STATE BOARD OF TECHNICAL EDUCATION, BIHAR

Scheme of Teaching and Examinations for

III[rd] SEMESTER DIPLOMA IN ELECTRICAL ENGINEERING/ ELECTRICAL & ELECTRONICS ENGINEERING.

(Effective from Session 2020- 21 Batch)

THEORY

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME							
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks A	Class Test (CT) Marks B	End Semester Exam. (ESE) Marks C	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
1.	Introduction to Electric Power Generation Systems	2020301	03	03	10	20	70	100	28	40	03
2.	Electrical Circuits	2020302	03	03	10	20	70	100	28	40	03
3.	Electrical and Electronic Measurements	2020303	04	03	10	20	70	100	28	40	04
4.	Electric Motors and Transformers	2020304	04	03	10	20	70	100	28	40	04
5.	Fundamentals of Basic electronics &Digital Electronics	2020305	03	03	10	20	70	100	28	40	03
		Total: -	**17**				**350**	**500**			17

PRACTICAL

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME					
			Periods per Week	Hours of Exam.	Practical (ESE)		Total Marks (A+B)	Pass Marks in the Subject	Credits
					Internal(A)	External(B)			
6.	Introduction to electric power generation laboratory	2020306	02 50% physical 50% Virtual	03	15	35	50	20	01
7.	Electrical Circuits Laboratory	2020307	02 50% physical 50% Virtual	03	15	35	50	20	01
8.	Web Technology Lab	2018308	02 50% physical 50% Virtual	03	07	18	25	10	01
9.	Electrical and Electronic Measurements Laboratory	2020309	02 50% physical 50% Virtual	03	07	18	25	10	01
10.	Electric Motors and Transformers Laboratory	2020310	02 50%physical 50% Virtual	03	15	35	50	20	01
		Total: -	**10**				**200**		05

TERM WORK

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME				
			Periods per Week	Marks of Internal Examiner (X)	Marks of External Examiner (Y)	Total Marks (X+Y)	Pass Marks in the Subject	Credits
11.	Python	2018311	02	07	18	25	10	01
12.	Fundamentals of Basic electronics &Digital Electronics	2020312	04	07	18	25	10	01
		Total: -	**06**			**50**		**02**
Total Periods per week Each of duration One Hour			**33**	Total Marks = **750**				**24**

INTRODUCTION TO ELECTRIC POWER GENERATION SYSTEMS
(ELECTRICAL ENGINEERING GROUP)

Subject Code	Theory						Credits
2020301	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	00	—	TA	:	10	
	—	—	—	CT	:	20	

Course Objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- An understanding of basic abstractions of electrical power generations from conventional and nonconventional sources of energy.
- The capability to use abstractions to comprehend and analyze the impact of various system on environments and economics aspects of energy generation.
- Maintain the efficient operation of various electric power generating plants.
- The capability to incorporate the knowledge of electrical power generation in other field of science, engineering and economics.

CONTENTS: THEORY

	Name of the Topic	Hrs./Unit
Unit -I	**Thermal Power Plants: Coal, Gas/ Diesel and Nuclear-based** Lay out and working of a typical thermal power plant with steam turbines and electric generators. Properties of conventional fuels used in the energy conversion equipment used in thermal powerplants: Coal, Gas/diesel. Nuclear fuels–fusion and fission action safe practices and working of various thermal power plants: coal-based, gas-based, diesel-based, and nuclear-based. Functions of the following types of thermal power plants and their major auxiliaries: Coal fired boilers: fire tube and water tube. Gas / diesel base combustion engines Types of nuclear reactors: Disposal of nuclear waste and nuclear shielding. Thermal power plants in Bihar.	10
Unit -II	**Large and Micro-Hydro Power Plants** Energy conversion process of hydro power plant. Classification of hydro power plant: High, medium and low head. Construction and working of hydro turbines used in different types of hydro power plant: . High head – Pelton turbine, medium head – Francis turbine, Low head – Kaplan turbine. Safe Practices for hydro power plants. Different types of micro-hydro turbines for different heads Pelton Francis and Kaplan turbines Locations of these different types of large and micro-hydro power plants in Bihar Potential locations of micro-hydro power plants in Bihar	8
Unit - III	**Solar and Biomass based Power Plants** Solar Map of India: Global solar power radiation. Solar Power Technology a. Concentrated Solar Power (CSP) plants, construction and working of Power Tower, Parabolic Trough, Parabolic Dish, Fresnel Reflectors b. Solar Photovoltaic (PV) power plant: layout, construction, working. C. Biomass-based Power Plants. Layout of a Bio-chemical based (e.g. biogas) power plant: a. Layout of a Thermo-chemical based (e.g. Municipal waste) power plant b. Layout of an Agrochemical based (e.g. bio-diesel) power plant Features of the solid, liquid and gas biomasses as fuel for biomass power plant.	10

