Vision (Electrical Department):

Development of all round, socially responsible, innovative electrical professionals and researchers leading to empowerment to serve needs of society, meet global challenges and emerge as Centre of Excellence.

Mission (Electrical Department):

M1: Establish vibrant learning environment to enable students for lifelong learning with ethical practices to face challenges of electrical engineering field and globalization by providing state-of-art infrastructural facilities.
M2: Promote active learning, critical thinking and engineering judgment coupled with business, entrepreneurial skills
M3: Expose to recent technological advancements and industrial professional practices.
M4: Introduce PG Programs and establish recognized research centre.
M5: Provide conducive environment and promote intellectual (scholarly) pursuits for encouraging innovation, research, real world problems with multidisciplinary approach.
M6: Offer consultancy and R&D services to various social, educational, industrial and commercial organizations for self reliance.
M7: Establish centre of excellence in the field of power quality and energy management

Program Education Objectives:

PEO1: To provide solid foundation in mathematics, science, humanity, environment and engineering fundamentals.

PEO2: To train students with wider electrical engineering concepts so as to comprehend, simulate, analyze, design, solve, draw inferences, realize and foster creativity, innovation and research to excel in technical field.

PEO3: To provide conducive academic environment to inculcate professional skills, ethical practices and soft skills leading to entrepreneurship development, enhancement of employability, success in competitive examinations and life-long learning.

PEO4: To relate engineering issues to socio-economic context with multidisciplinary approach to address the problem of real world.

Department of Electrical Engineering
K.K. Wagh Institute of Engineering Education and Research
Hirabai Haridas Vidyanagari, Amrut Dham, Panchavati, Nashik-422003

Program Outcomes (POs)		
PO1	**Engineering knowledge**	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis**	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design / Development of Solutions**	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct Investigations of Complex Problems**	Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment & Sustainability**	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and Team Work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Program Outcomes (POs)		
PO10	**Communication**	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance**	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life Long Learning**	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)	
PSO1	To apply fundamentals of Electrical Engineering to solve real time problems with social and multi-disciplinary approach.
PSO2	To model, simulate, analyze, critically evaluate and interpret the results with acquired professional skills and ethical practices, leading to enhancement of employability.

Department of Electrical Engineering
K.K. Wagh Institute of Engineering Education and Research
Hirabai Haridas Vidyanagari, Amrut Dham, Panchavati, Nashik-422003

Course Outcomes: 2018-2019

Course Outcomes (2015 Course) S.E_Semester 1

Course/COs	**Course outcomes of Power Generation Technology-203141**
203141.1/CO1	Identify operations of thermal power plant with all accessories and cycles.
203141.2/CO2	Aware of the principle of operation, components, layout, location, environmental and social issues of nuclear, diesel and gas power plant.
203141.3/CO3	Identify and demonstrate the components of hydro power plant and calculation of turbine required based on catchment area.
203141.4/CO4	Find the importance of wind-based energy generation along with its design, analysis and comparison.
203141.5/CO5	Apply solar energy in thermal and electrical power generation considering energy crisis, environmental and social benefits.
203141.6/CO6	Explain the operation of electrical energy generation using biomass, tidal, geothermal, hydel plants, fuel cell and interconnection with grid.
Course/COs	**Course outcomes of Engineering Mathematics-207006**
207006.1/CO1	Evaluate General solution of higher-order linear differential equation with constant coefficient using different Methods.
207006.2/CO2	Find Laplace transform, Inverse Laplace Transform for different functions using Definition, properties & its Applications
207006.3/CO3	Find Fourier transform & Inverse Fourier Transform for different functions Exhibits knowledge of Z transform and its properties
207006.4/CO4	Recognize nature of vector fields, use different vector differential operators & evaluate line, surface & Volume integrals & its Applications
207006.5/CO5	Analyze functions of complex variables in terms of continuity, differentiability and analyticity.
Course/COs	**Course outcomes of Material Science-203142**
203142.1/CO1	Categorize and classify different dielectric materials from

