

SYLLABUS

Electrical & Electronics Engineering

Class	DIPLOMA	L	T	P	C
Semester/Year	III/II	2	0	0	2
Subject Name	Introduction to Electric Generation System				
Subject Code	DEX20S301				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objectives:

1. The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences.
2. Maintain the efficient operation of various electric power generating plants.

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:

CO1: Maintain the optimized working of the thermal power plant.

CO2: Maintain the optimized working of large and micro hydro power plants.

CO3: Maintain the optimized working of solar and biomass-based power plants.

CO4: Maintain the optimized working of wind power plants.

CO5: Select the adequate mix of power generation based on economic operation.

Unit	Syllabus	Periods
UNIT-I	<p>Thermal Power Plants Coal, Gas/ Diesel and Nuclear-based: Layout 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 power plants: Coal, Gas/ diesel, Nuclear fuels –fusion and fission action Safe Practices and working of various thermal power plants: coal-based, gas-based, diesel-based, 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 based combustion engines. Types of nuclear reactors: Disposal of nuclear waste and nuclear shielding.</p>	12

UNIT-II	<p>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 Maharashtra Potential locations of micro-hydropower plants in Maharashtra.</p>	12
UNIT-III	<p>Solar and Biomass based Power Plants: Solar Map of India: Global solar power radiation solar power Technology:</p> <ol style="list-style-type: none"> Concentrated Solar Power (CSP) plants, construction and working of Power Tower, Parabolic Trough, Parabolic Dish, Fresnel Reflectors. Solar Photovoltaic(PV) power plant: layout, construction, working Biomass-based Power Plants. Layout of a Bio-chemical based (e.g. biogas) power plant. Layout of a Thermo-chemical based (e.g. Municipal waste) power plant. Layout of an Agro-chemical based (e.g. bio-diesel) power plant. Features of the solid, liquid and gas biomasses as fuel for biomass power plant. 	12
UNIT-IV	<p>Wind Power Plants: Wind Map of India: Wind power density in watts per square meter 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).</p>	10
UNIT-V	<p>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, brown out and black out; sample blackouts at national and international level.</p>	12
	<p>Text Books: 1. Gipe, Paul, Wind Energy Basics, Chelsea Green Publishing Co; ISBN: 978-1603580304 2. Wizelius, Tore; Earnest, Joshua – Wind Power Plants and Project Development, PHI 3. Gupta, J.B.A Course in Electrical Power – S.K Katarina and Sons, New Delhi. 2014,</p>	

Reference Books:

1. Nag. P. K. Power Plant Engineering, McGraw Hill, New Delhi, ISBN:978-9339204044.
2. Tanmoy Deb, Electrical Power Generation, Khanna Publishing House, Delhi (Ed.2018).
3. Gupta, B.R., Generation of Electrical Energy, S. Chand & Co. New Delhi.
4. Rachel, Sthuthi; Earnest, Joshua Wind Power Technologies, PHI Learning, New Delhi, ISBN: 9789388028493; E-book 978-93-88028-50-9.
5. Solanki, Chetan Singh, – Solar Photo voltaic: Fundamentals, Technologies and Applications, PHI Learning, New Delhi, ISBN: 9788120351110.
6. Hau, Erich, Wind Turbines, Springer- Verlag, Berlin Heidelberg, Germany, ISBN:978-3-642- 27150-2.
7. Gipe, Paul, Wind Energy Basics, Chelsea Green Publishing Co; ISBN: 9781603580304.

SYLLABUS

Electrical & Electronics Engineering

Class		DIPLOMA		L	T	P	C
Semester/Year		III/II		3	0	0	3
Subject Name		Electrical Circuits					
Subject Code		DEX20S302					
Paper	English						
	Hindi						
Max. Marks		100					
Course Objectives: <ol style="list-style-type: none"> 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 applying AC and DC circuit fundamentals. 							
Course Outcomes: <p>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:</p> <p>CO1: Trouble shoot problems related to single phase A.C series circuits.</p> <p>CO2: Trouble shoot problems related to single phase A.C parallel circuits.</p> <p>CO3: Trouble shoot problems related to three phase circuits.</p> <p>CO4: Use principles of circuit analysis to trouble shoot electric circuits.</p> <p>CO5: Apply network theorems to trouble shoot electric circuits.</p>							
Unit	Syllabus						Periods
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 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.	8
UNIT-V	Network Theorems: Superposition theorem. Thevenin's theorem. Norton's theorem Maximum power transfer theorem. Reciprocity theorem Duality in electric circuits.	8
	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Bell, David A., Electric Circuits, Oxford University Press New Delhi, ISBN:978-01-954-2524-6. 2. Boylested, R.L., Introductory circuit Analysis, Wheeler, New Delhi, ISBN:978-00-231-3161-5. 3. Mittle, V.N.; Mittle, Arvind; Basic Electrical Engineering, McGraw Hill Education, Noida, ISBN978-00- 705-9357-2 	
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Ashfaq Husain, Networks & Systems, Khanna Book Publishing, New Delhi. 2. Gupta, B.R; Singhal, Vandana;, Fundamentals of Electrical Network, S.Chand and Co., New Delhi, ISBN :978-81-219-2318-7. 3. Saxena, S.B Lal; Dasgupta, K; Fundamentals of Electrical Engineering, Cambridge UniversityPress Pvt. Ltd., New Delhi, ISBN: 978-11-0746-435-3. 4. Theraja, B. L. : Theraja, A. K;, A Text Book of Electrical Technology Vol-I, S. Chand & Co. Ram- nagar, New Delhi, ISBN :9788121924405. 5. Sudhakar,A.;Shyammohan,S.Palli;Circuitandnetwork,McGrawHillEducation,New Delhi, ISBN :978-93-3921-960-4. 	

SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA				
Semester/Year	III/II				
Subject Name	Electrical and Electronic Measurements				
Subject Code	DEX20S303				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objectives:

1. The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences.
2. Use relevant measuring instrument in different electrical applications.