Unit - IV	**Wind Power Plants** Wind Map of India**:** Wind power density in watts per square meter, Lift and drag principle; long path theory. Layout of Horizontal axis large wind power plant: Geared wind power plant. Direct-drive wind power plant. Salient Features of electric generators used in large wind power plants: Constant Speed Electric Generators: Squirrel Cage Induction Generators (SCIG), Wound Rotor Induction Generator (WRIG) Variable Speed Electric Generators: Doubly-fed induction generator (DFIG)wound rotor synchronous generator (WRSG), permanent magnet synchronous generator (PMSG)	8
Unit - V	**Small Wind Turbines** Horizontal axis small wind turbine: direct drive type, components and working Horizontal axis small wind turbine: geared type, components and working Vertical axis small wind turbine: direct drive and geared, components and working Type of towers and installation of small wind turbines on roof tops and open fields. Electric generators used in small wind power plants	4
Unit - VI	**Economics of Power Generation and Interconnected Power System** Related terms: connected load, firm power, cold reserve, hot reserve, spinning reserve. Base load and peak load plants; Load curve, load duration curve, integrated duration curve, Cost of generation: Average demand, maximum demand, demand factor, plant capacity factor, plant use factor, diversity factor, load factor and plant load factor. Choice of size and number of generator units, combined operation of power station. Causes and Impact and reasons of Grid system fault: State grid, national grid, brownout and black out; sample blackouts at national and international level	8
	Total	48

References:

1. Power Plant Engineering, by P K Nag. McGraw Hill, New Delhi, ISBN:978-9339204044
2. Electrical Power Generation, by Tanmoy Deb, Khanna Publishing House Delhi (Ed.2018)
3. Generation of Electrical Energy by B.R. Gupta, Chand &Co New Delhi,
4. Electrical Power generation by Dr. S. L. Uppal Khanna Publishers.
5. Solar Photovoltaics Fundamentals Technologies and Applications by Solanki, Chetan Singh PHI learning, New Delhi ISBN:9788120351110
6. Wind Power Plants and Project Development by T Wizelius Earnest Joshua–PHI
7. A Course in Electrical Power by JB Gupta S K Katarina and Sons, New Delhi.2014,
8. A Course in Electrical Power by Sony Gupta Bhatnagar Dhanpat Rai and Sons

9.	Electrical Power Generation	Kamal Singh	FPH
10.	Electrical Power Generation	Ashirwad Kumar	FPH
11.	Introduction to Electric Generation Systems	Deepak Garg	FPH

Course Outcomes:

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

a) Maintain the optimized working of the thermal power plant.

b) Maintain the optimized working of large and micro hydro power plants.

c) Maintain the optimized working of solar and biomass-based power plants.

d) Maintain the optimized working of wind power plants.

e) Select the adequate mix of power generation based on economic operation.

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ELECTRICAL CIRCUITS
(ELECTRICAL ENGINEERING GROUP)

Subject Code	Theory						Credits
2020302	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

Course Objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.
- Provide working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices.
- Maintain electrical systems applying AC and DC circuit fundamentals

CONTENTS: THEORY

	Name of the Topic	Hrs./Unit
Unit -I	**Single Phase A.C Series Circuits** Generation of alternating voltage, Phasor representation of sinusoidal quantities R, L, C circuit elements its voltage and current response R-L, R-C, R-L-C combination of A.C series circuit, impedance, reactance, impedance triangle, Power factor, active power, reactive power, apparent power, power triangle and vector diagram Resonance, Bandwidth, Quality factor and voltage magnification in series R-L, R-C, R-L-C circuit	10
Unit -II	**Single Phase A.C Parallel Circuits** R-L, R-C and R-L-C parallel combination of A.C. circuits. Impedance reactance phasor diagram, impedance triangle R-L, R-C, R-L-C parallel A.C. circuits power factor active power apparent power reactive power, power triangle Resonance in parallel R-L, R-C, R-L-C circuit, Bandwidth, Quality factor and voltage magnification	10
Unit -III	**Three Phase Circuits** Phasor and complex representation of three phase supply Phase sequence and polarity Types of three-phase connections, Phase and line quantities in three phase star and delta system Balanced and unbalanced load, neutral shift in unbalanced load Three phase power, active, reactive and apparent power in star and delta system.	10
Unit - IV	**Network Reduction and Principles of Circuit Analysis** Source transformation Star/delta and delta/star transformation, Mesh Analysis Node Analysis	08

Unit - V	**Network Theorems** Superposition theorem. Thevenin's theorem. Norton's theorem Maximum power transfer theorem, Reciprocity theorem Tellegen's Theorem Duality in electric circuits	10
	Total	48