	Electrical Engineering applications point of view.
203142.2/CO2	Summarize properties and characteristics of different classes of insulating material and determine its breakdown strength with experimentation.
203142.3/CO3	Classify magnetic materials and elaborate applications and latest manufacturing technologies.
203142.4/CO4	Choose conducting materials for application in various electrical equipment.
203142.5/CO5	Apply the knowledge of nanotechnology, batteries and solar cell materials for various applications.
203142.6/CO6	Test and measure dielectric loss tangent, strength of solid, liquid and gaseous insulating material and flux density as per IS.
Course/COs	**Course outcomes of Analog and Digital Electronics-203143**
203143.1/CO1	Convert different types of numbering systems, perform arithmetic operations and use of K-map in SOP and POS form.
203143.2/CO2	Design and develop and sequential and combinational circuits using different types of flip-flops.
203143.3/CO3	Understand Op-amp in open and close loop configurations and various applications as comparator and operation of voltage regulator IC.
203143.4/CO4	Use of Op-amp in instrumentation amplifier and signal generators, precision rectifiers, filters and IC 555 for different applications.
203143.5/CO5	Use BJT as amplifier with various configurations and understand construction, working and characteristics of FET.
203143.6/CO6	Understand and analysis of single phase and three phase uncontrolled rectifier with different types of loads.
Course/COs	**Course outcomes of Electrical Measurement and Instrumenttation-203144**
203144.1/CO1	Understand various characteristic of measuring instruments, their classification and range extension technique using shunt and multiplier
203144.2/CO2	Classify resistance, apply measurement techniques for measurement of resistance, inductance and capacitance
203144.3/CO3	Explain construction, working principle and use of dynamometer

	type wattmeter for measurement of power under balance and unbalance condition, also classify special purpose measuring instruments.
203144.4/CO4	Explain construction, working principle of 1-phase and 3-phase Induction/static energy meters and calibration procedure, range extension of wattmeter with the help of instrument transformer.
203144.5/CO5	Use of CRO for measurement of various electrical parameters, importance of transducer, their classification, selection criterion and various applications.
203144.6/CO6	Measurement of various physical parameters using transducer
Course/COs	**Course outcomes of Soft Skill-203151**
203151.1/CO1	Do SWOT analysis.
203151.2/CO2	Develop presentation and take part in group discussion.
203151.3/CO3	Understand and Implement etiquettes in workplace and in society at large.
203151.4/CO4	Work in team with team spirit
203151.5/CO5	Utilize the techniques for time management and stress management.
Course/COs	**Course outcomes of Audit Course -I -203154**
203154.1/CO1	Differentiate between types of solar Concentrators
203154.2/CO2	Apply software tool for solar concentrators
203154.3/CO3	Design different types of Solar collectors and balance of plant

Department of Electrical Engineering
K.K. Wagh Institute of Engineering Education and Research
Hirabai Haridas Vidyanagari, Amrut Dham, Panchavati, Nashik-422003

Course Outcomes (2015 Course) S.E_Semester 2

Course/COs	Course outcomes of Power System I-203145
203145.1/CO1	Recognize different patterns of load curve, calculate different factors associated with it, demand supply balance and tariff structure for LT and HT consumers
203145.2/CO2	Select ratings and demonstrate features and application of different electrical equipment in power station and selection of overhead line insulators.
203145.3/CO3	Design and analyze of a transmission line considering mechanical aspects and be aware of construction, classification, dielectric stress in underground cables.
203145.4/CO4	Calculate and analyze resistance and inductance of overhead transmission line for different configurations.
203145.5/CO5	Calculate and analyze capacitance of overhead transmission line for different configurations with and without effect of earth.
203145.6/CO6	Classify, model and analyze transmission line using ABCD constants.
Course/COs	**Course outcomes of Electrical Machines I-203146**
203146.1/CO1	Evaluate performance parameters of transformer with experimentation and demonstrate construction along with specifications as per standards.
203146.2/CO2	Distinguish between various types of transformer connections as per vector groups with application and to perform parallel operation of three phase transformers.
203146.3/CO3	Classify and differentiate various types of DC machines with its applications.
203146.4/CO4	Select and draft specifications of DC motors for various applications along with speed control methods.
203146.5/CO5	Correlate between various power stages of Induction Motor using slip and draw equivalent circuit diagram.
203146.6/CO6	Test and analyse the performance of Induction Motor as per IS standard.