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:

CO1: Check the working of the electrical measuring instrument.

CO2: Use different types of measuring instruments for measuring voltage and current.

CO3: Use different types of measuring instruments for measuring electric power.

CO4: Use different types of measuring instruments for measuring electric energy.

CO5: Use different types of electrical instruments for measuring various ranges of electrical parameters.

Unit	Syllabus	Periods
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 indicating	12

	instruments.	
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.	13
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.	8
UNIT-V	Circuit Parameter Measurement, CRO and Other Meters: Measurement of resistance: Low resistance: Kelvin's double bridge, Medium Resistance: Voltmeter and ammeter method. 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), Synchro scope, Tri-vector meter Signal generator: need, working and basic block diagram. Function generator: need, working and basic block diagram, function of symmetry	15

	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Sawhney A.K., Electrical and Electronics Measurements and Instrumentation, Dhanpai Rai and Sons, New Delhi, ISBN : 9780000279744. 2. Suryanarayna N.V. Electrical Measurements and Measuring Instruments, S. Chand and Co. New Delhi, ISBN: 8121920116. 	
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Theraja B. L., Theraja A. K., A Text Book of Electrical Technology Vol-I(Basic Electrical Engineering), S. Chand and Co. New Delhi, ISBN: 9788121924405. 	

	<ol style="list-style-type: none">2. Mittle V.N. Basic Electrical Engineering, McGraw – HillNewDelhi,ISBN:978-0-07-0088572-5.3. Edward Hughes, Electrical Technology, Pearson Education, New Delhi, ISBN-13: 978- 0582405196.4. Rajput R.K., Electrical and Electronic Measurement and Instrumentation, S. Chand and Co. New Delhi, ISBN: 9789385676017.5. Sawhney A.K., Electrical and Electronics Measurements and Instrumentation, Dhanpai Rai and Sons, New Delhi, ISBN : 9780000279744.	
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SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA				
Semester/Year	III/II				
Subject Name	Electric Motors and Transformers				
Subject Code	DEX20S304				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objectives:

1. The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences.
2. Maintain electric motors and transformers.

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:

CO1: Maintain different types of DC generators.

CO2: Maintain different types of DC motors.

CO3: Maintain single phase transformer.

CO4: Maintain three phase transformers.

CO5: Maintain different types of special purpose transformers used in different applications.

Unit	Syllabus	Periods
UNIT-I	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 and. Applications of DC generators. Classification of measuring instruments: indicating, recording and integrating instruments.	10

UNIT-II	<p>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.</p>	10
UNIT-III	<p>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.</p>	12
UNIT-IV	<p>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.</p>	15
UNIT-V	<p>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.</p>	12
	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Theraja, B.L., Electrical Technology Vol-II(AC and DC machines), S. Chand and Co. Ltd., New Delhi, ISBN:9788121924375. 2. Bandy Opadhyay, M. N., Electrical Machines Theory and Practice, PHI .Learning Pvt. Ltd., New Delhi, ISBN: 9788120329973. 3. Murugesk Kumar, K., DC Machines and Transformers, ISBN: 9788125916055. 	
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. G.C. Garg &P.S. Bimbhra, Electrical Machines, Vol-I, II, Khanna Book. Publishing House (ISBN: 978-9386173-447, 978-93-86173-607), New Delhi. 2. Mittle, V.N. and Mittle, Arvind., Basic Electrical Engineering, McGraw Hill Education, New Delhi, ISBN:9780070593572. 	

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| | <ol style="list-style-type: none">3. Kothari, D. P. and Nagrath, I. J., Electrical Machines, McGraw Hill Education. New Delhi, ISBN: 9780070699670.4. Bhattacharya, S.K., Electrical Machines, McGraw Hill Education, New Delhi, ISBN: 9789332902855.5. Mehta, V.K. and Mehta, Rohit, Principles of Electrical Machines, S.Chand and Co.Ltd., New Delhi, ISBN:9788121930888. | |
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SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA				
Semester/Year	III/II				
Subject Name	INDUSTRIAL INSTRUMENTATION AND CONDITION MONITORING				
Subject Code	DEX20S305				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objectives:

1. The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences.
2. Use instrumentation equipment for condition monitoring and control.

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:

- CO1:** Select relevant transducers/sensors for various applications.
CO2: Use relevant instruments for measuring non-electrical quantities.
CO3: Check the signal conditioning and telemetry system for their proper functioning.
CO4: Use data acquisition systems in various applications.
CO5: Undertake condition monitoring for diagnostic analysis of electrical equipment.

