

SYLLABUS

Electrical & Electronics Engineering

Class	DIPLOMA		L	T	P	C
Semester/Year	V/III		3	1	0	4
Subject Name	MICROCONTROLLER APPLICATIONS					
Subject Code	DEX20S501					
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 different types of microcontroller based 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 salient features of various types of micro controllers.

CO2: Interpret the salient features of archi type of types microcontrollers IC 8051.

CO3: Maintain the program features of the Microcontroller based application.

CO4: Develop assembly language program.

CO5: Develop programs to interface 8051 microcontrollers with LED/SWITCH.

Unit	Syllabus	Periods
UNIT-I	Introduction to Microcontrollers: Evolution of Microcontrollers. Block diagram of Microcomputer, elements of Microcomputer, types of buses Von Neuman and Harward Architecture Compare Microprocessor and Microcontrollers Need of Microcontroller Family of Microcontrollers and their specifications Versions of. Microcontroller 8951, 89C1051, 89C2051, 89C4051 with their specifications and comparison.	10

UNIT-II	Architecture of Microcontroller8051: Block diagram of 8051, function of each block Pin diagram, function of each pin. Concept of Internal memory and External memory (RAM and ROM). Internal RAM structure Reset and clock circuit. Various registers and SFRs of 8051.	8
UNIT-III	8051 Instruction Set and Programs : Overview of 8051 instruction set Various addressing modes Classification of instructions, Data transfer instructions Arithmetic instructions Logical instructions Branching instructions, Bit manipulation instructions, Stack, subroutine and interrupt related instructions Programs based on above instructions.	10
UNIT-IV	Assembly Language Programming: Software development steps, Software development tools like Editor, Assembler, Linker, Loader and Hex, converters. Role of various files created at various levels in running a Assembly program using simulators like RIDE or KEIL. Various directives of Assembly language programming Programs using directives.	12
UNIT-V	8051 Internal Peripherals and Related Programs: I/O ports- List, diagram, read write operation, instructions and related SFR Timers/counters – list, related SFRs, programming modes, operations with diagram. Serial communication- Basics of serial communication, baud rate, related SFRs, programming modes, operations with diagram. Interrupts related SFRs, types, operations with diagram. Power saving operation- modes, related SFR.	15
	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Embedded System & Microcontroller. Author: Manish Verma, K. B. Singh. Publisher: S. K. Kataria& Sons. Released: 2010. 2. Interfacing PIC Microcontrollers embedded design by Interactive Simulation by Martin Bates. 	
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Kenneth, Ayala, 8051 Microcontroller Architecture Programming and Application, PHIL earning, New Delhi, ISBN: 978-1401861582. 2. Mazidi, Mohmad Ali; Mazidi, Janice Gelispe; Mckinlay Roline D. The 8051 Microcontroller and Embedded system, Pearson Education, Delhi, ISBN978-8177589030. 3. Pal, Ajit, Microcontroller Principle and Application, PHI Learning, New Delhi, ISBN13: 978-81- 203-4392-4. 4. Deshmukh, Ajay, Microcontroller Theory and Application, Mc Graw Hill., New Delhi, ISBN-9780070585959. 5. Kamal, Raj, Microcontroller Architecture Programming, Interfacing and system Design, Pearson Education India, Delhi, ISBN: 9788131759905. 6. Mathur; Panda, Microprocessors and Microcontrollers, PHI Learning, New Delhi, ISBN: 978-81- 203-5231-5. 	

