUREMENT SUBJECT CODE- BTEEC303

This course introduces principle of operation and construction of basic instruments for measurement of electrical quantities. Measurement of basic circuit parameters, magnetic quantities, and passive parameters by using bridge circuits, sensors and transducers will be discussed. To introduce students to monitor, analyze and control any electrical system. To understand students how different types of meters work and their construction.

COURSE OUTCOME

CO1	Define various characteristic and classify measuring instruments along with range extension techniques.
CO2	Analysis based on comparing true and actual value of potentiometer & Power factor meter.
CO3	Apply measurement techniques for measurement of resistance, inductance and capacitance
CO4	Demonstrate construction, working principle of electro dynamo type and induction type instruments for measurement of power and energy
CO5	Make use of CRO for measurement of voltage, current and frequency
CO6	Develop the knowledge of theoretical and mathematical principles of electrical measuring instruments.

SUBJECT NAME- NETWORK THEORY **SUBJECT CODE- BTEEC401**

The course begins with description with circuit elements, sources. Understanding of various interesting network theorems applied to solve linear, time invariant network problems efficiently in time and s-domain. Steady and transient solution of network problems with various sources including impulse source(t). Representing a circuit in s-domain (Laplace domain). Two-port networks. Graph, tree of networks and use them to solve large network problems using matrices.

COURSE OUTCOMES-

CO1	Understand basic laws of network systems and apply them for solving electrical circuits.
CO2	Analyze electrical circuits using various network theorems and apply them to evaluate electrical quantities.
CO3	Analyse electrical network parameter for different application.
CO4	Develop Laplace Transformed network for steady state and transient analysis
CO5	Analyze the two port networks to evaluate the parameters of electrical & electronic systems for the designing of various circuits and devices.

SUBJECT NAME- NETWORK THEORY LAB **SUBJECT CODE- BTEEL406**

The course begins with description with circuit elements, sources. Understanding of various interesting network theorems applied to solve linear, time invariant network problems efficiently in time and s-domain. Steady and transient solution of network problems with various sources including impulse source(t). Representing a circuit in s-domain (Laplace domain). Two-port networks. Graph, tree of networks and use them to solve large network problems using matrices.

COURSE OUTCOMES-

Upon the completion of this course, the student will be able to:

CO1	Understand basics of electrical circuits with nodal and mesh analysis.
CO2	Appreciate electrical network theorems.
CO3	Analyze RLC circuits.
CO4	Determine the stability of an electrical circuit.
CO5	Design network filters.

Course Outcomes (CO) – Power System lab

Course Description:

A Power System lab course typically focuses on practical applications and experiments related to advanced power systems and electrical engineering concepts.

At the end of this course, students should be able to

CO1	Perform load flow analysis for power systems using software tools to assess voltage profiles, power losses, and system stability.
CO2	Develop skills in simulating and analyzing electrical faults and testing protection relays to ensure the safety and reliability of power systems.
CO3	Gain proficiency in assessing the transient stability of power systems under various fault conditions and disturbances and applying control strategies to enhance stability.
CO4	Perform power quality measurements, analyze waveforms, and identify and mitigate issues related to harmonics, sags, swells, and other disturbances.
CO5	Understand the control and operation of electrical machines like generators, motors, and transformers, conducting experiments to observe their performance characteristics.
CO6	Learn about the integration of renewable energy sources into the power grid.

SUBJECT NAME- ELECTRICAL & ELECTRONICS MEASUREMENT LAB SUBJECT CODE- BTEEL308

This practical laboratory covers experiments related to the measurement of different unknown electrical components such as capacitance, inductance, and power measurements. It is intended for undergraduate students of Electrical, Electronics, and Instrumentation Engineering.

COURSE OUTCOME

CO1	Calibrate - voltmeters, ammeters, single phase energy meter.
CO2	Analysis based on comparing true and actual value of potentiometer & Power factor meter.
CO3	To verify dielectric property of oil insulation, Analyse the measuring parameters of Anderson & Schering bridge.
CO4	To verify practically the concepts of displacement, force, strain, inductance, capacitance & resistance.
CO5	Examine the output of turns ratio and ratio error of CT

Course Outcomes (CO) – Basic Human Rights BTHM304

Course Description:

The study of Basic Human Rights is essential for the students of Engineering is all about human rights which create equality among all the citizens irrespective of the differences such as caste, religion, gender, race etc.The Rights of fundamental to all citizens and are given under the constitution of India. They recognises our freedom to make choices about our lives and to develop our potential as human being.They are about living a life free from fear, harassment or discriminations.