References:

1. Networks & Systems, by Ashfaq Husain, Khanna Book Publishing, New Delhi.
2. Fundamentals of Electrical Network by B. R Gupta Singhal Vandana S. Chand and Co. New Delhi ISBN:978-81-219-2318- 7
3. Fundamentals of Electrical Engineering by Saxena, S.B Lal, K .Dasgupta
4. A Text Book of Electrical Technology Vol-I by A K Theraja, B.L:Theraja; S.Chand & Co Ram Nagar New Delhi ISBN: 9788121924405
5. Circuit and network by A. Sudhakar A.S. Shyamalan, S. Palli;, McGraw Hill Education, New Delhi,ISBN:978-93-3921- 960-4
6. Electric Circuits by Bell, David A. Oxford University Press New Delhi, ISBN:978-01-954-2524-6
7. Introductory circuit Analysis by R.L Boylested, Wheeler, New Delhi, ISBN:978-00-231-3161-5
8. Basic Electrical Engineering by V.N. Mittel Arvind Mittel, McGraw Hill Education, Noida, ISBN:978-00-705-9357-2
9. Electric Circuit Analysis, by A.K. CHAKRAVARTI Dhan pat rai publication.
10. Circuit theory by S Saliva Hanan, S. Pravin Kumar, Vikas Publishing House Pvt. Ltd, Noida; ISBN:978-93259- 7418-0
11. Electrical Circuits & Network — Umesh Kumar — FPH
12. Electrical Circuits — O.P.Sharma — FPH

Course Outcomes:

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

a) Trouble shoot problems related to single phase A.C series circuits.
b) Trouble shoot problems related to single phase A.C parallel circuits.
c) Trouble shoot problems related to three phase circuits.
d) Use principles of circuit analysis to trouble shoot electric circuits.
e) Apply network theorems to troubleshoot electric circuits.

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ELECTRICAL AND ELECTRONIC MEASUREMENTS
(ELECTRICAL ENGINEERING GROUP)

Subject Code	Theory						Credits
2020303	No. of Periods Per Week			Full Marks	:	100	04
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
	—	—	—	CT	:	20	

Course Objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

Identify the various parameters that are measurable in electronic instrumentation.

- Employ appropriate instruments to measure given sets of parameters.
- Practice the construction of testing and measuring set up for electronic systems.
- To have a deep understanding about instrumentation concepts which can be applied to Control systems.
- Use relevant measuring instrument in different electrical applications.

CONTENTS: THEORY

Chapter	Name of the Topic	Hrs./Unit
Unit -I	**Fundamentals of Measurements** Measurement: Significance, units, fundamental quantities and standards Classification of Instrument Systems: Null and deflection type instruments Absolute and secondary instruments Analog and digital instruments Static and dynamic characteristics, types of errors Calibration: need and procedure Classification of measuring instruments: indicating, recording and integrating instruments. Essential requirements of an indicating instruments	08
Unit – II	**Measurement of voltage and current** DC Ammeter: Basic, Multi range, Universal shunt, DC Voltmeter: Basic, Multi-range, concept of loading effect and sensitivity. AC voltmeter: Rectifier type (half wave and full wave) CT and PT: construction, working and applications. Clamp-on meter.	10
Unit -III	**Measurement of Electric Power** Analog meters: Permanent magnet moving coil (PMMC) and Permanent magnet moving iron (PMMI) meter, their construction, working, salient features, merits and demerits Dynamometer type wattmeter: Construction and working Range: Multiplying factor and extension of range using CT and PT Errors and compensations. Active and reactive power measurement: One, two and three wattmeter method. Effect of Power factor on wattmeter reading in two wattmeter method. Maximum Demand indicator	16

Unit -IV	**Measurement of Electric Energy** Single and three phase electronic energy meter: Constructional features and working principle. Errors and their compensations. Calibration of single-phase electronic energy meter using direct loading.	04
Unit -V	**Circuit Parameter Measurement, CRO and Other Meters** Measurement of resistance: Low resistance: Kelvin's double bridge, Medium Resistance: Voltmeter and ammeter method	08
Unit -VI	High resistance: Megger and Ohm meter: Series and shunt Measurement of inductance using Anderson bridge (no derivation and phasor diagram) Measurement of capacitance using Schering bridge (no derivation and phasor diagram) Single beam/single trace CRO, Digital storage Oscilloscope**:** Basic block diagram, working, Cathode ray tube, electrostatic deflection, vertical amplifier, time base generator, horizontal amplifier, measurement of voltage/ amplitude/ time period/ frequency/ phase angle delay line, specifications. Other meters: Earth tester, Digital Multimeter; L-C-R meter, Frequency meter (ferromagnetic and Weston type), Phase sequence indicator, power factor meter (single phase and three phase dynamometer type), Synchroscope, Tri-vector meter. Signal generator: need, working and basic block diagram. Function generator: need, working and basic block diagram, function of symmetry.	18
	Total	64