Course/COs	**Course outcomes of Network analysis-203147**
203147.1/CO1	Developing strong basics for network theory.
203147.2/CO2	Develop the problem-solving technique for networks by application of theorems.
203147.3/CO3	Understand the behavior of the network by analyzing its transient response.
203147.4/CO4	Understand the behavior of the network by analyzing its transient response by Appling Laplace.
203147.5/CO5	Develop the problem-solving technique for networks by application of two-port network.
203147.6/CO6	Apply their knowledge of network theory for designing special circuits like filters.
Course/COs	**Course outcomes of Numerical Methods and Computer Programming-203148**
203148.1/CO1	Develop algorithms and implement programs using C language for various numerical methods.
203148.2/CO2	Demonstrate types of errors in computation and their causes of occurrence
203148.3/CO3	Identify various types of equations and apply appropriate numerical method to solve different equations.
203148.4/CO4	Apply different numerical methods for interpolation, differentiation and numerical integration.
203148.5/CO5	Apply and compare various numerical methods to solve first and second order ODE.
203148.6/CO6	Apply and compare various numerical methods to solve linear simultaneous equations.
Course/COs	**Course outcomes of Fundamentals of Microprocessor & Microcontroller-203149**
203149.1/CO1	Differentiate between microprocessor and microcontroller.
203149.2/CO2	Describe the architecture and features of various types of microcontroller.
203149.3/CO3	Demonstrate programming proficiency using the various addressing modes and all types of instructions of the target

	microcontroller.
203149.4/CO4	Program using the capabilities of the stack, the program counters the internal and external memory, timer and interrupts and show how these are used to execute a programme.
203149.5/CO5	Write assemble assembly language programs on PC and download and run their program on the training boards.
203149.6/CO6	Write assembly language programs and download the machine code that will provide solutions real-world control problems such as fluid level control, temperature control, and batch processes
Course/COs	**Course outcomes of Audit Course -II -203155**
203154.1/CO1	Will be able to do design of Solar PV system for small and large installations
203154.2/CO2	Will be able to handle software tools for Solar PV systems

Department of Electrical Engineering
K.K. Wagh Institute of Engineering Education and Research
Hirabai Haridas Vidyanagari, Amrut Dham, Panchavati, Nashik-422003

Course Outcomes (2015 Course) T.E_Semester 1

Course/COs	Course outcomes of Industrial and Technology Manamgment-311121
311121.1/CO1	Possess knowledge of types of business organizations; explore the fundamentals of economics and Management.
311121.2/CO2	Understand the basic concepts of current trends in Production and inventory management and Quality management.
311121.3/CO3	Analyze and differentiate between marketing management and financial management.
311121.4/CO4	Recognize the importance of Motivation, Group dynamics, Team work, leadership skill and entrepreneurship.
311121.5/CO5	Explain the fundamentals of Human Resource management.
311121.6/CO6	Identify the importance of Intellectual property rights and understand the concept of patents.
Course/COs	**Course outcome of Advance Microcontroller and its Application-303141**
303141.1/CO1	Precise and elaborate PIC 18F458 Microcontroller internal Architecture.
303141.2/CO2	Discriminate architecture and behavior of different PIC 18F458 ports.
303141.3/CO3	Collate C language programming and MP-Lab for PIC 18F458.
303141.4/CO4	Programming of PIC18F458 in MPLAB Integrated Development Environment.
303141.5/CO5	Testing and validation of hardware connections with PIC 18F458 and use of Timer.
303141.6/CO6	Inference of serial port and Interrupt handling for PIC 18F458.
Course/COs	**Course outcomes of Electrical Machine-II-303142**
303142.1/CO1	Understand construction, working and the test methods for voltage regulation of synchronous generators
303142.2/CO2	Determine voltage regulation of synchronous generator by various methods and parallel operation by various methods for load

