

## **Course Outcomes (COs)**

The course outcomes of the courses offered during the year 2023-24 from 1<sup>st</sup> year to 4<sup>th</sup> year of the undergraduate course of Electrical Engineering Program are given below:

undergradua	te course of El	ectrical Engineering Program are given below:	
Courses		Course Outcome Statements	
	After the cor	npletion of this course, students will be able to:	
3100022: Basic	3100022.1	Solve dc & ac circuits by applying fundamental laws & theorems	
Electrical &	3100022.2	Analyze magnetic circuits and resonance characteristics of ac electric circuits	
Electronics Engineering	3100022.3	<b>Describe</b> the working principle, construction, applications of single phase transformer & rotating electrical machines	
	3100022.4	Select the logic gates for various applications in digital electronic circuits	
	3100022.5	Explain the characteristics and parameters of Diode and Transistor	
	After the completion of this course, students will be able to:		
	3100022.1	<b>Demonstrate</b> the ability to operate lab equipment and instruments relevant to the electrical engineering field	
3100022:	3100022.2	Collect experimental data accurately and effectively	
Basic Electrical & Electronics	3100022.3	<b>Integrate</b> theoretical knowledge from coursework into practical applications and experiments	
Engineering Lab	3100022.4	<b>Communicate</b> experimental results effectively through oral presentations and written documentation	
	3100022.5	<b>Demonstrate</b> responsibility and professionalism in the completion of lab tasks and assignments	
	3100022.6	Show willingness to learn new techniques, tools, or methods to enhance practical engineering skills	
	After the con	npletion of this course, students will be able to:	
	3130101.1	Develop algorithms and flowchart for a given problem	
3130101:	3130101.2	Describe the concepts of procedural programming	
Computer Programming	3130101.3	<b>Explain</b> the concepts of object oriented programming and its significance in the real world	
	3130101.4	Develop computer programs to solve real world problems	
	3130101.5	Debug program effectively	
	After the con	npletion of this course, students will be able to:	
3130102:	3130102.1	<b>Describe</b> the properties and applications of conducting materials.	
Electrical	3130102.2	<b>Explain</b> behavior of semiconductor materials, their classification and applications.	
Engineering Material	3130102.3	Select appropriate Magnetic materials for given applications.	
	3130102.4	Select appropriate insulating material depending upon specific requirement	
	3130102.5	<b>Discuss</b> the merits and demerits of nanomaterials in green technology	
2120201	After the con	npletion of this course, students will be able to:	
3130201 :Python	3130201.1	Interpret the fundamental Python syntax and semantics	
Programming	3130201.2	<b>Determine</b> the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets	



	2122201.2		
	3130201.3	<b>Identify</b> the commonly used operations involving file systems and regular expressions.	
	3130201.4	<b>Discuss</b> the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python.	
	3130201.5	Design GUI Applications in Python	
	After the co	mpletion of this course, students will be able to:	
2120202	3130202.1	Apply different networks laws & theorems for solving AC and DC electric networks.	
3130202: Network	3130202.2	Compute the two-port parameters for given two port networks	
Analysis	3130202.3	Solve series/parallel resonant and magnetically coupled circuits	
	3130202.4	Solve three-phase circuits under balanced & unbalanced conditions	
	3130202.5	Evaluate transient response behavior of a network for given initial conditions	
	After the co	mpletion of this course, students will be able to:	
3130203:	3130203.1	<b>Explain</b> the basic concepts of electrical and electronic measurement and measuring instruments.	
Electrical &	3130203.2	Compute errors in a measurement system	
Electronics	3130203.3	<b>Describe</b> the construction and working of AC and DC bridges and their applications	
Measurement	3130203.4	<b>Describe</b> digital measuring instrument, signal Generator, CRO for appropriate measurement	
	3130203.5	<b>Select</b> appropriate transducers and A/D & D/A converters for measurement of physical quantity	
	After the co	mpletion of this course, students will be able to:	
3000003:	3000003.1	Explain the fundamental concepts of energy, ecosystems & environment.	
Environmental	3000003.2	Recognize various environmental problems and their effects.	
Engineering	3000003.3	Apply various air & water remediation methods.	
	3000003.4	Apply waste management techniques.	
	3000003.5	Apply the concepts of sustainability	
	After the co	mpletion of this course, students will be able to:	
3130203:	3130102.1	Handle an instrument and perform basic calibration	
Electrical & Electronics	3130102.2	<b>Estimate</b> the deviations in measurements due to possible errors and measures to minimize them based on their characteristics.	
Measurement	3130102.3	Measure unknown resistance, inductance and capacitance	
Lab	3130102.4	Acquire teamwork skills for working effectively in groups	
	3130102.5	Prepare technical report on experiments conducted in the lab	
	After the completion of this course, students will be able to:		
2130311:	2130311.1	Apply vector calculus to understand the behavior of static electric fields in engineering configurations	
Electromagnetic Field Theory	2130311.2	<b>Describe</b> Maxwell's equations in differential and integral forms and apply them to diverse engineering problems	
	2130311.3	<b>Formulate</b> engineering problems of Electromagnetic, Electrostatic and Magnetic to Static circuits using Basic relations.	