At the end of this course, students should be able to:

CO1	Understand the historical growth of the idea of human rights.
CO2	Ability to cooperate and to resolve conflict in a peaceful way.
CO3	Ability to organize and participate in social groups.
CO4	Identify strategies for the promotion of people's human rights.
CO5	Promotion and protection of human rights locally.
CO6	Promotion and protection of human rights globally.

Electrical Machine-II Sub. Code: BTEEC 403

Course Description:

This course is aimed at introducing the fundamental principles of operation, characteristics of different AC machines like Synchronous generator, Synchronous motor, Induction motor,Single phase induction motor and special purpose motors. The objective of the course is to use the knowledge of all the electrical machines in real life applications. Classroom and Lab sessions focuses on study of working, characteristics and applications of different AC machines

Course Outcomes (CO)

At the end of this course, students should be able to

CO1	Apply basic knowledge of science and engineering to understand electrical machines.
CO2	Understand construction, concepts, principles of operation, testing and application of synchronous machines, induction motor and special function motors.
CO3	Understand the behavior of synchronous machine on infinite bus and analyze data for qualitative and quantitative parameters to determine characteristics of machines by performing practical.
CO4	Perform professional duties in team of manufacturing, testing, operation and maintenance with the sense of safety precautions.
CO5	Apply knowledge for technological subjects such as utilization of electrical energy, switch gear and machine design for economical and sustainable developments.
CO6	Do higher studies and able to use updated software and tools for continuous updating of knowledge.

ELECTRICAL MACHINE-II LAB **Sub.Code : BTEEL 408**

Course Description:

In this laboratory course emphasis on imparting the practical knowledge and understanding of basic principles, determination of characteristic , performance and testing of AC Machines, Voltage regulation of synchronous alternator. Application of single phase motors

COURSE OUTCOMES

After successful completion of this lab course students will be able to:

CO1	Apply basic knowledge of science and engineering to understand electrical machine
CO2	Understand construction, concepts, and principles of operation, testing of synchronous machines and special function motors.
CO3	Analyze data for qualitative and quantitative parameters to determine characteristics of machines by performing practical
CO4	Apply knowledge for technological subjects such as utilization of electrical energy, switch gear & protection, manufacturing processes and safety precautions.
CO5	Discharging duties in technical field for economical, societal and sustainable developments.
CO6	Do higher studies and able to use updated software and tools for continuous updating of knowledge.

Course Outcomes (CO) – Advance Renewable Energy Sources

BTEEPE405C

Course Description:

Advanced Renewable Energy Sources are dealing with of science and technology. Energy technology is the back-boon of modern civilization and national economy. It is an applied science dealing with various renewable energy routes comprising the exploration and extraction of energy and by-products, transportation, storage, distribution and supply of secondary forms of energy. These courses explore available renewable energy sources and provide the platform to study judicious and economic choice of energy for environment friendly and sustain able developments.

At the end of this course, students should be able to:

CO1	Apply the basic knowledge of science, mathematics and engineering for understanding the non conventional energy system.
CO2	Understand the basic requirement, prediction of productivity and usage of Biomass plants.
CO3	To understand economics and environmental issues with power plant.
CO4	Analyze the cost effectiveness and life estimation of non conventional energy system with least environmental damage.
CO5	Analyze the data for wind and solar to demonstrate the correct usage of non conventional energy system.
CO6	Motivate the students to utilize and develop renewable energy generation.

COURSE OUTCOMES

ENGINEERING MATERIAL SCIENCE **Sub Code : BTES 305**

Course description:

The objective of this course is to introduce the students to the fundamental knowledge of various materials used in electrical engineering. The course provides the essential knowledge for the selection of different conducting and insulating materials. This course includes the classification and application of electrical engineering materials. Applications of modern electrical engineering materials and special purpose materials.