References:

1. A Text Book of Electrical Technology Vol-I (Basic Electrical Engg.) by A.K., Theraja B. L,Theraja S.Chand and Co. New Delhi, ISBN:9788121924405
2. Basic Electrical Engineering Mittle by V.N. McGraw-Hill New Delhi, ISBN:978-0-07-0088572-5,
3. Edward Hughes, Electrical Technology, Pearson Education, New Delhi, ISBN-13: 978-0582405196
4. Electrical and Electronic Measurement and Instrumentation, R.K Rajput, S.Chand and Co. New Delhi, ISBN :9789385676017
5. Electrical and Electronics Measurement sand Instrumentation. By A.K. Sawhney Dhanpat Rai and Sons, New Delhi, ISBN :9780000279744
6. Electrical Measurements and Measuring Instruments by N.V. Suryanarayana S. Chand and Co. New Delhi, ISBN:8121920116
7. Electrical Measurements — S.N. Bhargava — FPH
8. Electrical Measurements — Aashirvad Kumar — FPH
9. Electrical and Electronic Measurements — Deepak Kumar — FPH

Course outcomes:

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

a) Check the working of the electrical measuring instrument.
b) Use different types of measuring instruments for measuring voltage and current.
c) Use different types of measuring instruments for measuring electric power
d) Use different types of measuring instruments for measuring electric energy.
e) Use different types of electrical instruments for measuring various ranges of electrical parameters.

ELECTRIC MOTORS AND TRANSFORMERS
(ELECTRICAL ENGINEERING GROUP)

Subject Code	Theory						Credits
2020304	No. of Periods Per Week			Full Marks	:	100	04
	L	T	P/S	ESE	:	70	
	04	—	—	TA	:	10	
	—	—	—	CT	:	20	

Course Objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Provide the basic concept of DC machines and Transformers.
- Develop the skills of the students in the areas of machines and transformers by identifying the current problem in the industries and bring solutions through research.
- Diagnose the condition of DC machines and Transformers.
- Maintain electric motors and transformers.

CONTENTS: THEORY

Chapter	Name of the topic	Hrs./Unit
Unit -I	**DC Generators** DC generator: construction, parts, materials and their functions. Principle of operation of DC generator: Fleming's right hand rule, schematic diagrams, E.M.F. equation of generator, armature reaction, commutation. Applications of DC generators. Classification of measuring instruments: indicating, recording and integrating instruments.	12
Unit - II	**D.C. Motors** DC motor: Types of DC motors. Fleming's left-hand rule, Principle of operation of, Back E.M.F and its significance, Voltage equation of DC motor. Torque and Speed; Armature torque, Shaft torque, BHP, Brake test, losses, efficiency. DC motor starters: Necessity, two point and three-point starters. Speed control of DC shunt and series motor: Flux and Armature control. Brushless DC Motor: Construction and working.	14
Unit -III	**Single Phase Transformers** Types of transformers: Shell type and core type; Construction: Parts and functions, materials used for different parts: CRGO, CRNGO, HRGO, amorphous cores, Transformer: Principle of operation, EMF equation of transformer: Derivation, Voltage transformation ratio, Significance of transformer ratings Transformer No-load and on-load phasor diagram, Leakage reactance, Equivalent circuit of transformer: Equivalent resistance and reactance. Voltage regulation and Efficiency: Direct loading OC/SC method, All day efficiency.	14
Unit -IV	**Three Phase Transformers** Bank of three single phase transformers, Single unit of three phase transformer Distribution and Power transformers. Construction, cooling, three phase transformers connections as per IS:2026 (part IV)-1977, Three phase to two phase conversion (Scott Connection), Selection of transformer as per IS: 10028 (Part I)-1985, Criteria for selection of distribution transformer, and power transformer, Amorphous Core type Distribution Transformer, Specifications of three- phase distribution transformers as per IS:1180 (part I)-1989 Need of parallel operation of three phase transformer, Conditions for parallel operation. Polarity tests on mutually inductive coils and single-phase transformers; Polarity test, Phasing out test on Three-phase transformer	16

Unit -V	**Special Purpose Transformers** Single phase and three phase auto transformers: Construction, working and applications. Instrument Transformers: Construction, working and applications of Current transformer and Potential transformer. Isolation transformer: Constructional Features and applications. Single phase welding transformer: constructional features and applications. Pulse transformer: constructional features and applications. 'K' factor of transformers: overheating due to non-linear loads and harmonics.	08
	Total	64

References:

1. Electrical Machines, Vol- I,II by G.C. Garg & P.S. Bimbhra, Khanna Book Publishing House(ISBN:978- 9386173-447, 978-93-86173-607), New Delhi
2. Mittle,V.N.andMittle,Arvind.,BasicElectricalEngineering,McGrawHillEducation,New Delhi,ISBN: 9780070593572
3. Electrical Machines by D.P Kothari .and Nagrath, I.J.McGraw Hill Education. New Delhi, ISBN: 9780070699670
4. Electrical Machines by J.B. Gupta McGraw Hill Education, New Delhi,ISBN:9789332902855
5. Principle so Electrical Machines by Rohit Mehta, and V.K.Mehta,S.ChandandCo.Ltd.,NewDelhi,ISBN: 9788121930888
6. Electrical Technology Vol-II (A C and DC machines) by B.L. Theraja, S.Chand and Co. Ltd., New Delhi, ISBN: 9788121924375
7. Electrical Machines Theory and Practice, M.N. Bandyopadhyay, PHI Learning Pvt.Ltd.,New Delhi, ISBN: 9788120329973Vi
8. DC Machines and Transformers by K.Murugesh Kumar,ISBN:9788125916055
9. Electric Motors and Transformers Deepak Kumar FPH

Course outcomes:

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

a) Maintain different types of DC generators

b) Maintain different types of DC motors.

c) Maintain single phase transformer.

d) Maintain three phase transformers.

e) Maintain different types of special purpose transformers used in different applications.

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Fundamental of Basic Electronics & Digital Electronics
(ELECTRICAL ENGINEERING GROUP)

Subject Code	Theory						Credits
2020305	No. of Periods Per Week			Full Marks	:	100	03
	L	T	P/S	ESE	:	70	
	03	00	—	TA	:	10	
	—	—	—	CT	:	20	

Course Learning Objectives:

- To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To prepare students to perform the analysis and design of various digital electronic circuits.

CONTENTS: THEORY

	Name of the topic	Hrs./Unit
Unit -I	**Boolean Algebra & Logic Gates** Introduction to different Number systems: Binary, Octal, Decimal & Hexadecimal & their Conversion from one another Rules and Laws of Boolean Algebra – DE Morgan's Law Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR, Symbolic representation & Truth Table Karnaugh Maps (K-Maps) & its use for simplification of simple Boolean expressions	8
Unit -II	**Combinational Logic Circuit** Arithmetic Circuits: Addition, Subtraction, 1's Compliment, 2's compliment, Half Adder, Full Adder, Half subtractor, full subtractor Encoder, Decoder Multiplexer, Demultiplexer	6
Unit - III	**Sequential Logic Circuit & Data Converter** Flip Flops: SR, JK, T & D Flip flops (Truth Table & Excitation table only) Counters: Introduction to Up/Down Counter, Ripple Counter, Ring Counter Registers: Definition and Types Data Converter: Digital to Analog and Analog to Digital Converters	10
Unit - IV	**Semiconductor diode**: Rectifying diode Review of P-type and N-type semiconductor Junction of P-type & N type i.e., PN junction Barrier voltage, depletion region, Junction Capacitance. Forward biased & reversed biased junction Diode symbol, circuit diagram for V/S characteristics (forward & reversed) Characteristics of PN junction diode Specifications: - Forward voltage drop, Reversed saturation current, maximum forward current, power dissipation, Package view of diodes of different power ratings	12
Unit - V	**Bipolar Junction Transistor (BJT):** NPN and PNP Transistor – Operation and characteristics CB, CE, CC Configuration – characteristics and working **Biasing of BJT:** Introduction, need of biasing, concept of dc load line, selection of operating point (Q point), need of stabilization of Q point, (thermal run away concept) Types of biasing circuits: Fixed biased circuit, Base biased with emitter feedback, Base biased with collector feedback, Voltage divider, Emitter biased	**6**
Unit - VI	**Field Effect Transistor (FET):** FET – Working Principle, Classification, MOSFET Small Signal model, N-Channel/ P-Channel MOSFETs – characteristics, enhancement and depletion mode, MOFET as a Switch, Common Source Amplifiers Uni-Junction Transistor – equivalent circuit and operation	**6**
	Total	**48**

Reference Books:

1. Digital principles & Applications, Albert Paul Malvino & Donald P. Leach, McGraw Hill Education; Eighth edition ISBN: 978-9339203405
2. Digital Electronics, RogerL.Tokheim Macmillian, McGraw-Hill Education (ISE Editions); International 2 Revised edition ISBN: 978-0071167963
3. Digital Electronics – an introduction to theory and practice, William H. Gothmann, Prentice Hall India Learning Private Limited; 2 editions, ISBN: 978-8120303485
4. Electronics Devices and circuit theory, Boyestad & Nashel sky, Pearson Education India; 11 edition (2015), ISBN: 978-9332542600
5. Electronic Devices and Circuits, S. Salivahanan and N. Suresh Kumar, McGraw Hill Education; Fourth edition (1 July2017) ISBN: 978-9339219505
6. Electronics Devices & Circuits,Jacob Millman, McGraw Hill Education; 4 edition (2015), ISBN: 978-9339219543
7. Bell Electronics Devices & Circuits by J. David Prentice Hall of India
8. Basic Electronics Amit kumar FPH
9. Fundamentals of Basic Electronics Umesh Kumar FPH