	2130311.4	<b>Explain</b> the nature of Electromagnetic wave propagation and wave polarization.	
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	2130311.5	Solve engineering problems of Electromagnetic
	After the co	mpletion of this course, students will be able to:
	2130312.1	<b>Explain</b> the principles and construction of different AC and DC machines.
	2130312.2	<b>Discuss</b> the fundamental control practices such as starting, reversing, braking, plugging
2130312:		etc associated with AC and DC machines.
Electric Machines-	2130312.3	Analyze the performance of AC and DC machines.
Ι	2130312.4	<b>Develop</b> the equivalent circuits and compute the induced emf, torque, efficiency, losses
		etc.
	2130312.5	Describe various tests conducted for evaluating the performance of AC and DC
		machines.
	2130312.6	Evaluate the performance of machines under different operating conditions
2130313:	After the con	mpletion of this course, students will be able to:
Power		
System –I	2130313.1	Describe the general structure of power systems
	2130313.2	Develop the knowledge of generation of electricity based on conventional and
		nonconventional energy sources
	2130313.3	Determine the transmission line parameters
	2130313.4	Analyze the performance of overhead transmission line
	2130313.5	Describe the concept of power plant economics
	2130313.6	Explain different types of tariffs and power factor improvement techniques
2130314:	After the co	mpletion of this course, students will be able to:
Analog & Digital		
Electronics	2130314.1	Explain working principles of electronic devices e.g. Diode, Transistor, Amplifier, and
		Op-Amp.
	2130314.2	Categorize the different types of diode, Amplifier, Op-Amp, Flip-flop, logic gates and
		counters.
	2130314.3	Describe the various mathematical models of transistors
	2130314.4	Apply the various principles of digital electronics to design different types of Digital
		Electronics circuits for various applications.
	2130314.5	Evaluate the working of various digital electronics circuits like multiplexer, coder
		circuits, shift registers & counter
2130315:	After the co	mpletion of this course, students will be able to:
Self-Learning/	2120215.1	
Presentation	2130315.1	Refer various technical recourses available from multiple field
	2130315.2	Adhere to deadlines and commitment to complete the assignment
	2130315.3	Improve performance in self-learning domain
2120216	2130315.4	Acquire additional knowledge for competitive examinations
2130316:		mpletion of this course, students will be able to:
Summer Internship		
Project	2130316.1	Relate the theoretical aspects learned in classes into practical world
	2130316.2	Apply the new skills and supplement knowledge other than curriculum
	2130316.3	Practice communication and teamwork skills
	2130316.4	Apply the knowledge for placement & higher education
<u> </u>	2130316.5	Troubleshoot the problems related to particular experiment
2120212.	Aller the col	mpletion of this course, students will be able to:
2130312: Electric	2120212.1	Drow abaracteristics of electric machine for a specific rumase requirement
Electric Machines	2130312.1	<b>Draw</b> characteristics of electric machine for a specific purpose, requirement.
Lab-I	2130312.2	<b>Determine</b> the efficiency, regulation of any transformer.
La0-1	2130312.3	Integrate theoretical knowledge from coursework into practical applications and experiments
	ma Statamanta /	



	2130312.4	<b>Develop</b> the ability to work is team and learns professional ethics	
	2130312.5	Prepare an organized written engineering report	
	After the completion of this course, students will be able to:		
2130313:	2130313.1	Simulate the performance of the Transmission line using MATLAB Simulink environment.	
Power	2130313.2	Integrate theoretical knowledge from coursework into practical applications and	
System Lab-I		experiments	
Lao-I	2130313.3	<b>Show</b> willingness to learn new techniques, tools, or methods to enhance practical engineering skills	
	2130313.4	Develop teamwork skills for working effectively in groups	
	2130313.5	Prepare an organized written engineering report	
	After the co	mpletion of this course, students will be able to:	
2130314:	2130314.1	Integrate theoretical knowledge from coursework into practical applications and	
Analog & Digital	0100014.0	experiments	
Electronics Lab	2130314.2	Show willingness to learn new techniques, tools, or methods to enhance practical	
	2130314.3	engineering skills Develop teerwark skills for working offectively in groups	
	2130314.3	Develop teamwork skills for working effectively in groups	
		Prepare an organized written engineering report mpletion of this course, students will be able to:	
	Alter the co	inpletion of this course, students will be able to:	
	2130411.1	Explain the constructional details and working principle and various configurations	
		of three phase transformers.	
	2130411.2	Analyze the performance of 3-phase induction and synchronous machines using	
2130411:		equivalent circuits & phasor diagrams under different loading conditions.	