COURSE OUTCOMES

CO1	Students will be able to analyze the physics behind the electrical engineering materials essential for them to work in different industries and also motivate them to do innovative research.
CO2	Students will understand about superconductivity, laws of superconductivity, types and applications
CO3	Students will understand about dielectric materials and magnetism.
CO4	Students will Uuderstand the fabrication methods of integrated circuits and characteristics of various devices.
CO5	Students will have knowledge of special purpose materials.

CLASS: S.Y. (Electrical)

Name of Subject: Analog and Digital Electronics

At the end of this course, students should be able to

CO1	Apply basic knowledge of science and engineering to understand electronic devices and circuits.
CO2	Understand the construction and working principles of different electronic devices.
CO3	Analyze the circuit for determination of circuit parameters and response of electronic devices.
CO4	Understand the use of different electronic devices such as BJT, FET, Op-amp, IC 555, and PLL.
CO5	Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
CO6	Gain the basic concept of combinational and sequential circuits with the help of basic building blocks. Able to design combinational and sequential circuits using excitation and state table.

Name of Subject: Analog and Digital Electronics LAB

At the end of this course, students should be able to

CO1	Apply basic knowledge of science and engineering to understand electronic devices and circuits.
CO2	Understand the construction and working principles of different electronic devices.
CO3	Analyze the circuit for determination of circuit parameters and response of electronic devices.
CO4	Understand the use of different electronic devices such as BJT, FET, Op-amp, IC 555, and PLL.
CO5	Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
CO6	Gain the basic concept of combinational and sequential circuits with the help of basic building blocks. Able to design combinational and sequential circuits using excitation and state table.

Course Outcomes (CO)- Engineering Mathematics -III

Course Description:

The course is intended to provide understanding of concepts of mathematics and its application to engineering. This course introduces the student to the second and higher order differential equations and their solution, function of a complex variable.This course is aimed study concept of

At the end of this course, students should be able to

CO1	Solve engineering problems using the principles of solution of differential equations.
CO2	Understand analytic function of a complex variable and able to apply Cauchy integral theorem and residue theorem to solve contour integrations.
CO3	Use Fourier transforms and its inverse in practical applications of electronics engineering.
CO4	Apply Laplace transform and its inverse to solve initial value and other related problems.
CO5	Know basic statistical techniques required for electronics engineering.
CO6	To Under Stand Functions of Complex Variables (Integral calculus)

Course Outcomes (CO) – Power Quality Issues

Course Description:

Power quality issues have various course outcomes, depending on the specific objectives and goals of the course. Courses related to power quality aim to educate students or in the electrical engineering about the challenges, solutions, and implications of power quality problems.

At the end of this course, students should be able to

CO1	Gain a solid understanding of the fundamental concepts related to power quality, including voltage sag, voltage swell, harmonics, flicker, transients, and frequency variations.
CO2	Equip with the knowledge and tools to identify power quality issues in real-world electrical systems and analyze their causes and effects.
CO3	Learn how to measure and monitor power quality parameters using appropriate instruments and techniques.
CO4	Developing troubleshooting skills to diagnose and rectify power quality issues in a systematic manner is essential. Students should be able to apply their knowledge to solve problems in practical scenarios.
CO5	Learn how to analyze and protect against transient voltage spikes and surges that can damage equipment and disrupt operations.
CO6	Study the effects of harmonics on power quality and learn how to analyze harmonic distortion in electrical systems.

Course Outcomes (CO) – Power Plant Engineering

Course Description:

This course provides a comprehensive understanding of power plant engineering principles, practices, and technologies. It covers various aspects of power generation, including fossil fuel-based, renewable energy, and nuclear power plants. Students will learn about the design, operation, maintenance, and environmental considerations associated with power plants. The course also explores emerging trends in sustainable energy production.

At the end of this course, students should be able to

CO1	Understand Power Generation Principles
CO2	Analyze Power Plant Components
CO3	Design Power Generation Systems
CO4	Demonstrate knowledge of power plant operation, including startup, shutdown, load management, and safety protocols.
CO5	Evaluate the environmental impact of power generation,
CO6	Explore Renewable Energy Sources

SUBJECT NAME- ELECTRICAL MACHINE DESIGN SUBJECT CODE-BTEEC602

The goal of this course is to provide advanced knowledge and understanding about the construction and design of the electrical machines. The course provides to the students the basis and the methodologies to a correct design of the electrical machines (transformers, rotating AC machines and DC machines). Innovative tools and techniques will be used for the design optimization of the electrical machine for industrial, automotive and aerospace applications. The applying knowledge and understanding capabilities will allow the graduate to approach the problem linked to the design of the electrical machines.