Course Outcomes

After studying this course, the students would gain enough knowledge

1. Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.
2. To understand and examine the structure of various number systems and its application in digital design.
3. The ability to understand, analyze and design various combinational and sequential circuits.
4. Ability to identify basic requirements for a design application and propose a cost-effective solution.
5. The ability to identify and prevent various hazards and timing problems in a digital design.
6. To develop skill for building and troubleshooting digital circuits.

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INTRODUCTION TO ELECTRIC POWER GENERATION SYSTEMS LABORATORY
(ELECTRICAL ENGINEERING GROUP)

Subject Code 2020306	Practical						Credits
	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS: PRACTICAL

Course Objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Maintain the efficient operation of various electric power generating plants.
- The capability to incorporate the knowledge of electrical power generation in other field of science, engineering and economics.

Practical's:

1. Identify the routine maintenance part of the coal fired thermal power plant and gas fired thermal power plant after watching a video programme.
2. Assemble and dismantle a small diesel generator power plant.
3. Identify the routine maintenance part soft he nuclear fired thermal power plant after watching a video programme.
4. Identify the routine maintenance part soft he large hydro power plant after watching a video programme
5. Identify the routine maintenance parts of the micro hydro power plant after watching a video programme.
6. Assemble a micro hydro power plant and then dismantle it.
7. Assemble and dismantle of the parabolic trough or parabolic dish Concentrated Solar Power (CSP)plant.
8. Assemble the solar PV plant to produce electric power and then dismantle it.
9. Assemble and dismantle a small biogas plant to generate electric power
10. Identify the routine maintenance parts of the large wind power plant after watching a video programme.
11. Assemble a horizontal axis small wind turbine to produce electric power
12. Dismantle a horizontal axis small wind turbine.
13. Assemble a vertical axis small wind turbine o produce electric power and then dismantle it.
14. Identify the routine maintenance part soft he horizontal axis small wind turbine after watching a video programme.
15. Identify the routine maintenance parts of the vertical axis small wind turbine after watching a video programme.

Course Outcomes:

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

a) Maintain the optimized working of the thermal power plant.

b) Maintain the optimized working of large and micro hydro power plants.

c) Maintain the optimized working of solar and biomass-based power plants.

d) Maintain the optimized working of wind power plants.

e) Select the adequate mix of power generation based on economic operation.

ELECTRIC CIRCUITS LABORATORY
(ELECTRICAL ENGINEERING GROUP)

Subject Code	Practical						Credits
2020307	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS: PRACTICAL

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Maintain electrical systems by applying AC and DC circuit fundamentals. Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.
- Provide working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices.

practical's

1. Use dual trace oscilloscope to determine A.C voltage and current response in given R L,C circuit.
2. Use voltmeter, ammeter, wattmeter to determine active, reactive and apparent power consumed in given R-L series circuit. Draw phase or diagram.
3. Use voltmeter, ammeter to determine active, reactive and apparent power consumed in given R-C series circuit. Draw phasor diagram.
4. Use voltmeter, ammeter, wattmeter to determine active, reactive and apparent power consumed in given R-L-C series circuit. Draw phase or diagram.
5. Use variable frequency supply to creature sonance in given series R-L-C circuit or by using variable inductor or variable capacitor.
6. Use voltmeter, ammeter, and wattmeter to determine current, power factor active, reactive and apparent power in R-C parallel A.C. circuit.
7. Use voltmeter, ammeter, wattmeter, power factor meter to determine current, p.f., active, reactive and apparent power for given R-L-C parallel circuit with series connection of resistor and inductor in parallel with capacitor.
8. Use variable frequency supply create resonance in given parallel R-L-C circuit or by using variable inductor or capacitor.
9. Use voltmeter, ammeter, wattmeter, pf meter to determine line and phase quantities of voltage and current for balanced three phases tar and delta connected load and calculate active, reactive, and apparent power. Draw phasor diagram.
10. Use voltmeter, ammeter, watt meter, pf meter to determine line and phase quantities of voltage and current for unbalanced three phases tar and delta connected load and calculate active, reactive, and apparent power. Draw phase or diagram.
11. Use voltmeter, ammeter to determine current through the given branch of electric network by applying mesh analysis.
12. Use voltmeter, ammeter to determine current through the given branch of electric network by applying node analysis.
13. Use voltmeter, ammeter to determine current through the given branch and voltage across the given element of circuit by applying superposition theorem.
14. Use voltmeter, ammeter to determine equivalent circuit parameter in a given circuit by applying Thevenin's theorem

15. Use voltmeter, ammeter to determine equivalent circuit parameter in a given circuit by applying Norton's theorem
16. Use voltmeter, ammeter to determine load resistance for maximum power transfer for a given circuit by applying maximum power transfer theorem.