Electrical	2130411.3	Calculate voltage regulation of three phase synchronous machines	
Machines-II	2130411.4	Determine time constant, various sequence reactance and equivalent circuit	
		parameters under transient conditions for synchronous machines.	
	2130411.5	Analyze the effects of excitation and mechanical input on the operation of	
		synchronous machines.	
	2130411.6	Analyze the behavior of synchronous machine connected to infinite bus and parallel	
		operation of alternators.	
	After the co	mpletion of this course, students will be able to:	
	2130412.1	Explain the concepts of single line diagram and per unit system	
	2130412.2	Apply different load flow techniques to solve load flow problem	
2130412:	2130412.3	Perform fault calculations for symmetrical and unsymmetrical faults	
Power System-II	2130412.4	Explain the theoretical and practical aspects of Power System Stability, and its	
		enhancement	
	2130412.5	Elucidate the automatic generation control reactive power, voltage control, series an	
	0100115	shunt compensation	
	2130412.6	<b>Discuss</b> the insulation resistance, capacitance of various types of cables and the need	
	A.C. 1	of HVDC transmission.	
3130413:		mpletion of this course, students will be able to:	
Microprocessors & Embedded	2130413.1	<b>Describe</b> the fundamentals of microprocessor along with the peripheral interface devices.	
Systems	2130413.2	Describe architecture, memory organization, operation and interfacing of	
		8051microcontroller.	



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	2130413.3	Create Arduino development program using libraries for communication with devices
		& sensors.
	2130413.4	Configure Raspberry Pi in Python environment
	2130413.5	Develop interfacing between different sensors and Arduino / Raspberry Pi
	After the co	mpletion of this course, students will be able to:
3130414:	2130414.1	Develop the understanding of renewable energy sources.
Renewable Energy	2130414.2	<b>Investigate</b> the solar PV & wind energy operation and find their performance curves.
Lab	2130414.3	Examine smart house & load analysis kit.
	2130414.4	<b>Develop</b> teamwork skills for working effectively in groups.
	2130414.5	<b>Prepare</b> a technical report on experiments conducted in the lab.
	After the co	mpletion of this course, students will be able to:
	3100009.1	Explain the terminologies of Cyber Security, networking & Internet.
3100009:	3100009.2	Analyze methods used to protect data in the internet environment in real world
Cyber Security		situations.
	3100009.3	Discover the concept of IP security & architecture.
	3100009.4	<b>Compare</b> the types of Cyber security threats/vulnerabilities.
	3100009.5	<b>Develop</b> the understanding of cybercrime investigation and IT ACT 2000.
	After the co	mpletion of this course, students will be able to:
	2130411.1	<b>Demonstrate</b> the fundamental control practices associated with AC machines such as
2130411:		starting, reversing, braking, plugging, etc.).
Electric Machine	2130411.2	<b>Conduct</b> test on electrical machines for computing the efficiency, regulation and
Lab-II		parameters of equivalent circuit.
	2130411.3	<b>Develop</b> the ability to work is team with professional ethics
	2130411.4	Prepare an organized written report
	2130411.4	<b>Demonstrate</b> the fundamental control practices associated with AC machines such as
		starting, reversing, braking, plugging, etc.).
	After the co	mpletion of this course, students will be able to:
	2130412.1	Demonstrate the ability to operate lab equipment and instruments relevant to the
		electrical engineering field
2120412.	2130412.2	Collect experimental data accurately and effectively
2130412:	2130412.3	Integrate theoretical knowledge from coursework into practical applications and
Power System Lab -II		experiments
Lau -II	2130412.4	<b>Communicate</b> experimental results effectively through oral presentations and written
		documentation
	2130412.5	Demonstrate responsibility and professionalism in the completion of lab tasks and
		assignments
	2130412.6	Show willingness to learn new techniques, tools, or methods to enhance practical
		engineering skills
2130413:	After the completion of this course, students will be able to:	
Microprocessors		
& Embedded	2130413.1	Implement the program on 8085 kit.
Systems Lab	2130413.2	Develop the programs for 8051 interfacing
	2130413.3	Design the hardware for different IoT applications using Arduino/Raspberry PI and
		Sensors
	2130413.4	Develop teamwork skills for working effectively in groups.
1	2130413.5	Prepare technical report on experiments conducted in the lab



	After the co	mpletion of this course, students will be able to:
	Alter the co.	inpletion of this course, students will be able to.
	2130511.1	Explain the process of sampling and the effects of under sampling.
	2130511.2	<b>Classify</b> systems based on their properties and determine the response of LSI system
2130511:		using convolution.
Signals &	2130511.3	Apply the concepts of linear algebra to signals.
Systems	2130511.4	Analyze the spectral characteristics of continuous-time periodic and a periodic signal
2		using Fourier analysis.
	2130511.5	Analyze system properties based on impulse response and Fourier analysis.
	2130511.6	Apply the Laplace transform and Z- transform for analysis of continuous-time and
		discrete-time signals and systems
	After the co	mpletion of this course, students will be able to:
	2130512.1	Develop mathematical models of mechanical system, electrical system and
		electromechanical system.