COURSE OUTCOME

CO1	Able to express general design considerations in electrical machine design and incorporation of computer aided design, analysis and synthesis
CO2	Able to describe different steps used for transformer design
CO3	Able to describe different steps used for DC machine design
CO4	Able to describe different steps used for synchronous machine design
CO5	Able to illustrate machine design using Finite Element for transformers, induction motors, dc motors and synchronous motors
CO6	Able to describe different steps used for induction motor design

SUBJECT NAME- ELECTRICAL MACHINE DESIGN LAB SUBJECT CODE BTEEL607

The approaches always were to develop the thinking process of students in reaching a sound understanding of a broad range of topics in electrical machine design. The object is to promote the students‟ interest in learning more about the latest trend in electrical machine design. The object is not great depth, but the presentation is thorough enough to give theory at a level that can be understood by an undergraduate. With this beginning, the students will have the foundation to continue his education and be able to do better in professional duties in the field of design and manufacturing industries.

COURSE OUTCOME

CO1	Apply knowledge of mathematics, science, and engineering for design of electrical machines
CO2	Understand the electrical engineering material characteristic for designing an energy efficient electrical machine
CO3	Understand the temperature rise in electrical machines and impact on rating and duty of machines
CO4	Ability to design an electrical machines and components to meet desired needs within realistic constraints such as economic, environmental, social, safety, manufacturability, and sustainability
CO5	Ability to function on multidisciplinary teams with professional and ethical responsibility
CO6	Student understands the importance of design of machines based on their applications.

SUBJECT NAME- POWER SYSTEM ANALYSIS **SUBJECT CODE- BTEEC501**

This course is mainly for Undergraduate ThirdYear Electrical Engineering students, which will introduce and explain the fundamental concepts in the field of electrical power system engineering. The basic concepts of per unit system will be introduced along with their applications in circuit applications. Transmission line parameters, their calculations, and the modelling will be introduced. Basic load flow algorithms will be covered in details along with short-circuit analysis and the method of symmetrical components. Unbalanced fault analysis and basic power system stability analysis will also be covered in these lecture series. By the end of the course, the students should be able to gather high-quality knowledge of electrical power system components, its operation strategies, and stability analysis.

COURSE OUTCOME

CO1	Understand the mathematical representation of power system components and solution techniques.
CO2	Compute in depth on different methods of power flow solutions.
CO3	Analyze balanced short circuit analysis to understand the effects of symmetrical types of faults.
CO4	Understanding the concept of Fundamentals of symmetrical components for various electrical components
CO5	Analyze unbalanced short circuit analysis to understand the effects of symmetrical types of faults.
CO6	Understanding the Power System Analysis and Electrical Power Quality, causes, affects and mitigation methods

SUBJECT NAME-

FLEXIBLE AC TRANSMISSION SYSTEMS

SUBJECT CODE-

FACTS is the acronym for Flexible AC Transmission Systems and refers to a group of resources used to overcome certain limitations in the static and dynamic transmission capacity of electrical networks. The main purpose of these systems is to supply the network as quickly as possible with inductive or capacitive reactive power that is adapted to its particular requirements, while also improving transmission quality and the efficiency of the power transmission system. FACTS Devices course is designed to provide in-depth knowledge to provide actual hardware solution of the FACTS.

COURSE OUTCOMES-

CO-1	To acquire knowledge about the fundamental principles of Passive and Active Reactive Power Compensation Schemes at Transmission and Distribution level in Power Systems
CO-2	To learn various Static VAR Compensation Schemes like Thyristor/GTO Controlled
CO-3	To Reactive Power Systems, PWM Inverter based Reactive Power Systems and their controls.
CO-4	Understanding the concept of Fundamentals of symmetrical components for various electrical components
CO-5	To develop analytical modelling skills needed for modelling and analysis of such Static VAR Systems

SUBJECT NAME- POWER SYSTEM ANALYSIS LAB **SUBJECT CODE- BTEEL507**

This course is mainly for Undergraduate ThirdYear Electrical Engineering students, which will introduce and explain the fundamental concepts in the field of electrical power system engineering. The basic concepts of per unit system will be introduced along with their applications in circuit applications. Transmission line parameters, their calculations, and the modelling will be introduced. Basic load flow algorithms will be covered in details along with short-circuit analysis and the method of symmetrical components. Unbalanced fault analysis and basic power system stability analysis will also be covered in these lecture series. By the end of the course, the students should be able to gather high-quality knowledge of electrical power system components, its operation strategies, and stability analysis.