Unit	Syllabus	Periods
UNIT-I	Fundamentals of instrumentation: Basic purpose of instrumentation. Basic block diagram (transduction, signal conditioning, signal presentation) and their function. Construction, working and application of switching devices- Push button, limit switch, float switch, pressure switch, thermostat, electromagnetic relay.	8
UNIT-II	Transducers: Distinguish between Primary and Secondary, Electrical and Mechanical, Analog and Digital, Active and Passive. Mechanical devices pry. And sec. transducers. Advantages of electric transducers required characteristics of transducers. Factors affecting the choice of transducers Construction and principle of resistive transducer-Potentiometer variac and strain gauge No derivation. Only definition and formula for gauge factor types of strain gauges like unbounded, bonded and semiconductor. Construction and principle of Inductive transducers-L.V.D.T. and R.V.D.T, their applications. Construction, principle and applications of transducers – Piezo Electric transducer, photo- conductive cells, photo voltaic cells.	15
UNIT-III	Measurement of Non-Electrical Quantities: Temperature measurement Construction and Working of RTD, Thermistor and Thermo couple, radiation pyrometer, technical specifications and ranges. Pressure measurement – Construction and working of bourdon tube, bellow diaphragm and strain gauge, Combination of diaphragm and inductive transducer, Bourdon tube and LVDT, bellow and LVDT, diaphragm capacitance and bridge Circuit. Construction and Working of Speed Measurement by contacting and non-Contact Type- DC tachometer, photo-electric tachometer, too the drotortacho meter Generator-magnetic pick- up and Stroboscope. Construction and Working of Vibration measurement by accelerometer-LVDT accelerometer, i.e. electric type. Construction and Working of Flow measurement by electromagnetic and Turbine Flow meter. Construction and Working of Liquid level measurement by resistive, inductive, Capacitive gamma rays and Ultrasonic methods. Construction and Working of Thickness measurement by resistive, inductive, capacitive, ultrasonic and nuclear methods.	18
UNIT-IV	Signal Conditioning: Basic Concept of signal conditioning System. Draw pin configuration of IC 741. Define Ideal OP-AMP and Electrical Characteristics of OP-AMP. Different Parameters of op-amp:-Input offset voltage, Input off set current, Input bias current, Differential input resistance, CMMR, SVRR, voltage gain, output voltage, slew rate, gain band- width. Output short circuit current. Use of op-amp as inverting, non- inverting mode, adder, subtract or, and Working of Differential amplifier and instrumentation amplifier. Filters: Types of RC filters and frequency response -no derivation. Sample and hold circuits - operation and its application.	12
UNIT-V	Data Acquisition System: Generalized DAS-Block diagram and description of Transducer, signal conditioner, multiplexer, converter and recorder Draw Single Channel and Multi-channel DAS- Block diagram only. Difference between Signal Channel and Multi Channel DAS. Data conversion- Construction and Working of Analog to digital conversion- successive Approximation method, ramp type method. Digital to Analog conversion	

	<p>Construction and Working of binary weighted resistance method. Concept and methods of data transmission of electrical and electronic transmission. Construction and principle of telemetry system and its type - Electrical telemetering system-Digital display device- operation and its application of seven segment display, dot matrix display and concept of $3\frac{1}{2}$, $4\frac{1}{2}$ digits, LED and LCD applications Definition of condition monitoring Insulation deterioration Mechanism- factors affecting occurrence and rate of deterioration, types of stresses responsible for deterioration Different tests on transformer, their purpose, and the necessary condition of machine. Tests on Circuit breaker, purpose and required condition of machine. Tests on CT, purpose, item to be tested and required condition of machine. Power factor, capacitance /tan delta test Insulation and Polarization index, DC winding resistance test, Turns Ratio test tools and equipment used in Condition monitoring</p>	15
	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Mehta, V.K. Electronics and instrumentation, Third edition-S.Chand and company Pvt Ltd Re- print, 2010,ISBN: 81-219-2729-3. 2. Singh, S.K. Industrial instrumentation and control, Tata McGraw-Hill, 1987. ISBN: 007451914X, 9780074519141. 	
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. J.G. Joshi, Electronic Measurement and Instrumentation, Khanna Publishing House, New Delhi (ISBN:978-93-86173-621). 2. Sawhney, A.K. Electric and Electronic Measurement and instrumentation, Dhanpat Rai and Co. Author, Nineteenth revised edition 2011 reprint, 2014, ISBN:10:8177001000. 3. Rangan, C.S. G.R. Sharma. and V.S.V. Mani, Instrumentation devices and system, Pen ram International Publishing India Pvt. Ltd. Fifth edition, ISBN:10:0074. 	

SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA				
Semester/Year	III/II				
Subject Name	Summer Internship-I				
Subject Code	DEX20S306				
Paper	English				
	Hindi				
Max. Marks	50				

Course Objectives:

- 1.To encourage students to read, study & understand different topics of Electrical and Electronics engineering.
- 2.To make student acquire good oral & written communication skills.
- 3.To promote the habit of lifelong learning.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO1: Observe various activities in field.

CO2: Examine the utility of general and specific Software tool for Development.

CO3: Differentiate the construction projects individually and in team.

CO4: Develop the writing and communication skills for various engineering problems.

CO5: Adapt lifelong learning for benefit of society.

Syllabus

Each candidate shall have to undergo (2 week) 15 days in-house summer internship at the institute after the completion of their 2nd Semester exams (in summer vacations). Candidate can choose from various modules which are offered by the institute and after successful completion of internship they have to submit detailed report.

SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA				L	T	P	C
Semester/Year	III/II				0	0	2	1
Subject Name	Introduction to Electric Generation System Lab							
Subject Code	DEX20S307							
Paper	English							
	Hindi							
Max. Marks	50							

List of Experiments

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

SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA				
Semester/Year	III/II				
Subject Name	Electrical Circuits Lab				
Subject Code	DEX20S308				
Paper	English				
	Hindi				
Max. Marks	50				

List of Experiments

1. Use dual trace oscilloscope to determine A.C voltage and current response in given R, L, C circuit.
2. Use voltmeter, ammeter, and wattmeter to determine active, reactive and apparent power consumed in given R-L series circuit. Draw phasor 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, and wattmeter to determine active, reactive and apparent power consumed in given R-L-C series circuit. Draw phasor diagram.
5. Use variable frequency supply to create resonance in given series R-L-C circuit or by using variable inductor or variable capacitor.
6. Use voltmeter, ammeter, and wattmeter to determine current, p.f., active, reactive and apparent power in R-C parallel A.C. circuit.
7. Use voltmeter, ammeter, wattmeter, p.f 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, p.f meter to determine line and phase quantities of voltage and current for balanced three phase star and delta connected load and calculate active, reactive, and apparent power. Draw phasor diagram.
10. Use voltmeter, ammeter, wattmeter, p. f. meter to determine line and phase quantities of voltage and current for unbalanced three phase star and delta connected load and calculate active, reactive, and apparent power. Draw phasor diagram.

11. Use voltmeter, ammeter to determine current through the given branch of a electric network by applying mesh analysis.
12. Use voltmeter, ammeter to determine current through the given branch of a 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.