Course outcomes:

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

- Trouble shoot problems related to single phase A.C series circuits.
- Trouble shoot problems related to single phase A.C parallel circuits.
- Troubleshoot problems related to three phase circuits.
- Use principles of circuit analysis to trouble shoot electric circuits.
- Apply network theorems to troubleshoot electric circuits.

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WEB TECHNOLOGY LAB

SUBJECT CODE: 2018308	Practical			No. of period in one session:			Credits
	No. of Periods per Week			Full Marks:	:	25	01
	L	T	P/S	ESE	:	25	
		-	02	Internal	:	07	
				External	:	18	

Course Learning Objectives:

This Lab course is intended to practice whatever is taught in theory class of 'Web Technologies'. Some of the things that should necessary be covered in lab.

Course outcomes:

Student will be able to program web applications using and will be able to do the following:

- Use LAMP Stack for web applications
- Write simple applications with Technologies like HTML, Java script, AJAX, PHP
- Connect to Database and get results
- Parse XML files Student will be able to develop/build a functional website with full features.

Content: Practical		Hrs.	Marks
Unit – 1	Home page Development static pages (using Only HTML) of an online Book store.	04	
Unit – 2	Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.	06	
Unit – 3	Write a PHP program to display a digital clock which displays the current time of the server.	06	
Unit – 4	Write an HTML code to display your CV on a web page.	04	
Unit – 5	Write an XML program to display products.	05	
Unit – 6	Create a web page with all types of Cascading style sheets.	06	
Unit – 7	Write a PHP program to display a digital clock which displays the current time of the server.	05	
Unit – 8	Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.	04	

This is a skill course. More student practice and try to find solution on their own, better it will be.

Reference Books:

1. "Web Technologies--A Computer Science Perspective", Jeffrey Jackson
2. "Internet & World Wide Web How to Program", Deitel, Deitel, Goldberg, Pearson Education
3. "Web programming- Building Internet Application", Chris Bales
4. Web Applications: Concepts and Real-World Design, Knuckles

ELECTRICAL AND ELECTRONIC MEASUREMENTS LABORATORY
(ELECTRICAL ENGINEERING GROUP)

Subject Code 2020309	Practical						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P	ESE	:	25	
	—	—	02	Internal	:	07	
	—	—	—	External	:	18	

CONTENTS: PRACTICAL

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Use relevant measuring instrument in different electrical applications.
- Identify the various parameters that are measurable in electronic instrumentation.
- Employ appropriate instruments to measure given sets of parameters.
- Practice the construction of testing and measuring set up for electronic systems.
- To have a deep understanding about instrumentation concepts which can be applied to Control systems.

Practical's:

1. Identify measuring instruments on the basis of symbol son dial, type, accuracy, class position and scale.
2. Identify the components of PMMC and MI instruments.
3. Troubleshoot PMMC and MI instruments.
4. Measure AC and DC quantities in a working circuit.
5. Extend range of ammeter and volt meter by using (i) shunt and multiplier (ii) CT and PT.
6. Use Clamp-on meter for measurement of AC/DC current, AC/DC voltage.
7. Use electro-dynamic watt-meter for measurement of power in a single-phase circuit
8. Troubleshoot electro dynamic watt-meter for measurement of power in a single-phase circuit
9. Use single watt meter for measurement of active and reactive power of three phase balanced load.
10. Use two watt-meters for measuring active power of three-phase balanced load.
11. Calibrate single phase electronic energy meter by direct loading.
12. Troubleshoot single phase electronic energy meter.
13. Use digital multi-meter for measurement of AC/DC current, AC/DC voltage.
14. Use Kelvin's double bridge for measurement of low resistance.
15. Use voltmeter and ammeter method for measurement of medium resistance.
16. Use Megger for insulation resistance measurements.
17. Use earth tester for measurement of earth resistance.
18. Use CRO for the Measurement of supply frequency in single-phase circuit.
19. Use Tri-vector meter for measuring kW, and kVA of a power line.