2130512:	2130512.2	<b>Represent</b> the complex system into standard canonical form by signal flow graph and
Control System		block diagrams reduction rules.
	2130512.3	<b>Compute</b> the time and frequency-domain responses of first and second-order systems
		to standard inputs.
	2130512.4	Formulate control engineering problems in state-variable form.
	2130512.5	<b>Evaluate</b> the stability of a closed-loop control system in time-domain as well as in
		frequency-domain.
	After the co	mpletion of this course, students will be able to:
	0100510.1	
	2130513.1	<b>Explain</b> static & dynamic characteristics of power electronics devices like Diode SCR,
	2120512.2	BJT, MOSFET and IGBT. etc
2130513: Power	2130513.2	Explain the configuration of different commutation methods.
Electronics	2130513.3	<b>Describe</b> the configuration of AC to DC converter, Dual converter, chopper, cyclo- converter.
	2130513.4	<b>Develop</b> different model of different converters to calculate their performance
	2130313.4	parameter
	2130513.5	Identify the problems/limitations of power electronics devices, converters and suggest
	2150515.5	solution
	After the co	mpletion of this course, students will be able to:
		inflution of this course, students will be usic to:
	2130514.1	Explain the concepts, theories and features associated with protective devices and
		circuit breakers.
0100514	2130514.2	Classify relays and circuit breakers based on criterion such as construction, type of
2130514:		supply, working principle, actuating quantities.
Switchgear & Protection	2130514.3	Select relays and circuit breakers for specific equipments and applications.
Protection	2130514.4	<b>Design</b> protection schemes for generators, motors, transformers and transmission lines.
	2130514.5	Analyze the behavior and performance of relays under different loading levels and
		faults.
	2130514.6	Select the protective devices and their locations for protecting power systems against
		over voltages.
	After the completion of this course, students will be able to:	
2130515:	2130515.1	Describe Data Science techniques and various tools such as file execution, variable
Data Sciences		creations, etc.
	2130515.2	Use control structures and exploratory data analysis for Data processing.
	2130515.3	Evaluate the nature of data using descriptive statistics.

2130515.4         Apply Data cleaning techniques for effective interpretation.           2130515.5         Apply data science techniques to analyze and optimize within the field of electrical engineering, including power systems, electrical machine learning and control smart grids, and renewable energy           After the completion of this course, students will be able to:           2130512.5           Control System           Lab           2130513.1           Control System           Lab           2130512.4           Integrate the corrected knowledge from coursework into practical applications and experiments           2130512.4           Proper a technical report on experiments conducted in the lab.           After the completion of this course, students will be able to:           2130513.1           Penomstrate VI characteristics of Semiconductor Devices and Various Firing scheme of SCR.           Power Electronics           2130513.1           Demonstrate VI characteristics of semiconductor Devices and Various Firing scheme of SCR.           2130513.5           Proper an organized written report.           2130514.5           Viriols approxemance of single and three phases VSI Inverter.           2130514.1         Validate the characteristics & performance of various Relays           Protection         Propera an organized written repor		Estd. 1957	माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (M.P.), INDIA Deemed University (Declared under Distinct Category by Ministry of Education, Government of India) NAAC ACCREDITED WITH A++ GRADE DEPARTMENT OF ELECTRICAL ENGINEERING
2130515.5         Apply data science techniques to analyze and optimize within the field of electrical engineering, including power systems, electrical machine learning and control smart grids, and renewable energy           After the completion of this course, students will be able to:           2130512:           Control System           Lab           2130512:           Control System           Lab           2130512:           2130512:           Control System           Lab           2130512:           Develop teamwork skills for working effectively in groups.           2130512:           Develop teamwork skills for working effectively in groups.           2130513:           Power Electronics           2130513:           Power the completion of this course, students will be able to:           2130513:           Pomenstrate the performance of same and hare phases Not Nerver.           2130513:           Prepare an organized written report.           2130514:           Validate the characteristics & performance of various Relays           Protection           2130514:           Validate the characteristics & performance of various Relays           Protection           2130514:         Validate the characte		2120515 4	Annha Data alagning tashni suga fan affasting intermedation
Image: constraint of the completion of this course, students will be able to:           2130512:         2130512:1           Control System Lab         2130512:1           2130512:         110512:2           Control System Lab         2130512:3           2130512:         1230512:3           2130512:4         Prepare a technical report on experiments conducted in the lab.           2130513:         Develop teamwork skills for working effectively in groups.           2130513:         2130513:1           Power Electronics         2130513.2           Power Electronics         2130513.3           Compare the performance of various converters AC to DC and DC to AC converter           2130513:         Demonstrate the performance of converters in its different modes of operation.           2130514:         Validate the characteristics & performance of various converters AC to DC and DC to AC converter           2130514:         Demonstrate the performance of converters in its different modes of operation.           2130514:         Validate the characteristics & performance of various Relays           Protection         2130514.1         Validate the characteristics & performance of various Relays           Protection         2130515.1         Validate the characteristics & performance of various Relays           Protection         2130515.1         Validate th			