SYLLABUS
Electrical & Electronics Engineering

Class		DIPLOMA	L	T	P	C
Semester/Year		V/III	3	1	0	4
Subject Name		Switchgear and Protection				
Subject Code		DEX20S502				
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 switch gear and protection schemes used in electrical power systems.						
Course outcomes:						
CO1: Identify various types off adults in power system.						
CO2: Select suitable switch gears for different applications.						
CO3: Test the performance of different protective relays.						
CO4: Maintain protection systems of alternators and transformers.						
CO5: Maintain protection schemes for motors and transmission lines.						
Unit	Syllabus					Periods
UNIT-I	Basics of Protection: Necessity, functions of protective system. Normal and abnormal conditions. Types of faults and their causes. Protection zones and backup protection Short circuit fault calculations in lines fed by generators through transformers Need of current limiting reactors and their arrangements.					8
UNIT-II	Circuit Interruption Devices: Isolators Vertical break, Horizontal break and Pantograph type. HRC fuses. Construction, working, characteristics and applications. Arc formation process, methods of arc extinction (High resistance and Low resistance), Arc voltage, Recovery voltage, Re-striking voltage, RRRV. HT circuit breakers (Sulphurhexa Fluoride (SF6), Vacuum circuit breaker) Working, construction, specifications and applications. L.T. circuit breaker (Air circuit breakers (ACB), Miniature circuit breakers (MCB), Molded case circuit breakers (MCCB) and Earth leakage circuit breaker (ELCB)) Working and applications. Selection of LT and HT circuit breakers (ratings), Selection of MCCB for motors. Gas insulated switchgear.					9

<p>UNIT-III</p>	<p>Protective Relays: Fundamental quality requirements: Selectivity, Speed, Sensitivity, Reliability, Simplicity, Economy. Basic relay terminology- Protective relay, Relay time, Pick up, Reset current, current setting, Plug setting multiplier, Time setting multiplier. Protective relays: Classification, principle of working, construction and operation of – Electromagnetic (Attracted armature type, Solenoid type, Watt-hour meter type) relay, Thermal relay. Block diagram and working of Static relay. Over current relay-Time current characteristics. Microprocessor based over current relays: Block diagram, working. Distance relaying- Principle, operation of Definite distance relays. Directional relay: Need and operation. Operation of current and voltage differential relay.</p>	<p>11</p>
<p>UNIT-IV</p>	<p>Protection of Alternator and Transformer: Alternator Protection. Faults, Differential protection over current, earth fault, overheating and field failure, protection. Reverse power protection. Transformer Protection Faults, Differential, over current, earth fault, over heating protection, Limitations of differential protection. Buchholz relay: Construction, operation, merits and demerits.</p>	<p>13</p>
<p>UNIT-V</p>	<p>Protection of Motors, Bus-bar and Transmission Line Motor: Fault Short circuit protection, Overload protection, Single phase preventer. Bus bar and Transmission line Faults on Bus bar and Transmission Lines. Bus bar protection: Differential and Fault bus protection. Transmission line: Over current, Distance and Pilot wire protection.</p>	<p>14</p>
	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Singh, R.P., Switch gear and Power System Protection, PHI Learning, New Delhi, ISBN: 978-81-203-3660-5. 2. Gupta. J.B. Switch gear and Protection, S.K. Kataria and Sons, New Delhi, ISBN: 978-93-5014- 372-8. 3. Veerapan, N., Krishna murty, S. R., Switchgear and Protection, S .Chand and Co., New Delhi. ISBN: 978-81-2193-212-7. 	
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Mehta V. K; Rohit Mehta, Principles of Power System, S .Chand and Co. New Delhi. ISBN:978-81-2192-496-2. 2. Rao. Sunil S., Switchgear and Protection, Khanna Publishers, New Delhi, ISBN: 978-81-7409- 232-3. 3. Singh, R.P. Switch gear and Power System Protection, PHIL earning, New Delhi, ISBN: 978-81-203-3660-5. 4. Gupta .J.B. Switch gear and Protection, S.K. Kataria and Sons, New Delhi, ISBN: 978-93-5014- 372-8. 5. Veerapan, N., Krishna murty, S. R., Switchgear and Protection, S .Chand and Co., New Delhi. ISBN: 978-81-2193-212-7. 6. Ram, Badri; Vishwakarma D.N., Power System Protection and Switchgear, Mc Graw -Hill, New Delhi. ISBN: 978-07-107774. 	