	sharing.
303142.3/CO3	understand working principle of synchronous motor and effect of excitation, load conditions on the performance and its applications
303142.4/CO4	Understand the various speed control methods of three phase induction motors.
303142.5/CO5	Understand construction, working of compensated and uncompensated of single-phase series motors and applications
303142.6/CO6	Understand construction, working, starting methods, merits and demerits of single-phase induction motors and comparison with three phase induction motor.
Course/COs	**Course outcomes of Power Electronics-303143**
303143.1/CO1	Develop characteristics of different power electronic switching devices.
303143.2/CO2	Reproduce working principle of power electronic DC-DC converters for different types of loads
303143.3/CO3	Reproduce working principle of power electronic single-phase AC-DC converters for different types of loads
303143.4/CO4	Reproduce working principle of power electronic three phase converters and AC Voltage Regulator for different types of loads
303143.5/CO5	Reproduce working principle of power electronic single-phase DC-AC converters.
303143.6/CO6	Design procedures and techniques of power electronics systems. Use and analyze three phase inverter circuits with 180 and 120 mode of conduction, harmonic elimination techniques. Need of Multilevel inverters.
Course/COs	**Course outcomes of Electrical Installation Maintenance and Testing-303144**
303144.1/CO1	Draw Single line diagram; differentiate various maintenance strategies and elaborate the concept of condition monitoring and its applications in industry.
303144.2/CO2	Test the transformer oil, reconditioning of oil as per IS/IEC, condition monitoring of various parts of transformer.
303144.3/CO3	Elaborate the various fault diagnostic methods for induction motor, fault monitoring methods & remedies.

303144.4/CO4	Test of power cables, induction motor, transformer and capacitor bank for analyzing causes of failure, abnormal conditions, troubleshooting & remedies.
303144.5/CO5	Calculate the voltage drops in ac distribution system for different supply system and. Select the economical conductor size for overhead system.
303144.6/CO6	Design, Test and estimate the earthing system for substation, residential and commercial buildings with its maintenance.
Course/COs	**Course outcomes of Seminar and Technical Communication - 303145**
303145.1/CO1	Relate with the current technologies and innovations in Electrical engineering.
303145.2/CO2	Improve presentation and documentation skill.
303145.3/CO3	Apply theoretical knowledge to actual industrial applications and research activity.
303145.4/CO4	Communicate effectively.
Course/COs	**Course outcomes of Audit Course III -303152 (A)**
303145.1/CO1	Will be able understand the wind energy system and as well generation of electricity by wind energy system
303145.2/CO2	Will be able to understand the various designs and types of wind machines, grid interaction, advantages and limitations of the technology
Course/COs	**Course outcomes of Audit Course III -303152 (B)**
303145.1/CO1	Will be able understand the Microcontroller MSP 430 and their Applications
303145.2/CO2	Will be able to understand the 16-bit MSP430 microcontroller architecture, Pin diagram, Memory organization of MSP430, special function registers, GPIO control.
303145.2/CO2	Will be able understand the Programming MSP430 in embedded C, Timers and RTC using MSP430, timer modes and its programming

Department of Electrical Engineering
K.K. Wagh Institute of Engineering Education and Research
Hirabai Haridas Vidyanagari, Amrut Dham, Panchavati, Nashik-422003

Course Outcomes (2015 Course) T.E_Semester 2

Course/COs	Course outcomes of Power System-II -303146
303146.1/CO1	Model and analyze short, medium and long transmission line with and without compensation
303146.2/CO2	State and prove the advantages and limitations of EHVAC transmission system and to calculate corona voltages and loss.
303146.3/CO3	Transform the power system quantities into per unit system and determine Y Bus and load flow analysis.
303146.4/CO4	Calculate and analyze currents and voltages in case of symmetrical fault and suggest suitable rating of circuit breaker.
303146.5/CO5	Calculate and analyze currents and voltages in case of unsymmetrical fault using symmetrical components,
303146.6/CO6	List and describe the classification and components of HVDC transmission along with controllers.
Course/COs	**Course outcomes of Control System-I -303147**
303147.1/CO1	Differentiate between various controls system and obtain transfer function of simple mechanical and electrical systems by classical control theory.
303147.2/CO2	Apply standard test signals to verify time domain specification of various types of systems.
303147.3/CO3	Analyze stability of system in time domain technique.
303147.4/CO4	Calculate frequency domain specifications and find out stability by using frequency domain analysis.
303147.5/CO5	Compare time and frequency response of second order system.
303147.6/CO6	Design and tuning of P, PI and PID controller by various technique and Obtain mathematical model of different control system components.
Course/COs	**Course outcomes of Utilization of Electrical Machines-303148**
303148.1/CO1	Able to summarize the principle of electric heating and welding and their applications. Also, able to design resistance furnaces.
303148.2/CO2	Understand and categorize electrochemical processes, their principle of operation and applications. Compare various