After the completion of this course, students will be able to:           2130512:         2130512.1           Control System Lab         2130512.3           Develop teamwork skills for working effectively in groups.           2130512.4         Prepare a technical report on experiments conducted in the lab.           After the completion of this course, students will be able to:           2130513:         Develop teamwork skills for working effectively in groups.           2130513:         Demonstrate VI characteristics of Semiconductor Devices and Various Firing scheme of SCR.           Power Flectronics         2130513.2         Demonstrate the performance of various converters AC to DC and DC to AC converter Lab         2130513.3           Compare the performance of single and three phases VSI Inverter.         2130513.5         Prepare an organized written report.           2130513.5         Prepare an organized written report.         2130514.1         Validate the characteristics & performance of various Relays           Protoction Lab         2130514.1         Validate the characteristics & performance of various Relays           Protoction Lab         2130515.1         Develop the ability to work in a team 2130515.2         Develop the ability to work in a team 2130515.3         Prepare an organized written report.           2130515.1         Validate the characteristics & performance of various Relays         Prepare 2130515.3         Prepare an organized		2100010.0	
2130512:       2130512.1       Integrate theoretical knowledge from coursework into practical applications and experiments         2130512:       2130512.2       Investigate the properties of different Controllers.         2130512:       2130512.3       Develop teamwork skills for working effectively in groups.         2130512:       2130512.4       Prepare a technical report on experiments conducted in the lab.         After the completion of this course, students will be able to:       2130513:         Power Electronics       2130513.2       Demonstrate the performance of various converters AC to DC and DC to AC converter         Lab       2130513.1       Demonstrate the performance of single and three phases VSI Inverter.         2130513:       Compare the performance of converters in its different modes of operation.         2130513:       Develop the ability to work is team and learns professional ethics.         After the completion of this course, students will be able to:         2130514:       Validate the characteristics & performance of various Relays         Prepare an organized written report.       2130514.3         Lab       2130514.3       Develop the ability to work in a team         2130515:       Virie the programs using libraries NumPy, Matplotlib to work with the datasets         2130515:       2130515.1       Write the real-world problems.         2130515:       2130515.2 </td <td></td> <td></td> <td></td>			
2130512:       experiments       Control System         Lab       2130512.2       Investigate the properties of different Controllers.         2130512.3       Develop teamwork skills for working effectively in groups.         2130512.4       Prepare a technical report on experiments conducted in the lab.         After the completion of this course, students will be able to:         2130513:       Demonstrate the performance of Semiconductor Devices and Various Firing scheme of SCR.         Power Flectronics       2130513.2       Demonstrate the performance of converters AC to DC and DC to AC converter         Lab       2130513.4       Demonstrate the performance of converters in its different modes of operation.         2130513.5       Prepare an organized written report.       2130513.6         2130514.4       Develop the ability to work is team and learns professional ethics.         After the completion of this course, students will be able to:       2130514.2         2130515.1       Vrite the programs using libraries NumPy, Matplotlib to work with the datasets         2130515.2       Demonstrate technical skills related to data science         2130515.3       Prepare an organized written report.         2130515.4       Develop the ability to work is team and learns professional ethics.         After the completion of this course, students will be able to:         2130515.1       Write the pre		After the con	mpletion of this course, students will be able to:
Lab       2130512.3       Develop teamwork skills for working effectively in groups.         2130512.4       Prepare a technical report on experiments conducted in the lab.         After the completion of this course, students will be able to:         2130513:       2130513.1         Demonstrate Ul characteristics of Semiconductor Devices and Various Firing scheme of SCR.         Power Electronics       2130513.2         2130513.4       Demonstrate the performance of various converters AC to DC and DC to AC converter         2130513.5       Demonstrate the performance of converters in its different modes of operation.         2130513.6       Develop the ability to work is team and learns professional ethics.         After the completion of this course, students will be able to:         2130514:       Validate the characteristics & performance of various Relays         Protection       2130514.2       Prepare an organized written report.         2130515:       2130515.1       Write the programs using libraries NumPy, Matplotlib to work with the datasets         2130515:       2130515.3       Prepare an organized written report.         2130515.4       Develop the ability to work is team and learns professional ethics.         After the completion of this course, students will be able to:       2130515.3         2130515.4       Develop the ability to work is team and learns professional ethics. <t< td=""><td></td><td>2130512.1</td><td></td></t<>		2130512.1	
2130512.3         Develop teamwork skills for working effectively in groups.           2130512.4         Prepare a technical report on experiments conducted in the lab.           After the completion of this course, students will be able to:         2130513:           Power Flectrones         2130513.2         Demonstrate VI characteristics of Semiconductor Devices and Various Firing scheme of SCR.           Power Flectrones         2130513.3         Compare the performance of various converters AC to DC and DC to AC converter 2130513.5           Prepare an organized written report.         2130513.6         Develop the ability to work is team and learns professional ethics.           After the completion of this course, students will be able to:         2130514.1         Validate the characteristics & performance of various Relays           2130514:         Switchgear & 2130514.1         Validate the characteristics & performance of various Relays           2130515.4         Prepare an organized written report.         2130514.3           2130515.4         Prepare an organized written report.         2130515.4           2130515.5         Develop the ability to work is team and learns professional ethics.           After the completion of this course, students will be able to:         2130515.4           2130515.5         Develop the ability to work is team and learns professional ethics.           2130515.6         Develop the ability to work is team and learns professio	-	2130512.2	Investigate the properties of different Controllers.