SYLLABUS

Electrical & Electronics Engineering

Class	DIPLOMA		L	T	P	C
Semester/Year	IV/II		3	0	0	3
Subject Name	Electrical Testing and Commissioning					
Subject Code	DEX20S503					
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. Follow standard safety procedures in testing and commissioning of electrical equipment.

Course outcomes:

- CO1:** Follow safety procedure switch respect to earthing and insulation of electrical equipment.
- CO2:** Select proper tools, equipment, for installation, testing, maintenance of electrical machines and transformers.
- CO3:** Test and commission electrical equipment in accordance with IS codes.
- CO4:** Make plans for trouble shooting electrical machines.
- CO5:** Sunder take regular preventive and break down maintenance.

Unit	Syllabus	Periods
UNIT-I	Electrical Safety and Insulation: Do's and don'ts regarding safety in domestic electrical appliances as well for substation/ power station operators. Electrical safety in industry/power stations/ substations at the time of operation/ control/ maintenance. Fire detection alarm, fire-fighting equipments. Factors affecting life of insulating materials, classifications of insulating materials as per IS:1271-1958. Measuring insulation resistance by different methods such as i) Polarization, ii) Dielectric absorption, iii) Megger and to predict the condition of insulation. Reconditioning of insulation, Insulating oil - properties of insulating oil, causes of deterioration of oil, testing of transformer oil as per IS 1866-1961.	10

UNIT-II	Installation and Erection: Concept of foundation for installation of machinery. Requirements of foundation for static and rotating electrical machinery. Concept of leveling and aligning Procedure for leveling and aligning alignment of direct coupled drive, effects of misalignment. Installation of transformer as per I.S.-1886-1967 and procedure of installation of transformer, Requirements of installation of pole mounted transformer. Requirements of installation of rotating electrical machines as per I.S. 900 – 1965.Devices and tools required for loading, unloading, lifting, and carrying heavy equipment and precautions to be taken while handling them.	10
UNIT-III	Testing and Commissioning: Concept of testing, Objective soft testing. Roles of I.S.S. in testing of electrical equipment, Types of tests and concepts, Routine tests, type tests, supplementary test, special tests, Methods of testing - Direct/Indirect/Regenerative testing. Tolerances for the various items for equipment –transformer, induction motor, dc motor, synchronous machines Commissioning, Tests before Commissioning for transformer, induction motor, alternator testing of transformer as per I.S.1886- 1967 and I.S.2026- 1962. Testing of three-phase Induction motor as per I.S.325 - 1970.Testing of single-phase induction motor as per I.S.990-1965.Testing of synchronous machines as per ISS. Testing of D.C. machines.	15
UNIT-IV	Trouble shooting Plans: Internal and external causes for failure / abnormal operation of equipment. List of mechanical faults, electrical faults and magnetic faults in the electrical equipment remedies, applications. Use of tools like bearing puller filler gauges, dial indicator, spirit level, megger, earth tester, and growler. Common troubles in electrical equipment and machines. Preparation of trouble shooting charts for D.C. Machines, AC Machines and transformers.	12
UNIT-V	Maintenance: Concept of maintenance, types of maintenance, Routine, preventive and breakdown maintenance. Causes of failure of electrical machines. Preventive maintenance-procedure or developing maintenance schedules for electrical machines. Factors affecting preventive maintenance schedules, Concept of TPM, Pillars of TPM. Identification of different types of faults developed such as mechanical/ electrical/ magnetic faults. Maintenance schedules of the following as per I.S.S. 1. Distribution transformer as per I.S.1886-1967. 2. Single phase and three phase Induction motors as per I.S.900-1965. 3. Batteries.	12
	Text Books: 1. Rosenberg. Mc GRAW-HILL, 1st Edition, May 2003, Maintenance and Repairs, ISBN No 9780071396035. 2. Sharotri, S.K. Glencoe / Mc graw- Hill; 2 nd Edition, June 1969; Preventive Maintenance of Electrical Apparatus, ISBN No 10: 007030839X 13: 978-0070308398.	