COURSE OUTCOMES:

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

a) Check the working of the electrical measuring instrument.

b) Usedifferenttypesofmeasuringinstrumentsformeasuringvoltageandcurrent.

c) Usedifferenttypesofmeasuringinstrumentsformeasuringelectricpower

ELECTRIC MOTORS AND TRANSFORMERS LABORATORY
(ELECTRICAL ENGINEERING GROUP)

Subject Code	Practical						Credits
2020310	No. of Periods Per Week			Full Marks	:	50	01
	L	T	P	ESE	:	50	
	—	—	02	Internal	:	15	
	—	—	—	External	:	35	

CONTENTS: PRACTICAL

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Provide the basic concept of DC machines and Transformers.
- Develop the skills of the students in the areas of machines and transformers by identifying the current problem in the industries and bring solutions through research.
- Diagnose the condition of DC machines and Transformers.
- Maintain electric motors and transformers.

Practical's:

1. Dismantle a DC machine.
2. Reverse the direction of rotation of the DC shunt motor.
3. Perform brake test on DC shunt motor.
4. Control the speed of DC shunt motor by different methods.
5. Control the speed of DC series motor by different methods.
6. Perform the brake test on DC series motor.
7. Check the functioning of single-phase transformer.
8. Determine regulation and efficiency of single-phase transformer by direct loading.
9. Perform open circuit and short circuit test on single phase transformer to determine equivalent circuit constants, voltage regulation and efficiency.
10. Perform parallel operation of two single phase transformers to determine the load current sharing.
11. Performparalleloperationoftwosinglephasetransformersanddeterminetheapparentandrealpower load sharing.
12. Performpolaritytestonasingle-phasetransformerwhosepolaritymarkingsaremasked.
13. Performphasingouttestonathree-phasetransformerwhosephasemarkingsaremasked.
14. Connecttheauto-transformerinstep-upandstep-downmodesnotingtheinput/outputreadings.
15. Check the functioning of the CT, PT and isolation transformer.
16. Test the pulse transformer.

Course outcomes:

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

a) Maintain different types of DC generators.

b) Maintain different types of DC motors.

c) Maintain single phase transformer.

d) Maintain three phase transformers.

e) Maintain different types of special purpose transformers used in different applications.

PYTHON (Term Work)

(ELECTRICAL ENGINEERING GROUP)

Subject Code 2018311	Term Work						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/TW				
	—	—	02	Internal	:	07	
	—	—	—	External	:	18	

CONTENTS: Practical		Hrs.	Marks
UNIT – 01	Write a program to demonstrate basic data type in python.		
UNIT – 02	Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)		
UNIT – 03	Write a python program Using for loop, write a program that prints out the decimal equivalent of 1+½+1/3….1/n		
UNIT – 04	Write a Python program to find first n prime numbers. Write a program to demonstrate list and tuple in python.		
UNIT – 05	Write a program using a for loop that loops over a sequence. Write a program using a while loop that asks the user for a number and prints a countdown from that number to zero.		
UNIT – 06	Write a Python Program to add matrices. Write a Python program to multiply matrices.		
UNIT – 07	Write a Python program to check if a string is palindrome or not.		
UNIT – 08	Write a Python program to Extract Unique values dictionary values		
UNIT – 09	Write a Python program to read file word by word Write a Python program to Get number of characters, words.		
UNIT – 10	Write a Python program for Linear Search		

References Books:

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
2. Starting Out with Python, Tony Gaddis, Pearson
3. Core Python Programming, Wesley J. Chun, Prentice Hall
4. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University
5. Introduction to Computation and Programming Using Python. John V. Guttag, MIT Press.

Fundamentals of Basic electronics &Digital Electronics Term Work

(ELECTRICAL ENGINEERING GROUP)

Subject Code 2020312	Practical						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/TW				
	—	—	04	Internal	:	07	
	—	—	—	External	:	18	

CONTENTS: PRACTICAL

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To prepare students to perform the analysis and design of various digital electronic circuits.

Term Work:

1. To verify the truth tables for all logic fates – NOT OR AND NAND NOR XOR XNOR using CMOS Logic gates and TTL Logic Gates
2. Implement and realize Boolean Expressions with Logic Gates
3. Implement Half Adder, Full Adder, Half Subtractor, Full Subtractor using ICs.
4. Design and development of Multiplexer and De-multiplexer using multiplexer ICs.
5. Verification of the function of SR, D, JK and T Flip Flops.
6. To plot Forward & Reverse biased characteristics of diode.
7. To Plot Input & output characteristics of transistor in CE mode.
8. To Plot Input & output characteristics of transistor in CB mode.
9. To Plot Characteristics of FET.

Course outcomes:

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

1. Have a thorough understanding of the fundamental concepts and techniques used in digital electronics.

2. To understand and examine the structure of various number systems and its application in digital design.

3. The ability to understand, analyze and design various combinational and sequential circuits.

4. Ability to identify basic requirements for a design application and propose a cost-effective solution.

5. The ability to identify and prevent various hazards and timing problems in a digital design.

6. To develop skill to build, and troubleshoot digital circuits.