After the completion of this course, students will be able to:           2130513:         2130513.1           Power Flectronies         2130513.2           Lab         2130513.3           Compare the performance of various converters AC to DC and DC to AC converter           2130513.4         Demonstrate the performance of converters in its different modes of operation.           2130513.5         Prepare an organized written report.           2130513.6         Develop the ability to work is team and learns professional ethics.           After the completion of this course, students will be able to:           2130514.1         Validate the characteristics & performance of various Relays           Protection         2130514.3         Develop the ability to work in a team           2130514.4         Learn professional ethics.         After the completion of this course, students will be able to:           2130515.5         Damostrate technical skills related to data science         2130515.4           Data Science Lab         2130551.4         Write the programs using libraries NumPy, Matplotlib to work with the datasets           2130515.4         Develop the ability to work is team and learns professional ethics.           After the completion of this course, students will be able to:           2130515.4         Develop the ability to work is team and learns professional ethics.           After the comple	Lau	2130512.3	Develop teamwork skills for working effectively in groups.
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	130507.4	Acquire additional knowledge helpful for competitive examinations.	
	After the completion of this course, students will be able to:		
120717	130717.1	Analyze the operating principles and characteristics of traction motors with respect to speed, temperature, loading condition	
130717:	130717.2	Describe different types of heating and welding techniques	
Utilization of	130717.3	Explain principles of illumination and its measurement	
Electrical Energy	130717.4	Explain basic principle of electric traction including speed-time curves of different traction services	
	130717.5	<b>Describe</b> braking, acceleration and other related parameters of traction system, including demand side management.	
130718: Electric Drives	After the co	mpletion of this course, students will be able to:	
	130718.1	<b>Describe</b> various components of a drive system along with modes of operation, control needs and identify stable/unstable regions	
	130718.2	<b>Explain</b> various drives & loads, their characteristics and control methods under various operating	
	130718.3	Explain performance analysis & control of ac &dc drives	
	130718.4	Describe working static converters for speed control of different types of drives	
	130718.5	Explain the functioning of solar, battery powered and traction drives and explain	
		energy conservation methods	
	After the co	mpletion of this course, students will be able to:	
120710	130719.1	Interpret the environmental importance of electric vehicles and their role in society.	
130719:	130719.2	Analyze electric drive train topologies and propulsion mechanisms used in EVs	
Electric Vehicle	130719.3	Design energy storage and management strategies for V2G and G2V concepts.	
	130719.4	Analyze dynamics of EVs for constant and variable tractive efforts and charging.	
	130719.5	Select different components and sizes of EVs.	
	After the co	mpletion of this course, students will be able to:	
910205:	910205.1	<b>Discuss</b> the safety procedures involved with electrical equipment.	
Applications of	910205.2		
Electrical	710203.2	<b>Describe</b> the working principle of substation equipment	
		<b>Describe</b> the working principle of substation equipment <b>Explain</b> the basics of lighting and illumination and its parameters and able to design	
Equipment &	910205.3	Explain the basics of lighting and illumination and its parameters and able to design	
Equipment & Motors	910205.3	<b>Explain</b> the basics of lighting and illumination and its parameters and able to design Illumination systems for various applications.	