SYLLABUS

Electrical & Electronics Engineering

Class	DIPLOMA	L	T	P	C
Semester/Year	III/II	0	0	2	1
Subject Name	Electrical and Electronic Measurements Lab				
Subject Code	DEX20S309				
Paper	English				
	Hindi				
Max. Marks	50				

List of Experiments

1. Identify measuring instruments on the basis of symbols on 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 voltmeter 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 electrodynamic watt-meter for measurement of power in a single phase circuit.
9. Use single wattmeter 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. Trouble shoot 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, kVAr and kVA of a power line.

SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA				L	T	P	C
Semester/Year	III/II				0	0	2	1
Subject Name	Electric Motors and Transformers Lab							
Subject Code	DEX20S310							
Paper	English							
	Hindi							
Max. Marks	50							

List of Experiments

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. Perform parallel operation of two single phase transformers and determine the apparent and real power load sharing.
12. Perform polarity test on a single phase transformer whose polarity markings are masked.
13. Perform phasing out test on a three phase transformer whose phase markings are masked.
14. Connect the auto-transformer in step-up and step-down modes noting the input/output readings.
15. Check the functioning of the CT, PT and isolation transformer.
16. Test the pulse transformer.

SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA				
Semester/Year	IV/II				
Subject Name	Fundamentals of Power Electronics				
Subject Code	DEX20S401				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objectives:

1. The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences.
2. Maintain the proper functioning of power electronic devices.

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:

CO1: Select power electronic devices for specific applications.

CO2: Maintain the performance of Thyristors.

CO3: Trouble shoot turn-on and turn-off circuits of Thyristors.

CO4: Maintain phase controlled rectifiers.

CO5: Maintain industrial control circuits.

Unit	Syllabus	Periods
UNIT-I	Power Electronic Devices: Power electronic devices Power transistor: construction, working principle, V-I characteristics and uses. IGBT: Construction, working principle, V-I characteristics and uses. Concept of single electron transistor (SET) - aspects of Nano- technology.	8
UNIT-II	Thyristor Family Devices: SCR: construction, two transistor analogy, types, working and characteristics. SCR mounting and cooling. Types of Thyristors: SCR, LASCR, SCS, GTO, UJT, PUT, DIAC and TRIAC Thyristor family devices: symbol, construction, operating principle and V-I characteristics.	10

	Protection circuits: over-voltage, over-current, Snubber, Crowbar.	
UNIT-III	Turn-on and Turn-off Methods of Thyristors: SCR Turn-On methods: High Voltage thermal triggering, Illumination triggering, dv/dt triggering, Gate triggering. Gate trigger circuits – Resistance and Resistance-Capacitance circuits. SCR triggering using UJT, PUT: Relaxation Oscillator and Synchronized UJT circuit. Pulse transformer and opto-coupler based triggering. SCR Turn-Off methods: Class A- Series resonant commutation circuit, Class B-Shunt Resonant commutation circuit, Class C-Complimentary Symmetry commutation circuit, Class D –Auxiliary commutation, Class E- External pulse commutation, Class F-Line or natural commutation.	15
UNIT-IV	Phase Controlled Rectifiers: Phase control: firing angle, conduction angle. Single phase half controlled full controlled and midpoint controlled rectifier with R, RL Load: Circuit diagram, working, input- output waveforms, equations for DC output and effect of freewheeling diode. Different configurations of bridge controlled rectifiers: Full bridge, half bridge with common anode, common cathode, SCRs in one arm and diodes in another arm.	12
UNIT-V	Industrial Control Circuits: Applications: Burglar’s alarm system, Battery charger using SCR, Emergency light system, Temperature controller using SCR and; Illumination control / fan speed control TRIAC. SMPS. UPS: Offline and Online SCR based AC and DC circuit breakers.	10
	Text Books: 1. Fundamentals of Power Electronics Author : R. W. Erickson and D. Maksimovic Publisher : Springer Science & Business Media. 2. Power electronics: circuits, devices, and applications Author : M. H. Rashid Publisher : Pearson Education India.	
	Reference Books: 1. Rama moorty M., An Introduction to Thyristors and their applications, East-West Press Pvt. Ltd., New Delhi, ISBN: 8185336679. 2. Sugandhi, Rajendra Kumar and Sugandhi, Krishna Kumar, Thyristors: Theory and Applications, New Age International (P) ltd. Publishers, New Delhi, ISBN: 978-0-85226-852-0. 3. Bhattacharya, S.K., Fundamentals of Power Electronics, Vikas Publishing House Pvt. Ltd. Noida. ISBN: 978-8125918530. 4. Jain & Alok , Power Electronics and its Applications, Penram International Publishing (India) Pvt. Ltd, Mumbai, ISBN:978-8187972228. 5. Rashid, Muhammad, Power Electronics Circuits Devices and Applications, Pearson Education India, Noida, ISBN:978-0133125900. 6. Singh, M. D. and Khanchandani, K.B., Power Electronics, Tata McGraw Hill Publishing Co. Ltd, New Delhi, 2008 ISBN:9780070583894. 7. Zbar, Paul B., Industrial Electronics: A Text –Lab Manual, McGraw Hill Publishing Co. Ltd., New Delhi, ISBN: 978-0070728226. 8. Grafham D.R., SCR Manual, General Electric Co., ISBN: 978-0137967711.	

SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA		L	T	P	C
Semester/Year	IV/II		3	0	0	3
Subject Name	ELECTRIC POWER TRANSMISSION AND DISTRIBUTION					
Subject Code	DEX20S402					
Paper	English					
	Hindi					
Max. Marks	100					

Course Objectives:

1. The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences.
2. Maintain the proper functioning of the electrical transmission and distribution systems.

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:

CO1: Interpret the normal operation of the electric transmission and distribution systems.

CO2: Maintain the functioning of the medium and high voltage transmission system.