COURSE OUTCOME

CO1	Understand the formation of Y-bus and perform load flow analysis
CO2	Solution of power flow problem of a given power system using Gauss-Siedel method, Newton Raphson Method, Fast Decoupled method.
CO3	Understanding the concept of symmetrical fault analysis in a power system.
CO4	Understanding the concept of unsymmetrical fault analysis in a power system.
CO5	Analyze unbalanced short circuit analysis to understand the effects of symmetrical types of faults.
CO6	Understanding the Power System Analysis and Electrical Power Quality, causes, affects and mitigation methods

Course Outcomes (CO) – Electrical Safety BTEEOC505B

Course Description:

This course describes identification of components needed to provide a safe environment, analyze resulting safety and health issues. This program is intended as an overview of basic electrical safety for individuals with limited electrical training who as a part of their work, may be potentially exposed to electrical hazards. This is an awareness level course for "unqualified persons" as defined by OSHA. Electricity is essential to modern life, both at home and on the job. Some employees work with electricity directly like electricians, electronic workers, and power line workers. Many of us work around electricity but are not qualified to directly handle electrical components, or in other words, not allowed to be potentially exposed to live electrical parts.

At the end of this course, students should be able to:

CO1	Understand the basic of safety and its need and objectives in industries.
CO2	Learn the role and responsibility of safety management and its activities.
CO3	Apply the knowledge of safety for awareness and training programs.
CO4	Apply the safety practices and inspections using strategies that developed through hazard identification analysis
CO5	Categorize the different hazards and its safety precautions and action in different type of industry
CO6	Anayze importance of different training program.

CourseOutcomes (CO)-Power Electronics

CO1	Build and test circuits using power devices such asSCR
CO2	Analyze and design-controlled rectifier, DC to DC converters, DC to ACinverters
CO3	Learn how to analyze these inverters and some basic applications
CO4	Design SMPS.
CO5	To gain the knowledge of Power electronic devices and its applications
CO6	To develop the knowledge about which device to choose for a particular application

Course Outcomes (CO) – Control System Lab BTEEL608

Course Description:

The study of Control System Engineering is essential for the students of Electrical, Electronics, Mechanical, Aerospace & Chemical Engineering. It has applications ranges from Electrical Power System to process Control System. The course explores the knowledge of basic control systems, control system components, mathematical modeling, time response & frequency response analysis. The course also deals in concept of design & its preliminary consideration.

At the end of this course, students should be able to:

CO1	The students should be able to learn the type of System, dynamics of physical systems, classification of control system, analysis and design objective.
CO2	The students should learn how to represent system by transfer function and block diagram reduction method and Mason‟s gain formula.
CO3	The students should able to learn time response analysis and demonstrate their knowledge to frequency response
CO4	Students can be able to learn stability analysis of system using Root locus, bode plot, polar plot and Nyquist plot.
CO5	The students should able to learn state variable technique.
CO6	The students should able to learn Controllability and observability and their testing

Course Outcomes (CO) – Control System BTEEC603

Course Description:

The study of Control System Engineering is essential for the students of Electrical, Electronics, Mechanical, Aerospace & Chemical Engineering. It has applications ranges from Electrical Power System to process Control System. The course explores the knowledge of basic control systems, control system components, mathematical modeling, time response & frequency response analysis. The course also deals in concept of design & its preliminary consideration.