Reference Books:

1. Deshpande. M.V. PHI Learning Pvt. Ltd., 2010, Design and Testing of Electrical Machines ISBN No 8120336453, 9788120336452.
2. Rao, BVS Asia Club House, First Reprint, 2011, Operation and Maintenance of Electrical Equipment Vol-I, ISBN No 8185099022.
3. Rosenberg. M.C. GRAW-HILL, 1st Edition, May 2003, Maintenance and Repairs, ISBN No 9780071396035.
4. Sharotri, S.K. Glencoe /Mc graw- Hill; 2nd Edition, June1969; Preventive Maintenance of Electrical Apparatus, ISBN No 10: 007030839X 13: 978-0070308398.
5. Mc GRAW-HILL, 1st Edition, May 2003, Maintenance and Repairs, ISBN No 9780071396035.

SYLLABUS
Electrical & Electronics Engineering

Class		DIPLOMA	L	T	P	C
Semester/Year		V/III	3	0	0	3
Subject Name		Electrical Estimation and Contracting				
Subject Code		DEX20S504				
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. Design electrical installation with costing for tendering.

Course outcomes:

CO1: Follow National Electrical Code 2011 in electrical installations.

CO2: Estimate the electrical installation works.

CO3: Estimate the work of non-industrial electrical installations.

CO4: Estimate the work of industrial electrical installations.

CO5: Prepare abstract, tender, quotation of public lighting and other installations.

Unit	Syllabus	Periods
UNIT-I	Electric Installation and Safety: Scope and features of National electric code 2011 Types of electrical installation. Fundamental principles for electrical installation Permit to work, safety instructions and safety practices Purpose of estimating and costing.	8
UNIT-II	Estimation and Costing: Meaning and purpose of- Rough estimate, detailed estimate, supplementary estimate, annual maintenance estimate and revised estimate. Factors to be considered while preparation of detailed estimate and economical execution of work. Contracts- Concepts of contracts, types of contracts, contractor, role of contractor. Tenders and Quotations- Type of tender, tender notice, preparation of tender document, and method of opening of tender. Quotation, quotation format, comparison between tender and quotation. Comparative statement, format comparative statement. Order format, placing of purchasing order. Principles of execution of works, planning, organizing and	15

	completion of work, Billing of work.	
UNIT-III	Non-Industrial Installations: Types of Non-industrial installations Office buildings, shopping and commercial center, residential installation, Electric service and supply design consideration of electrical installation in commercial buildings. Design procedure of installation- steps involved in detail, Estimating and costing of unit Earthing of commercial installation. Design electrical installation scheme of commercial complex. Erection, Inspection and testing of installation as per NEC.	12
UNIT-IV	Industrial Installation: Classification of industrial buildings Classification based on power consumption, Drawing of wiring diagram and single line diagram for single phase and three phase Motors. Design consideration in industrial installations Design procedure of installation-detailed steps Design electrical installation scheme of factory/small industrial unit, preparation of material schedule and detailed estimation Installation and estimation of agricultural pump and flour mill.	12
UNIT-V	Public Lighting Installation: Classification of outdoor installations streetlight/ public lighting installation Street light pole structures. Selection of equipment's, sources used in street light installations. Cables, recommended types and sizes of cable. Control of street light installation. Design, estimation and costing of street light Preparation of tenders and abstracts. Distribution Lines and LT Substation: Introduction to overhead and underground distribution line. Materials used for distribution line HT and LV Cables used for distribution line, factors determining selection of LT/ HT power Cables, cable laying and cable termination method according to IS Design, estimation and costing of HT LT overhead line and underground cabling. Types of 11 KV Distribution substations their line diagram, Estimation of load, Load factor, diversity factor and determination of rating of distribution. Transformer. Design, estimation and costing of outdoor and indoor 11 KV substations.	15
	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Singh, Surjit Ravi Deep Singh, Dhanpat Rai and Sons, Electrical Estimating and Costing, ISBN 13:1234567150995. 2. Gupta,J. B.S.K Kataria and Sons Re print Edition, AC our sein Electrical Installation Estimating and Costing ISBN 10: 935014279113:978-9350142790. 3. BureauofIndianStandard.IS:732-1989, Code of Practice for Electrical Wiring Installation. 	
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Raina, K.B.; Dr. S. K. Bhattacharya New Age International Publisher First, Reprint 2010, Electrical Design Estimating and Costing ISBN: 978-81-224-0363-3. 2. Allagappan,, N. S. Ekambarram, Tata McGraw Hill Publishing Co. Ltd, Electrical Estimating and Costing, ISBN 13:9780074624784. 3. Singh, Surjit Ravi Deep Singh, Dhanpat Rai and Sons, Electrical Estimating and Costing, ISBN 13:1234567150995. 	