CO3: Interpret the parameters of the extra high voltage transmission system.

CO4: Maintain the functioning of the low voltage AC distribution system.

CO5: Maintain the components of the transmission and distribution lines.

Unit	Syllabus	Periods
UNIT-I	Basics of Transmission and Distribution: Single line diagrams with components of the electric supply transmission and distribution systems. Classification of transmission lines: Primary and secondary transmission; standard voltage level used in India. Classification of transmission lines: based on type of voltage, voltage level, length and others Characteristics of high	12

	voltage for power transmission. Method of construction of electric supply transmission system –110 kV, 220 kV, 400 kV. Method of construction of electric supply distribution systems – 220 V, 400V, 11 kV, 33 kV.	
UNIT-II	Transmission Line Parameters and Performance: Line Parameters: Concepts of R, L and C of line parameters and types of lines. Performance of short line: Efficiency, regulation and its derivation, effect of power factor, vector diagram for different power factor. Performance of medium line: representation, nominal ‘T’, nominal ‘ π ’ and end condenser methods. Transposition of conductors and its necessity. Skin effect and proximity effect.	10
UNIT-III	Extra High Voltage Transmission: Extra High Voltage AC (EHVAC) transmission line: Necessity, high voltage substation components such as transformers and other switchgears, advantages, limitations and applications and lines in India. Ferranti and Corona effect. High Voltage DC (HVDC) Transmission Line: Necessity, components, advantages, limitations and applications. Layout of mono polar, bi-Polar and homo-polar transmission lines. Lines in India. Features of EHVAC and HVDC transmission line. Flexible AC Transmission line: Features, d types of FACTS controller. New trends in wireless transmission of electrical power.	12
UNIT-IV	A.C Distribution System: AC distribution: Components classification, requirements of an ideal distribution system, primary and secondary distribution system. Feeder and distributor, factors to be considered in design of feeder and distributor. Types of different distribution schemes: radial, ring, and grid, layout, advantages, disadvantages and applications. Voltage drop, sending end and receiving end voltage. Distribution Sub-Station: Classification, site selection, advantages, disadvantages and applications. Single Line diagram (layout) of 33/11KV Sub-Station, 11KV/400V sub-station, Symbols and functions of their components.	15
UNIT-V	Components of Transmission and Distribution Line: Overhead Conductors: Properties of material, types of conductor with trade names, significance of sag. Line supports: Requirements, types of line structures and their specifications, methods of erection. Line Insulators: Properties of insulating material, selection of material, types of insulators and their applications, causes of insulator failure, derivation of equation of string efficiency for string of three suspension insulator, methods of improving string efficiency. Underground Cables: Requirements, classification, construction, comparison with overhead lines, cable laying and cable jointing.	15
	Text Books: 1. Electric Power Transmission and Distribution by Released July 2008 Publisher(s): Pearson India ISBN: 9788131707913. 2. D.P. Kothari , I.J. Nagarath, ‘Power System Engineering’, Tata Mc Graw-Hill Publishing Company limited, New Delhi, Second Edition, 2008. 3. C.L. Wadhwa, ‘Electrical Power Systems’, New Academic Science Ltd, 2009.	

Reference Books:

1. G.C. Garg, Utilization of Electric Power & Electric Traction, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-86173-355).
2. Mehta, V.K., Principles of Power System, S. Chand and Co. New Delhi, ISBN: 9788121924962.
3. Soni; Gupta; Bhatnagar, A Course in Electrical Power, Dhanpat Rai and Sons New Delhi, ISBN: 9788177000207
4. Gupta, J.B., A Course in Power Systems, S.K. Kataria and sons, New Delhi, ISBN: 9788188458523.
5. Theraja, B.L.; The raja, A.K., A Text book of Electrical Technology Vol. III, S.Chand and Co. New Delhi, ISBN: 9788121924900.
6. Uppal, S.L., A Course in Electrical Power, S.K. Khanna Publisher New Delhi, ISBN: 9788174092380.

SYLLABUS
Electrical & Electronics Engineering

Class		DIPLOMA				L	T	P	C
Semester/Year		IV/II				3	0	0	3
Subject Name		INDUCTION, SYNCHRONOUS AND SPECIAL ELECTRIC MACHINES							
Subject Code		DEX20S403							
Paper	English								
	Hindi								
Max. Marks		100							
<p>Course Objectives:</p> <ol style="list-style-type: none"> The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences. Maintain Induction, Synchronous and FHP Machines used in different applications. 									
<p>Course Outcomes:</p> <p>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:</p> <p>CO1: Maintain three phase induction motor used in different applications. CO2: Maintain single phase induction motor used in different applications. CO3: Maintain three phase alternators used in different applications. CO4: Maintain synchronous motors used in different applications. CO5: Maintain FHP motors used in different applications.</p>									
Unit	Syllabus								Periods
UNIT-I	<p>Three Phase Induction Motor: Working principle: production of rotating magnetic field, Synchronous speed, rotor speed and slip. Constructional details of 3 phase induction motors: Squirrel cage induction motor and Slip ring induction motor. Rotor quantities: frequency, induced e.m.f, power factor at starting and running condition. Characteristics of torque versus slip (speed), Torques: starting, full load and maximum with relations among them. Induction motor as a generalized transformer with phasor diagram. Four quadrant operation, Power flow diagram Starters: need and types; stator resistance, auto transformer, star delta, rotor resistance and soft starters. Speed control methods: stator voltage, pole changing, rotor resistance and VVVF. Motor selection for different applications as</p>								15