At the end of this course, students should be able to:

CO1	Apply the basic knowledge of science, mathematics and engineering for understanding the concept of open loop and closed-loop control systems and to find transfer function
CO2	Understand the knowledge of basic control systems, control system components
CO3	Understand and identify the synchros characteristics and synchros as an error detector
CO4	Understand and identify the characteristic of two phase ac servomotors and identify its application for control system applications
CO5	Evaluate time domain response of second order system for step input by using software
CO6	Evaluate stability of system by bode diagram of an open loop transfer function by using software

SUBJECT NAME – SWITCHGEAR AND PROTECTION **SUBJECT CODE- BTEEC601**

This course is mainly for Undergraduate Final Year Electrical Engineering students, which will introduce and explain the fundamental concepts in the field of electrical power system engineering. In the event of an electrical surge, effective switchgear will trigger, automatically interrupting the flow of power and protecting the electrical systems from damage. Switchgears are also used for de-energizing equipment for safe testing, maintenance, and fault clearing. In the case of a malfunction in the circuit, the switchgear counters quickly to prevent the damage from spreading into the healthy parts. Thus, it helps in preventing a complete shutdown of the circuit. Switchgears also have the facility to offer hand-held operations in case of a fault of electrical control.

COURSE OUTCOME

CO1	Describe basic terminology of Protective Relaying, different types of faults and components used in Power System protection
CO2	Describe and Design the Overcurrent Protection schemes used for Medium Voltage Line
CO3	Differentiate and Describe various distance protection schemes used for High Voltage line
CO4	Explain differential protection as applicable to bus bars, transformers, alternators, motors and Employ suitable protection scheme for various abnormal and faulty conditions.
CO5	Describe and Differentiate Static Relays with Electromechanical Relays
CO6	Discuss various methods of Arc interruption and Explain Principle of operation, working and applications of different types of Circuit Breakers

SUBJECT NAME – SWITCHGEAR AND PROTECTION- LAB

An electrical power system consists of generators, transformers, and transmission and distribution lines. In case of fault, an automatic protective scheme comprising of circuit breakers and protective relays isolate the faulty section providing protection to the healthy section. Safety of machines/equipment and human beings is the major criteria of every protection scheme. It is essential that the diploma pass out students should develop skills of operating various controls and switchgear in power system. They are required to carry out remedial measures for faults/abnormalities in machines/equipment in power system using appropriate diagnostic instrument/devices. These includes switches, fuse, isolators, circuit breakers, relays, control panels, lightning arresters, current transformer, potential transformer, and various associated equipment. Some equipment is designed to operate under both normal and abnormal conditions. Some equipment is meant for switching and not sensing the fault

COURSE OUTCOME

CO1	Make the circuit connections required to perform the Experiment, take observations and analyze the data to make valid conclusions
CO2	Apply and verify the principals of Switchgear & Protection through Laboratory Experimental Work
CO3	Demonstrate the magnetization characteristics of Current Transformer and Identify the Problems associated with CT saturation
CO4	Demonstrate & Discuss the operation of various Static Relays
CO5	Understand and Demonstrate the working of IDMT Relay by plotting it's Time-Current Characteristics

CourseOutcomes (CO)-Power Electronics Lab

CO1	Design SCR firing circuit
CO2	Understand the concept of power conversion AC to DC, DC to DC etc.
CO3	Measure the response of single phase and three phase supply.
CO4	Design different types of Controller.
CO5	Describe the 1-ϕ Half and full controlled Bridge rectifier with R and RL Load
CO6	Describe simulation of Single Phase Semi Controller Converter, Full Controller Converter & Single Phase Inveter

Course Outcomes (CO)- Microprocessors and Microcontrollers

Course Description:

Objective of this course is to introduce to the students the fundamentals of microprocessor and Microcontrollers

.

. At the end of this course, students should be able to

CO1	Students get ability to conduct experiments based on interfacing of devices to or interfacing to real world applications
CO2	Students get ability to interface mechanical system to function in multidisciplinary system like in robotics, Automobiles.
CO3	Students can identify and formulate control and monitoring systems using microprocessors.
CO4	Learn use of hardware and software tools
CO5	Develop interfacing to real world devices
CO6	Graduates will be able to design real time controllers using microcontroller-based system.
CO7	Learn importance of microcontroller in designing embedded application

Microprocessors and Microcontrollers lab

Course Outcomes:

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

CO1	Identify relevant information to supplement to the Microprocessor and Microcontroller course.
CO2	Set up programming strategies and select proper mnemonics and run their program on the training boards.
CO3	Practice different types of programming keeping in mind technical issues and evaluate possible causes of discrepancy in practical experimental observations in comparison.
CO4	Develop testing and experimental procedures on Microprocessor and Microcontroller analyze their operation under different cases.
CO5	Prepare professional quality textual and computational results, incorporating accepted data analysis and synthesis methods, simulation software, and word-processing tools.
CO6	Primarily via team-based laboratory activities, students will demonstrate the ability to interact effectively on a social and interpersonal level with fellow students, and will demonstrate the ability to divide up and share task responsibilities to complete assignments.