	<p>4. Gupta, J.B.S.K Kataria and Sons Reprint Edition, AC oursein Electrical Installation Estimating and Costing ISBN 10: 935014279113:978-9350142790.</p> <p>5. BureauofIndianStandard.IS:732-1989, Code of Practice for Electrical Wiring Installation.</p> <p>6. Bureau of Indian Standard. SP-30:2011, National Electrical Code 2011.</p>	
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SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA				
Semester/Year	V/III	L	T	P	C
Semester/Year	3	0	0	0	3
Subject Name	Solar Power Technologies				
Subject Code	DEX20S505				
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 types of solar power technologies.

Course outcomes:

- CO1:** Maintain the solar non-electric equipment.
CO2: Maintain CSP plants.
CO3: Maintain solar PV systems.
CO4: Maintain solar PV electronics and MPPT systems.
CO5: Maintain off-grid and on-grid solar power plants.

Unit	Syllabus	Periods
UNIT-I	Solar Energy: Solar Map of India: Global solar power radiation, Different types of Solar water heaters: Construction, working, specifications and installation, Solar Heating systems, Solar drying and different types of Solar cookers Solar lighting. Preventive maintenance of all of the above.	8
UNIT-II	Concentrated Solar Power (CSP): Concentrated Solar Power (CSP) plants or solar thermal electric systems. Parabolic Trough: Construction, working and specifications Parabolic Dish: Construction, working and specifications. Power Tower, Fresnel Reflectors: Construction, working and specifications Solar Stirling engines. Preventive maintenance of all of the above.	10
UNIT-III	Solar PV Systems: Solar PV cell: Types construction, working, Typical specifications of solar cells Solar PV working principle: Series and parallel connections of solar modules Solar Photovoltaic (PV) system: components layout	