	per the load torque-speed requirements. Maintenance of three phase induction motors.	
UNIT-II	Single phase induction motors: Double field revolving theory, principle of making these motors self-start. Construction and working: Resistance start induction run, capacitor start induction run, capacitor start capacitor run, shaded pole, repulsion type, series motor, universal motor, hysteresis motor. Torque-speed characteristics for all of the above motors. Motor selection for different applications as per the load torque-speed requirements. Maintenance of single phase induction motors.	10
UNIT-III	Three phase Alternators: Principle of working, moving and stationary armatures. Constructional details: parts and their functions, rotor constructions. Windings: Single and Double layer. E.M.F. equation of an Alternator with numerical by considering short pitch factor and distribution factor. Alternator loading: Factors affecting the terminal voltage of alternator; Armature resistance and leakage reactance drops. Armature reaction at various power factors and synchronous impedance. Voltage regulation: direct loading and synchronous impedance methods. Maintenance of alternators.	12
UNIT-IV	Synchronous motors: Principle of working /operation, significance of load angle. Torques: starting torque, running torque, pull in torque, pull out torque. Synchronous motor on load with constant excitation (numerical), effect of excitation at constant load (numerical). V-Curves and Inverted V-Curves. Hunting and Phase swinging, Methods of Starting of Synchronous Motor, Losses in synchronous motors and efficiency (no numerical), Applications areas.	12
UNIT-V	Fractional horse power (FHP) Motors: Construction and working: Synchronous Reluctance Motor, Switched Reluctance Motor, BLDC, Permanent Magnet Synchronous Motors, stepper motors, AC and DC servomotors. Torque speed characteristics of above motors. Applications of above motors.	10
	Text Books: 1. Fundamentals of Electromechanical Energy Conversion By Jacek F. Gieras Copyright Year 2017 Author(s) Biography Gieras, Jacek F. 2. Special electrical machines J R Cardoso, M B C Salles and M C Costa Published December 2019 • Copyright © IOP Publishing Ltd 2020. 3. T.J.E. Miller, Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 1989.	
	Reference Books: 1. P.S. Bimbhra, Electric Machines, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-86173- 294). 2. Mittle, V.N. and Mittle, Arvind., Basic Electrical Engineering, McGraw Hill Education New Delhi, ISBN:9780070593572. 3. Kothari, D. P. and Nagrath, I. J., Electrical Machines, McGraw Hill Education. New Delhi, ISBN: 9780070699670.	

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| | <p>4. Bhattacharya, S.K., Electrical Machines, Mc Graw Hill Education, New Delhi, ISBN: 9789332902855.</p> <p>5. Theraja, B.L. Electrical Technology Vol II (AC and DC machines), S. Chandand Co. Ltd. ,New Delhi, ISBN :9788121924375.</p> | |
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SYLLABUS

Electrical & Electronics Engineering

Class		DIPLOMA	L	T	P	C
Semester/Year		IV/II	3	0	0	3
Subject Name		Industrial Drives				
Subject Code		DEX20S404				
Paper	English					
	Hindi					
Max. Marks		100				

Course Objectives:

1. The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences.
2. Maintain electric AC and DC Drives.

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:

CO1: Select relevant DC motor for various electric drive applications.

CO2: Select relevant AC motor for various electric drive applications.

CO3: Maintain DC Drives.

CO4: Maintain AC Drives.

CO5: Maintain microprocessor/micro controlled electric motors.

Unit	Syllabus	Periods
UNIT-I	Electric Drives: Need of Electric Drives, Functional Block diagrams of an electric drives. DC Motors, Motor Rating Series, Shunt and compound DC motors. Universal motor Permanent magnet motor DC servomotor Moving coil motor Torque motor. Starting and Braking of DC Motors. Brushless DC Motors for servo applications. Maintenance procedure.	10

UNIT-II	AC Motors: Single phase AC Motors. Resistance split phase motors. Capacitor run motors. Capacitor start motors Shaded pole motors. Three phase Induction Motors. Squirrel cage Induction motor. Slip ring Induction Motor. Starting methods of Induction Motor. Braking methods of Induction Motor Determination of Motor Rating. Maintenance procedure.	10
UNIT-III	DC Drives: Single phase SCR Drives. Half wave converter. Full wave converter. Semi converter. Dual converter. Three Phase SCR Drives. Half wave converter. Full wave converter. Semi converter. Dual converter Reversible SCR Drives.. Speed control methods of DC series Motor Chopper Controlled DC Drives. Solar and battery powered vehicles Maintenance procedure.	12
UNIT-IV	AC Drives: Starting and Braking of Induction motors. Stator voltage control. Variable Frequency Control Voltage Source Inverter Control Current Source Inverter Control Rotor Resistance Control. Slip Power Recovery. Solar powered pump drives Maintenance procedure for AC drives Sequences of stages & drives required in each stage for following applications:. Textile mills Steel rolling mills. Paper mills, Sugar mills.	12
UNIT-V	Advanced Techniques of Motor Control: Microcontroller/ Microprocessor based control for drives Phase locked loop control of DC motor. AC/DC motor drive using Microcomputer control AC/DC motor drive using Microcontroller control. Synchronous Motor drives. Ratings & specifications of stepper motor. Stepper motor drives employing microcontroller (No programming).	10
	Text Books: 1. VEDAM SUBRAMANIAM “Electric drives (concepts and applications)”, Tata McGraw-Hill.2001. 2. NAGARATH.IJ & KOTHARI .D.P, ”Electrical machines”, Tata McGraw-Hill.1998.	
	Reference Books: 1. P.S. Bimbhra, Electric Machines, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-86173- 294). 2. Saxena, S.B Lal; Dasgupta, K., Fundamentals of Electrical Engineering, Cambridge university press pvt. Ltd., New Delhi, ISBN: 9781107464353. 3. Theraja, B. L. ; Theraja, A. K., A Text Book of Electrical Technology Vol-II, S. Chand and Co. Ram- nagar, New Delhi, ISBN:9788121924405. 4. Mittle, V.N. Mittle, Arvind, Basic Electrical Engineering, McGraw Hill Education, Noida, ISBN: 9780070593572. 5. Sen P.C., Power Electronics, Mcgraw -Hill Publishing Company Limited, New Delhi. ISBN: 9780074624005. 6. Dubey Gopal K., Fundamentals of Electrical Drives, Second Edition, Narosa Publishing House, New Delhi.ISBN:9788173194283.	

SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA		L	T	P	C
Semester/Year	IV/II		3	0	0	3
Subject Name	Communication Technologies					
Subject Code	DEX20S405					
Paper	English					
	Hindi					
Max. Marks	100					

Course Objectives:

1. The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:
2. Use relevant data communication technique.

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:

CO1: Identify the different types of data communication equipment and techniques.

CO2: Use relevant digital modulation techniques.

CO3: Interpret the specifications of the data communication media.

CO4: Maintain the fibre optics networks for data communication.

CO5: Use OSI model and relevant data communication protocols.

CO6: Maintain wireless network environment.

Unit	Syllabus	Periods
UNIT-I	Data Communication and Modulation: Block diagram of communication system. Types of communication system: synchronous and asynchronous, simplex, half-duplex, Full duplex, serial and parallel communication.	

	Classification of communication technique: AM, FM, & PM on the basis of definition, wave- form, bandwidth,. modulation index. Modulation and demodulation: Block diagram of AM, FM and PM. Pulse Modulation: Block diagram for waveform generation of PAM, PWM & PPM, working principle, advantages, disadvantages and applications. Advantages of pulse modulation over AM and FM.	10
UNIT-II	Digital Modulation Techniques: Digital Communication: Block diagram and working principle, waveforms, strength and limitations. Sampling process Nyquist sampling theorem, quantization process, quantization error, quantization noise. PCM: Block diagram, working principle, waveforms, advantages, disadvantages, application of PCM. Principle of ASK, PSK, FSK. Application of ASK, PSK, FSK.	10
UNIT-III	Data Communication Media: Baud rate, Bit rate, types of errors in data communication and error correction techniques. Types of communication media and frequency band of operation. Guided media: Types of cable-twisted pair cable, coaxial cable, fiber optic cable. Unguided media: Microwave communication, Infrared communication.	12
UNIT-IV	Fibre Optics: Introduction to Fiber optic communication. Strength and limitations of fiber optic system Light propagation: reflection, refraction, Snell's law Light propagation through cable: Mode of propagation, index profile. Fibre optic cables: cable construction, fibre optics cable modes, single mode, step index fibre, multimode index fibre, multimode graded index fibre, fibre cable losses. Light source and Detector: Light emitting diode (LED), Photo Transistor, Laser diode, opto coupler.	15
UNIT-V	Data Communication Protocols and Interfacing Standard : OSI (Open Systems Interconnection) Reference model Introduction to protocol, FTP SMTP, TCP/IP, UDPLAN standards. Introduction to IEEE Standards for LAN and GPIB RS-232 standard Introduction, and working principle Network topologies, introduction star, ring, tree, bus, mesh, hybrid Basic functions of networking devices: modem, switches, routers, repeaters, hubs, bridges gateway. Advanced Data Communication: Introduction to Wi-Fi and Wi- Max Bluetooth architecture and its layers, Universal serial bus (USB) architecture Bluetooth and USB.	15
	Text Books: 1. Information and Communication Technology for Development By Richard Heeks: 2017 ISBN: 9781317313564, 1317313569. Published:8 November 2017;Taylor & Francis. Language: English Author: Richard Heeks. 2. Information and Communication Technology in Organizations: Adoption, Implementation, Use and Effects. Author: Harry Bouwman: Bart van den Hooff. Lidwien van de Wijn gaert & Jan van Dijk Publisher: SAGE	

	Publications Ltd. Publication year: 2005. Online pub date: May 31, 2012.	
	<p>Reference Books:</p> <ol style="list-style-type: none">1. Wayne Tomasi, Electronic Communication System, Prentice Hall of India, ISBN 13:9780130494924.2. Reynders D., Steve Macky, Wright Edwin, Practical Industrial Data Communications, Newnes publication, ISBN10:07506639523.3. George F. Kennedy, Barnard Davis, Electronic Communication System, Tata Mc Graw Hill, ISBN 13:9780074636824.4. Forouzan B.A., Data Communication & Networking, McGraw Hill Education; 5 editions ISBN- 13:0073376226-978.5. Prasad K.V.K.K., Principles of Digital communication systems and computer networks, Dream- tech press, New Delhi, ISBN13:9788177223620.6. Tanenbaum, Andrew S. David J. Wetherill, Computer Networks, Pearson; 5 editions ISBN 13:9788121924252.	

SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA				
Semester/Year	IV/II				
Subject Name	Mini Project				
Subject Code	DEX20S406				
Paper	English				
	Hindi				
Max. Marks	50				

Course Objectives:

1. To develop an application of Electrical & Electronics engineering problems & have a feel of real life situations in planning & development of projects.
2. To impart training of handling various types of Computer Science engineering problems by use software's.
3. To utilize the expertise in engineering to solve industry's technological problems.
4. To become innovative and professional in technology development, and system implementation.
5. To be able to function in their profession with social awareness and responsibility.
6. To be able to interact with their peers in industry and society as engineering professionals and leaders & inculcate a habit of working in a group.
7. Enable students to prepare professional reports for design projects and data presentation skill and to use computers and some computer graphics.

Course Outcomes:

Upon completion of the course, the students will be able to:

CO 1: Recognize various engineering problems and techniques to solve them.

CO 2: Reproduce the solution of the problems upon the need of society.

CO 3: Cooperate to work within group.

CO 4: Develop the writing and communication skills for various engineering problems.

CO 5: Display lifelong learning.

Syllabus

Each candidate shall work on a unique project of Electrical & Electronics engineering work and shall submit report.

OR

Shall submit a detailed report of experimental work / software package on any specific problem of importance.