Course Outcomes (CO) – Electric And Hybrid Electric Vehicles

Course Description:

Course outcomes (CO) are statements that describe the specific knowledge, skills, and abilities that students are expected to acquire or demonstrate upon successfully completing a course on Electric and Hybrid Electric Vehicles (EVs and HEVs). These outcomes help both students and instructors understand the purpose and expectations of the course.

At the end of this course, students should be able to

CO1	Understand the fundamental principles of electric and hybrid electric vehicle technologies
CO2	Equip with the knowledge and tools to identify power quality issues in real-world electrical systems and analyze their causes and effects.
CO3	learn how to measure and monitor power quality parameters using appropriate instruments and techniques.
CO4	Developing troubleshooting skills to diagnose and rectify power quality issues in a systematic manner is essential. Students should be able to apply their knowledge to solve problems in practical scenarios.
CO5	learn how to analyze and protect against transient voltage spikes and surges that can damage equipment and disrupt operations.
CO6	Study the effects of harmonics on power quality and learn how to analyze harmonic distortion in electrical systems.

SUBJECT NAME- POWER SYSTEM OPERATION AND CONTROL SUBJECT CODE- (BTEEC701)

The primary objective of this course is to analyze efficient and optimum operation of electric power generation systems and to provide an overview about the control techniques adopted to ensure the economic operation of a power system. This course also introduces optimization methods and their application in practical power system operation problems. In this course, modern control system solution methods are employed for power generation system problems. This course provides application of modern numerical techniques and analytical methods for dealing with and solving operation-related problems in electric power systems. In addition, it further discusses some real-time practical power system problems and their solutions.

COURSE OUTCOME

CO1	Analyze the Load forecasting
CO2	Understand Unit Commitment
CO3	Plan generation scheduling
CO4	Build control of power systems
CO5	Model state estimation for power system
CO6	Apply power system operation techniques and control

SUBJECT NAME- **SUBJECT CODE-**

HIGH VOLTAGE ENGINEERING **BTEEC701**

This course is designed to review the fundamentals and practices of insulating materials and their applications in electrical and electronics engineering, breakdown phenomenon in insulating material (solid, liquid, and gases), generation and measurement of high D.C., A.C. and impulse voltages and currents, overvoltage phenomenon in electrical power system and insulation coordination, high voltage testing techniques.

COURSE OUTCOMES-

CO-1	Understand the concepts of high voltage engineering
CO-2	Learn the fundamental concept of electric breakdown in liquids, gases, and solids.
CO-3	Understand fundamental concepts of high voltage AC and DC
CO-4	Evaluate the form of discharges in Gaseous, Liquid and Solid dielectrics
CO-5	Understand fundamental concepts of high voltage impulse generation.
CO-6	Learn the techniques employed in high voltage measurements.

Course Outcomes (CO) – High VoltageEngineering Lab: BTEEL707

Course Description:

In this laboratory, course emphasis on imparting practical knowledge and understanding of high voltage testing equipment's, different insulating materials and its breakdown phenomenon, high voltage laboratories and testing of high voltage equipment. The lab course also provides the platform to understand generation and measurement of high voltages.

At the end of this course, students should be able to:

CO1	1. Apply the concepts of High Voltage Engineering through laboratory experimental work and Connect the circuit to perform experiments, measure, analyze the observed data to conclude
CO2	Evaluate the performance of breakdown testing of various dielectrics.
CO3	Calibrate the breakdown voltage of air using sphere-gap assembly.
CO4	Understand concept of Visualize and analyze the corona effect.
CO5	Understand the methods of generation and Measurement of high voltagesand testing of various electrical equipment's.
CO6	Understand the methods of generation and Measurement currents and testing of various electrical equipment's.

BIOMEDICAL INSTRUMENTATION

Course Description:

This course provides knowledge about biomedical instruments used in medical application medical recording and monitoring at patient monitoring system.