	refrigeration cycles and summarize working of Refrigerator and Air Conditioner.
303148.3/CO3	Able to understand various types of luminaries and design simple residential illumination schemes.
303148.4/CO4	Classify and compare various traction systems with their merits and demerits. Also, able to identify the parts and to sketch the block diagram of an electric locomotive with explanation of function of each block.
303148.5/CO5	Able to understand speed time curve and specific energy consumption. Calculate tractive effort, power, acceleration and velocity of traction.
303148.6/CO6	Understand electric braking methods, control of traction motors, train lighting and signaling system.
Course/COs	**Course outcomes of Design of Electrical Machines-303149**
303149.1/CO1	Understands various causes of heat development, various auxiliaries and detailed specifications of transformers as per IS 2026
303149.2/CO2	Understand various cooling methods, factors governing cooling methods, and estimation of winding parameters of transformers
303149.3/CO3	Understands the electro-mechanical design of transformers based on forces developed under short circuit conditions and use of software to design the transformers.
303149.4/CO4	Understands the effect of harmonic fields on the performance due to selecting slots in stator & rotor, factors to be considered designing the motors.
303149.5/CO5	Understands the significance of length of air gap, UMP and design the three-phase induction motor.
303149.6/CO6	Determine the performance of three-phase induction motor.
Course/COs	**Course outcomes of Energy Audit Management-303150**
303150.1/CO1	Explain existing Energy scenario, provision of Energy conservation act 2001, Electricity act 2003
303150.2/CO2	Apply Various principles and key elements of Energy management, Energy policy and Efficiency programs
303150.3/CO3	Differentiate supply side and demand side management and

	various DSM options, its application and role of tariff
303150.4/CO4	Explain procedure of detailed Energy audit with case studies and various data analysis tools, perform data analysis and various Instruments used to carry out Energy Audit
303150.5/CO5	Analyze, identify various Energy conservation opportunities and implement Energy conservation measures in various utilities
303150.6/CO6	Apply various financial tools including sensitivity analysis, study and analyze various case studies of Energy Audit
Course/COs	**Course outcomes of Electrical Workshop -303151**
303151.1/CO1	Integrate electrical/electronic circuits for useful applications
303151.2/CO2	Acquire hardware skills to fabricate circuits designed.
303151.3/CO3	Read data manuals/data sheets of different items involved in the circuits.
303151.4/CO4	Test and debug circuits.
303151.5/CO5	Produce the results of the testing in the form of report.
Course/COs	**Course outcomes of Audit Course IV -303153**
303153.1/CO1	Will be able understand the With TPS7A4901 and TPS7A8300, study
303153.2/CO2	Will be able understand the Study of DC-DC Buck converter

Department of Electrical Engineering
K.K. Wagh Institute of Engineering Education and Research
Hirabai Haridas Vidyanagari, Amrut Dham, Panchavati, Nashik-422003

Course Outcomes (2015 Course) B.E_Semester 1

Course/COs	Course outcomes of Power System Operation and Control-403141
403141.1/CO1	Identify and analyze the dynamics of power system and suggest means to improve stability of system
403141.2/CO2	Identify the effect of reactive power on Power system and suggest the suitable means of reactive power management
403141.3/CO3	Selection of appropriate FACTs technology
403141.4/CO4	Analyze the generation-load balance in real time operation and its effect on frequency and develop automatic control strategies with mathematical relations.
403141.5/CO5	Formulate objective functions for optimization tasks such as unit commitment and economic load dispatch to obtain solution using computational techniques.
403141.6/CO6	Evaluate reliability indices of Power system
Course/COs	**Course outcomes of PLC and SCADA Application-403142**
403142.1/CO1	Able to explain the necessity of PLC, to construct the block diagram and to list out functioning of PLC and also able to identify the more common machine control terminology.
403142.2/CO2	Identify the parts of an electrical machine control diagram including rungs, branches, rails, contacts, and loads. Recognize the diagramming symbols for common components such as switches, control transformers, relays, fuses, and time delay relays.
403142.3/CO3	Able to explain physical, electrical, functional characteristics and application of discrete and analog I/O; how these I/O systems provide the connection between PLCs and outside world.
403142.4/CO4	They will be able to write the knowledge to process control applications for development of ladder for various automation processes.
403142.5/CO5	Able to explain different components to make up a typical SCADA system, and the evolution of SCADA systems through its