		<ul><li>Explain the basics of lighting and illumination and its parameters and able to design Illumination systems for various applications.</li><li>Apply the electrical energy applications for traction and understand the power</li></ul>	
	910205.3 910205.4	<ul> <li>Explain the basics of lighting and illumination and its parameters and able to design Illumination systems for various applications.</li> <li>Apply the electrical energy applications for traction and understand the power electronics technology in efficient utilization of electrical power.</li> </ul>	
Motors	910205.3 910205.4	<ul><li>Explain the basics of lighting and illumination and its parameters and able to design Illumination systems for various applications.</li><li>Apply the electrical energy applications for traction and understand the power</li></ul>	
	910205.3 910205.4 After the co	<ul> <li>Explain the basics of lighting and illumination and its parameters and able to design Illumination systems for various applications.</li> <li>Apply the electrical energy applications for traction and understand the power electronics technology in efficient utilization of electrical power.</li> <li>mpletion of this course, students will be able to:</li> </ul>	
Motors	910205.3 910205.4 After the co 910206.1	<ul> <li>Explain the basics of lighting and illumination and its parameters and able to design Illumination systems for various applications.</li> <li>Apply the electrical energy applications for traction and understand the power electronics technology in efficient utilization of electrical power.</li> <li>mpletion of this course, students will be able to:</li> <li>Explain fundamentals of sensors &amp; transducers.</li> </ul>	
Motors 910206:	910205.3 910205.4 After the co 910206.1 910206.2	<ul> <li>Explain the basics of lighting and illumination and its parameters and able to design Illumination systems for various applications.</li> <li>Apply the electrical energy applications for traction and understand the power electronics technology in efficient utilization of electrical power.</li> <li>mpletion of this course, students will be able to:</li> <li>Explain fundamentals of sensors &amp; transducers.</li> <li>Describe physical principles of sensing.</li> </ul>	
Motors 910206: Sensor	910205.3 910205.4 After the co 910206.1 910206.2 910206.3	<ul> <li>Explain the basics of lighting and illumination and its parameters and able to design Illumination systems for various applications.</li> <li>Apply the electrical energy applications for traction and understand the power electronics technology in efficient utilization of electrical power.</li> <li>mpletion of this course, students will be able to:</li> <li>Explain fundamentals of sensors &amp; transducers.</li> <li>Describe physical principles of sensing.</li> <li>Compare various sensor materials and technology used in designing sensors.</li> </ul>	
Motors 910206: Sensor	910205.3 910205.4 After the co 910206.1 910206.2 910206.3 910206.4	<ul> <li>Explain the basics of lighting and illumination and its parameters and able to design Illumination systems for various applications.</li> <li>Apply the electrical energy applications for traction and understand the power electronics technology in efficient utilization of electrical power.</li> <li>mpletion of this course, students will be able to:</li> <li>Explain fundamentals of sensors &amp; transducers.</li> <li>Describe physical principles of sensing.</li> <li>Compare various sensor materials and technology used in designing sensors.</li> <li>Select appropriate sensor for given application.</li> </ul>	
Motors 910206: Sensor	910205.3 910205.4 After the co 910206.1 910206.2 910206.3 910206.4 910206.5	<ul> <li>Explain the basics of lighting and illumination and its parameters and able to design Illumination systems for various applications.</li> <li>Apply the electrical energy applications for traction and understand the power electronics technology in efficient utilization of electrical power.</li> <li>mpletion of this course, students will be able to:</li> <li>Explain fundamentals of sensors &amp; transducers.</li> <li>Describe physical principles of sensing.</li> <li>Compare various sensor materials and technology used in designing sensors.</li> <li>Select appropriate sensor for given application.</li> <li>Recognize the latest trends in the field of sensor.</li> </ul>	
Motors 910206: Sensor Technology	910205.3 910205.4 After the co 910206.1 910206.2 910206.3 910206.4 910206.5	<ul> <li>Explain the basics of lighting and illumination and its parameters and able to design Illumination systems for various applications.</li> <li>Apply the electrical energy applications for traction and understand the power electronics technology in efficient utilization of electrical power.</li> <li>mpletion of this course, students will be able to:</li> <li>Explain fundamentals of sensors &amp; transducers.</li> <li>Describe physical principles of sensing.</li> <li>Compare various sensor materials and technology used in designing sensors.</li> <li>Select appropriate sensor for given application.</li> </ul>	
Motors 910206: Sensor Technology 130720:	910205.3 910205.4 After the co 910206.1 910206.2 910206.3 910206.4 910206.5 After the co	<ul> <li>Explain the basics of lighting and illumination and its parameters and able to design Illumination systems for various applications.</li> <li>Apply the electrical energy applications for traction and understand the power electronics technology in efficient utilization of electrical power.</li> <li>mpletion of this course, students will be able to:</li> <li>Explain fundamentals of sensors &amp; transducers.</li> <li>Describe physical principles of sensing.</li> <li>Compare various sensor materials and technology used in designing sensors.</li> <li>Select appropriate sensor for given application.</li> <li>Recognize the latest trends in the field of sensor.</li> </ul>	
Motors 910206: Sensor Technology 130720: Electrical Drives	910205.3 910205.4 After the co 910206.1 910206.2 910206.3 910206.3 910206.4 910206.5 After the co 130720.1	<ul> <li>Explain the basics of lighting and illumination and its parameters and able to design Illumination systems for various applications.</li> <li>Apply the electrical energy applications for traction and understand the power electronics technology in efficient utilization of electrical power.</li> <li>mpletion of this course, students will be able to:</li> <li>Explain fundamentals of sensors &amp; transducers.</li> <li>Describe physical principles of sensing.</li> <li>Compare various sensor materials and technology used in designing sensors.</li> <li>Select appropriate sensor for given application.</li> <li>Recognize the latest trends in the field of sensor.</li> <li>mpletion of this course, students will be able to:</li> </ul>	
Motors 910206: Sensor Technology 130720:	910205.3 910205.4 After the co 910206.1 910206.2 910206.3 910206.4 910206.5 After the co	<ul> <li>Explain the basics of lighting and illumination and its parameters and able to design Illumination systems for various applications.</li> <li>Apply the electrical energy applications for traction and understand the power electronics technology in efficient utilization of electrical power.</li> <li>mpletion of this course, students will be able to:</li> <li>Explain fundamentals of sensors &amp; transducers.</li> <li>Describe physical principles of sensing.</li> <li>Compare various sensor materials and technology used in designing sensors.</li> <li>Select appropriate sensor for given application.</li> <li>Recognize the latest trends in the field of sensor.</li> </ul>	



	130720.5	Prepare technical report on experiments conducted in the lab	
	After the completion of this course, students will be able to:		
130721:	130721.1	Perform the programming of PLC ladder diagrams	
Industrial	130721.2	Select appropriate Logic Gate operations	
Automation	130721.3	Analyze industrial automation system with sequential machines control	
Lab	130721.4	<b>Develop</b> small application using PLC & sensors to the real world	
-	130721.5	<b>Develop</b> teamwork skills for working effectively in groups.	