COURSE OUTCOMES

After successful completion of this lab course students will be able to:

CO1	Understand the importance of biomedical measurement in patient monitoring system.
CO2	Understand the application of the electronic systems in medical applications.
CO3	Understand and able to interpret the signals like ECG, EMG and EEG.
CO4	Understand the blood pressure measurement, causes of cardiac failure and remedies for cardiac failure.
CO5	Understand operation of modern imaging system and Electrotherapy equipment in medical diagnosis.
CO6	Understand applications of modern imaging system and Electrotherapy equipment in medical diagnosis.

SUBJECT NAME – ELECTRICAL UTILIZATION **SUBJECT CODE- BTEEPE703**

This course is mainly for Undergraduate Final Year Electrical Engineering students, which will introduce and explain the fundamental concepts in the field of electrical power system engineering. Electrical energy is able to adapt many different functions. Electrical energy has a great variety of applications. Electrical energy is an essential part of science and technology. The major utilization of electrical energy is to generate output from electrical and electronics devices. The advantage of electric power is its reliable and uninterrupted supply runs the equipment efficiently and continuously. The transportation of electricity is easy once the transmission lines are functional. They work for years and need no or very less maintenance. Less starting time − Electric locomotives can be stating without any loss of time. Less maintenance cost & time − The maintenance cost of an electric traction system is about half of that of steam traction system and also the time required for maintenance is quite low.

COURSE OUTCOME

CO1	Study Electric Traction system understand different kinds of drive and control systems as used in electric traction along with the details of its power supply arrangement.
CO2	Achieve thorough knowledge about series-parallel control of dc motors, multiple unit drive, current collecting device, and different braking schemes of electric traction.
CO3	Study Electric Drive and elevator used in industries
CO4	Study Electric Traction system motors.
CO5	Choose and adopt right kind of heating and welding processes depending upon the actual situation.
CO6	Choose appropriate lamps and lighting scheme and design for different applications, including street and flood lighting.

SUBJECT NAME- **SUBJECT CODE-**

INTRODUCTION TO INDUSTRY 4.0 ANDINDUSTRIAL INTERNET OF THINGS **BTEEPE801**

Industry 4.0 concerns the transformation of industrial processes through the integration of modern technologies such as sensors, communication, and computational processing. Technologies such as Cyber Physical Systems (CPS), Internet of Things (IoT), Cloud Computing, Machine Learning, and Data Analytics are considered to be the different drivers necessary for the transformation. Industrial Internet of Things (IIoT) is an application of IoT in industries to modify the various existing industrial systems. IIoT links the automation system with enterprise, planning and product lifecycle. This course has been organized into the following modules.

COURSE OUTCOMES-

CO-1	To acquire knowledge about the Sensing & actuation, Communication-Part I, Part II, Networking-Part I, Part II.
CO-2	To learn various Industry 4.0 Globalization and Emerging Issues, The Fourth Revolution, LEAN Production Systems, Smart and Connected Business Perspective, Smart Factories
CO-3	Industrial IoT- Layers: IIoT Sensing-Part I, Part II, IIoT Processing-Part I, Part II, IIoT Communication-Part I.
CO-4	Understanding the concept of Industrial IoT: Big Data Analytics and Software Defined Networks: IIoT Analytics - Introduction, Machine Learning and Data Science - Part I, Part II, R and Julia Programming, Data Management with Hadoop.
CO-5	Industrial IoT- Application Domains: Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management.

Course Outcomes (CO) – High Power Multi Converter BTEEC801

Course Description:

This course includes different types of high power converters used in the industry for applications in HVDC, FACTS, Motor Drives, Power quality improvement. Traditional converters like NPC and emerging converters like modular multilevel converters will be covered. Operational issues and design considerations for these medium/high voltage high power converters will be covered. The course will discuss many practical issues faced in the industry while designing and operation of these converters.

At the end of this course, students should be able to:

CO1	Analyze various phase shifting transformer configurations for multipulse converters
CO2	Evaluate various multi-level inverter configurations and design control schemes for them.
CO3	Design control scheme for current source PWM inverters
CO4	Analyze various configurations of back-back converter and matrix converter for ac-ac conversion
CO5	Design basic driver/gating and protection circuit.
CO6	To analyse different techniques to overcome problems in high power converter.