SYLLABUS

Electrical & Electronics Engineering

Class	DIPLOMA	L	T	P	C
Semester/Year	IV/II	0	0	2	1
Subject Name	ELECTRIC POWER TRANSMISSION AND DISTRIBUTION LAB				
Subject Code	DEX20S407				
Paper	English				
	Hindi				
Max. Marks	50				

List of Experiments

Laboratory work is not applicable for this course.

Following are the suggested student-related co-curricular activities which can be undertaken to accelerate the attainment to the various outcomes into his course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) port folio which will be use full for their placement interviews:

1. Prepare are port based on transmission line network in Maharashtra.
2. Collect the information on components of transmission line.
3. Evaluate transmission line performance parameters of a given line.
4. Library/Internet survey of electrical high voltage line and HVDC lines.
5. Visit to 33/11 KV and 11KV/400V Distribution Substation and write airport.

Also one micro-project can be assigned to the student. A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

A. Prepare a model showing:

1. Single line diagram of electric supply system.
2. Single line diagram of a given distribution system.
3. Short line and medium transmission line.
4. Write are port on the same by giving the detail so felines in Maharashtra State.

B. Collect different samples of Overhead Conductors, Underground Cables, and Lines up ports and Line

Insulators.

C. Prepare a power point presentation:

1. Extra High Voltage AC Transmission line.
2. High Voltage DC Transmission line.
3. Flexible AC Transmission line.
4. New trends in wireless transmission of electrical power.

D. Collect information on:

1. A.C Distribution System adjacent to your institute.
2. Draw a layout diagram of 11KV/400V substation in your campus/adjacent substation.

SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA				
Semester/Year	IV/II				
Subject Name	ELECTRIC MACHINES Lab				
Subject Code	DEX20S408				
Paper	English				
	Hindi				
Max. Marks	50				

List of Experiments

1. Identify the different parts (along with function and materials) for the given single phase and three phase induction motor.
2. Connect and run the three phase squirrel cage induction motors (in both directions) using the DOL, star-delta, auto-transformer starters (any two).
3. Perform the direct load test on the three phase squirrel cage induction motor and plot the efficiency versus output, ii) power factor versus output, iii) power factor or versus motor current and iv) torque – slip/speed characteristics.
4. Conduct the No-load and Blocked-rotor tests on given 3- ϕ squirrel cage induction motor and determine the equivalent circuit parameters.
5. Conduct the No-load and Blocked-rotor tests on given 3- ϕ squirrel cage induction motor and plot the Circle diagram.
6. Control the speed of the given three phase squirrel cage/slip ring induction motor using the applicable methods: i) auto-transformer, ii) VVVF.
7. Measure the open circuit voltage ratio of the three phase slip ring induction motor.
8. Conduct the direct load test to determine the efficiency and speed regulation for different loads on the given single phase induction motor; plot the efficiency and speed regulation curves with respect to the output power.
9. Perform the direct loading test on the given three phase alternator and determine the regulation and efficiency.
10. Determine the regulation and efficiency of the given three phase alternator from OC and SC tests (Synchronous impedance method).

11. Conduct the test on load or no load to plot the 'V' curve and inverted 'V' curves (at no-load) of 3-synchronous motor.
12. Dismantling and reassembling of single phase motors used for ceiling fans, universal motor for mixer.
13. Control the speed and reverse the direction of stepper motor.
14. Control the speed and reverse the direction of the AC servo motor.
15. Control the speed and reverse the direction of the DC servo motor.
16. Control the speed and reverse the direction of the DC servomotor.

SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA		L	T	P	C
Semester/Year	IV/II		0	0	2	1
Subject Name	Industrial Drives Lab					
Subject Code	DEX20S409					
Paper	English					
	Hindi					
Max. Marks	50					

List of experiment

1. Dismantle the given DC motor and identify its different parts.
2. Dismantle the given AC motor and identify its different parts.
3. Control the speed of DC Motor using armature voltage control method.
4. Control the speed of DC Motor using field current control method.
5. Measure the output voltage of chopper for resistive load by varying the frequency and/or duty cycle of chopper.
6. Control the speed of three phase squirrel cage induction motor using stator voltage control method.
7. Effect on speed of given D.C. series motor by varying armature voltage using step down chopper.
8. Observe the effect on speed of the given D.C. separately excited motor by varying voltage using step down chopper.
9. Control the speed of the given separately excited motor by changing the firing angle of SCR using single phase semi converter and measure the speed.
10. Control the speed of the given separately excited motor by changing the firing angle of SCR using single phase full converter and measure the speed.
11. Control the speed of the given three phase induction motor by using constant V/f method and plot the graph between speed and frequency.
12. Control the speed of the given three phase induction motor by varying frequency and plot the graph between speed and frequency.
13. Control the speed of the given synchronous motor drives using microcontroller.
14. Demonstrate High power SCR/power device and Heat sink and write their specifications and rating.
15. Control the speed of single phase capacitor split phase induction motor using DIAC –TRIAC circuit.
16. Control the speed of DC motor drives using microcontroller.

SYLLABUS
Electrical & Electronics Engineering

Class		DIPLOMA	L	T	P	C
Semester/Year		IV/II	0	0	2	1
Subject Name		Communication Technologies Lab				
Subject Code		DEX20S410				
Paper	English					
	Hindi					
Max. Marks		50				

List of experiment

1. Differential AM, FM, & PM.
2. Differential Pulse Code Modulation.
3. Delta Modulation.
4. Adaptive Delta Modulation.
5. Differential of FTP, SMTP, TCP/IP, UDPLAN standards.
6. Study of Types of cable-twisted pair cable, coaxial cable, fiber optic cable.
7. Frequency Shift Keying Generation and Detection.
8. Phase Shift Keying Generation and Detection.
9. DPSK Generation and Detection.
10. QPSK Generation and Detection.
11. Study of the spectral characteristics of PAM.
12. Study of the spectral characteristics of PWM.
13. Study of the Application of ASK, PSK, FSK.