	monolithic, distributed, and networked evolution. Able to list out and explain the various applications of SCADA system in real time processes for data acquisition and control.
403142.6/CO6	The students must be able to list out and explain the protocols for communicating information over networks such as the internet and explores proprietary and open protocols designed specifically for use in SCADA systems and to interface the PLC & SCADA system.
Course/COs	**Course outcomes of Elective-I (Power Quality) -403143**
403143.1/CO1	Understand/Identify importance of various power quality issues.
403143.2/CO2	Carry out power quality monitoring
403143.3/CO3	List and explain various causes and effects of power quality problems
403143.4/CO4	Analyze power quality parameters and carry out power quality analysis
403143.5/CO5	Select cost effective mitigation technique for various power quality problems
403143.6/CO6	Use IEEE 519-2014 power quality standard for harmonic compliance
Course/COs	**Course outcomes of Elective-II (Electric & Hybrid Vehicles)-403144**
403144.1/CO1	Explain the difference between HEV & EV.
403144.2/CO2	Describe various energy storage technologies for EV.
403144.3/CO3	Classify different types of balancing methods for battery.
403144.4/CO4	Compare series & parallel hybrid drive train.
403144.5/CO5	Explain suitability of Switch Reluctance Machine for EV.
403144.6/CO6	Describe the operation of vehicle to home (V2H).
Course/COs	**Course outcomes of Control System-II -403145**
403145.1/CO1	Design linear control system, common compensating network, find transfer function of lag, lead and simple lag-lead network, design using Bode diagram.
403145.2/CO2	Learn state space analysis, concept of diagonalization, eigen

	values, eigen vectors. know state transition matrix, its properties and various methods to determine it.
403145.3/CO3	Recognize controllability & observability of system., predict effect of pole zero cancellation on the controllability & observability of the system, duality property.
403145.4/CO4	Analyze nonlinearities in real life, common type of non-linearities, peculiar behavior of nonlinear system, describing function. tuning of PID controller, Ziegler-Nichol method.
403145.5/CO5	Learn reconstruction process, zero order hold (ZOH) and it's transfer function, solution using z transform method.
403145.6/CO6	Interpret general procedure for obtaining Pulse-transfer function, sampled data closed loop systems, physical realizability of discrete data system, realization of digital controller by various programming methods, Digital PID controller.
Course/COs	**Course outcomes of Project Phase I -403146**
403146.1/CO1	To develop skills for carrying literature survey and organize the material in proper manner.
403146.2/CO2	To provide opportunity of designing and building complete system/subsystem based on their knowledge acquired during graduation
403146.3/CO3	To understand the needs of society and based on it to contribute towards its betterment and to learn to work in a team.
403146.4/CO4	To explore and to acquire specified skill in areas related to Electrical Engineering
403146.5/CO5	To ensure the completion of given project such as fabrication, conducting experimentation, analysis, validation with optimized cost.
403146.6/CO6	To Collect the data in report form and represent and communicate findings of the completed work in written and verbal form.
Course/COs	**Course outcomes of Audit Course V -403152**
403152.1/CO1	Will be able understand the Hydro energy system and as well generation of electricity by wind energy system
403152.2/CO2	Will be able to understand the Software tools for simulation, validation and economics of hydro power

403152.3/CO3	Will be able to understand the Environmental impact of various capacity hydroelectric plants
403152.4/CO4	Will be able to understand the Energy conversion calculations

Department of Electrical Engineering
K.K. Wagh Institute of Engineering Education and Research
Hirabai Haridas Vidyanagari, Amrut Dham, Panchavati, Nashik-422003