100007:			
Disaster	After the completion of this course, students will be able to:		
Management	100007.1	<b>Propose</b> disaster prevention and mitigation approaches.	
8	100007.2	<b>Classify</b> global and national disasters, their trends and profiles.	
	100007.3	Appreciate the impacts of various disasters.	
	100007.4	Apply Disaster Risk Reduction in management.	
Ī	100007.5	Find the linkage between disasters, environment and development	
900104:	After the co	mpletion of this course, students will be able to:	
Energy			
Conservation &	900104.1	Explain the basic concepts of Energy Audit & its various terminologies, rules and	
Management		regulations, policy and how to write reports.	
	900104.2	Acquire fundamental knowledge on the science of energy and on both the conventional	
_		and non-conventional energy technologies	
_	900104.3	Describe different energy auditing methods and the implementation procedures	
	900104.4	Identify present scenario of energy utilization, management and corresponding ACT	
_		of regulatory commission	
	900104.5	<b>Recognize</b> process billing, energy tariff and power factor improvements to achieve	
	A C/ / 1	energy efficient systems.	
	After the co	mpletion of this course, students will be able to:	
010105	900105.1	Describe the origin of bio potentials and the role of bio potential electrodes &	
910105: Biomedical		transducers	
Instrumentation	900105.2	Apply the physical and medical principles in the measurements of cardiovascular	
-	900105.3	system parameters <b>Discuss</b> the physical and medical principles used a respiratory system measurement	
-	900105.4	<b>Identify</b> the patient safety issues related to biomedical instrumentation	
	900105.5	<b>Discuss</b> the techniques for noninvasive Diagnostic Instrumentation	
		mpletion of this course, students will be able to:	
910106:	900105.1	Analyze architecture of industrial automation system	
Industrial	900105.2	Select appropriate sensors	
Automation	900105.3	Acquire the knowledge of PID control technique	
	900105.4	<b>Develop</b> small application using PLC & transducer,	
	900105.5	<b>Compare</b> AC and DC drives for particular applications.	
100008: Intellectual	After the co	mpletion of this course, students will be able to:	
Property	100008.1	Imbibe the knowledge of Intellectual Property and its protection through various laws	
Rights(IPR)	100008.2	Apply the knowledge of IPR for professional development	
- · · ·	100008.3	Develop a platform for protection and compliance of Intellectual Property Rights &	
		knowledge	
-	100008.4	knowledge Create awareness amidst academia and industry of IPR and Copyright compliance	



		Imbibe the knowledge of Intellectual Property and its protection through various laws
130831 :	After the co	mpletion of this course, students will be able to:
Project		
	130831.1	Formulate the real world problems.
	130831.2	Express the technical ideas, strategies & methodologies.
	130831.3	Utilize the new tools, algorithms, techniques to obtain solution of the project.
	130831.4	Test & validate the developed prototype/results.
	130831.5	Write a project report.
	130831.6	Prepare oral demonstrations.
130831 :	After the completion of this course, students will be able to:	
Internship		
	130831.1	Identify job skills, knowledge, and attitude requisite to constitute a professional
		identity.
	130831.2	Express the technical ideas, strategies & methodologies
	130831.3	Demonstrate profession ethics and awareness about general workplace behavior
	130831.4	Adhere to deadlines and commitment to complete the assignment.
	130831.5	Write professional work reports and presentations.
130802 :	After the completion of this course, students will be able to:	
Professional		
Development	130832.1	Develop intellectual curiosity, competency and skills
	130832.2	Develop critical thinking, creativity and effective communication
[	130832.3	Display professionalism and ownership of professional growth and learning