Course Outcomes (2015 Course) B.E_Semester 2

Course/COs	Course outcomes of Switchgear and Protection -403147
403147.1/CO1	Able to identify various type of fault occurs on power system and explain the necessity of protection system. Explain and summarize the different principles of protection schemes, ability to identify DMT, IDMT type relays. Use of different type of relay as per their requirements.
403147.2/CO2	Discuss formation of an electric arc and various terms recovery and restriking voltage. Will be able to explain different arc interruption process.
403147.3/CO3	Understand and explain and select Air Blast circuit breakers, SF6 circuit breaker, Vacuum circuit breaker. Differentiate circuit breaker by their voltage requirement. Describe and select the ratings of circuit breaker as per IS/IEC standards.
403147.4/CO4	Distinguish different analog, static relay and numerical relay. Describe the concept of operating principle and block diagram of these relay. Also, able to explain use of PMU in power system protection. Identify the causes of over loading and suggest the proper protection scheme for three phase induction motor.
403147.5/CO5	Illustrate the various types of faults in transformer and alternator. Implement proper protection scheme and calculate CT ratio for transformer and alternator protection.
403147.6/CO6	Understand and explain bus bar protection schemes. Describe the concept of time graded and current graded system. Compare and select impedance relay, reactance relay, mho relay and quadrilateral relays for distance protection, also able to tell concept of insulation coordination and WAM.
Course/COs	**Course outcomes of Power electronics Controlled Drive -403148**
403148.1/CO1	Understand motor load dynamics and multi quadrant operation of drives
403148.2/CO2	Analyze operation of converter fed and chopper fed DC drives.

403148.3/CO3	Understand braking methods of D.C. and induction motor drive.
403148.4/CO4	Understand vector control for induction motor drives
403148.5/CO5	Understand synchronous motor drive.
403148.6/CO6	Understand classes and duty cycles of motor and applications of drives in industries.
Course/COs	**Course outcomes of Elective-III (HVDC and FACTS)-403149**
403149.1/CO1	Compare HVDC and EHV AC systems for various aspects.
403149.2/CO2	Reproduce the layout of HVDC system with various components including protective devices
403149.3/CO3	Differentiate VSC HVDC and conventional HVDC system
403149.4/CO4	Differentiate various types of Power Electronic Controllers
403149.5/CO5	Analyzemodeling of FACTs Controllers
403149.6/CO6	Simulate various controllers and HVDC systems using software's
Course/COs	**Course outcomes of Elective IV (Smart Grid)-403150**
403148.1/CO1	Justify Smart Grid fundamentals & case study, Barriers for Smart Grid implementation & CDM opportunities in Smart Grid, Comparison of Conventional grid & Smart Grid
403148.2/CO2	Describe AMR, OMS, PHEV, V2G, Home & Building Automation
403148.3/CO3	Describe Substation Automation, PMU, WAMS, GIS, Energy Storage
403148.4/CO4	Analyse Micro grid, Organic Solar Cell, Variable Speed Wind Turbines, Integration of Renewable Energy Resources
403148.5/CO5	Find and describe Power Quality & EMC issues of Smart Grid, Power Quality Audit
403148.6/CO6	Justify Cyber Security, Cloud Computing, Wi-Fi & Wi-Max, HAN, NAN, WAN
Course/COs	**Course outcomes of Project Phase II - 403146**
403146.1/CO1	To develop skills for carrying literature survey and organize the material in proper manner.
403146.2/CO2	To provide opportunity of designing and building complete system/subsystem based on their knowledge acquired during

	graduation
403146.3/CO3	To understand the needs of society and based on it to contribute towards its betterment and to learn to work in a team.
403146.4/CO4	To explore and to acquire specified skill in areas related to Electrical Engineering
403146.5/CO5	To ensure the completion of given project such as fabrication, conducting experimentation, analysis, validation with optimized cost.
403146.6/CO6	To Collect the data in report form and represent and communicate findings of the completed work in written and verbal form.
Course/COs	**Course outcomes of Audit Course VI -403153**
403153.1/CO1	Will be able understand Energy Storage Systems such as battery, battery types, supercapacitor, superconducting energy storage, flywheel,
403153.2/CO2	Will be able to understand the energy management strategies,
403153.3/CO3	Will be able to understand the case study of Design of a Battery Electric Vehicle (BEV)