	and working. Solar modules, arrays and their standard specifications. Roof top and streetlight solar PV systems and typical specifications. Maintenance of these systems.	12
UNIT-IV	Solar PV Electronics: Solar Charge controllers: working and specifications, switchgear and cables Batteries: Different types for solar PV systems, maintenance and specifications Solar Inverters: working and specifications. Signal conditioning systems: working and specifications. Solar Power tracking: construction, working, tilt angle, solar radiation, I-V, P-V characteristics, maximum power point tracking (MPPT) Maintenance of these systems.	12
UNIT-V	Solar PV Off-grid and Grid Tied Systems: Solar off grid systems: layout and specifications. Solar Grid tied (on grid) systems: Working principle of grid-tied dc-ac inverter, grid synchronization and active power export. Net metering: main features and working. Solar-wind Hybrid systems: Layout and specifications.	12
	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Solanki, Chetan Singh,- Solar Photovoltaic Technology and Systems- A Manual For Technicians, Trainers and Engineers, PHI Learning, New Delhi, ISBN: 9788120347113. 2. Kothari, D.P.eta L: Renewable Energy Sources and Emerging Technologies, PHI. 3. David M. Buchla, Thomas E. Kissell, Thomas L. Floyd, - Renewable Energy Systems, Pearson Education New Delhi, ISBN: 9789332586826. 	
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Solanki, Chetan Singh, Solar Photovoltaics: Fundamentals, Technologies and Applications, PHI Learning, New Delhi, ISBN: 9788120351110. 2. Solanki,ChetanSingh,-SolarPhotovoltaicTechnologyandSystems- AManualforTechnicians, Trainers and Engineers, PHI Learning, New Delhi, ISBN: 9788120347113. 3. Kothari, D. P.etaL: Renewable Energy Sources and Emerging Technologies, PHI. 4. David M. Buchla, Thomas E. Kissell, Thomas L. Floyd, - Renewable Energy Systems, Pearson Education New Delhi,ISBN: 9789332586826. 5. Rachel, Sthuthi, Earnest, Joshua; -Wind Power Technologies, PHI Learning. 6. O.P. Gupta, Energy Technology, Khanna Publishing House, ISBN: 978-93-86173-683. 	



**SYLLABUS
DIPLOMA**

Class	Diploma (EX/CSE/ME/CE)	L	T	P	C
Semester/Year		3	-	-	3
Subject Name	Industrial Automation				
Subject Code	DOC20S506				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objectives:

1. To present the basic fundamentals of industrial automation and engineering.
2. To expose the Student to different element of automation, their properties, structures and imperfections present in them.

Course Outcomes:

- CO1:** State the principles of Industrial automation.
- CO2:** Discuss various types of automation.
- CO3:** Use different types of hydraulic and pneumatic systems.
- CO4:** Understand working of sensors and actuators.
- CO5:** Understand the working of industrial automation and control system.

Unit	Syllabus	Periods
UNIT-I	Introduction to Automation: Definition and fundamentals of automation, reasons for Automating, basic elements of an automated system: Power, Program and control system Advanced automation functions: safety, maintenance & repair diagnosis, error detection and recovery Levels of automation Automation principles and strategies: USA principle, ten strategies of automation and production system, automation migration strategy.	10
UNIT-II	Mechanization and Automation: Mechanization and automation, product cycle, hard Vs flexible automation, Capital- intensive Vs low cost automation Types of systems-mechanical, electrical, hydraulic, pneumatic and hybrid systems Automation using CAMS, Geneva mechanisms, gears etc. Assembly line Automation: automated assembly systems, transfer systems, vibratory bowl feeders, non-vibratory feeders, part orienting, feed track, part placing & part escapement systems. Introduction to Material storage/ handling and transport systems, and its automation using AS/RS, AGVS and conveyors etc.	10
UNIT-III	Pneumatics and hydraulics: Hydraulic and pneumatic devices-Different types of valves , Actuators and auxiliary elements in Pneumatics & hydraulics , their applications and use of their ISO symbols Synthesis and design of circuits (up to 3 cylinders)-pneumatic, electro pneumatics and hydraulics Design of Electro-Pneumatic Circuits using single solenoid and double solenoid valves; with and without grouping.	11
UNIT-IV	Sensors & Actuators Sensors: Selection of sensors (Displacement, temperature, acceleration, force /pressure) based on static and dynamic characteristics Interfacing: Concept of interfacing, bit accuracy and sampling speed, amplifying electronics, and microcontroller Actuators: Principle and selection of mechano-electrical actuators (1) DC motors (2) Stepper Motors (3) Solenoid Actuators (4) Servo Motors (5) BLDC.	10

UNIT-V	Industrial control systems: Process industries versus discrete manufacturing industries, Continuous versus discrete control, Computer process control, Forms of computer process control Discrete control using PLC- discrete process control, Programmable logic controller, its architecture, ladder logic, Ladder Logic Programming for different types of logic gates, Latching, Timers, Counter, Practical Examples of Ladder Programming.	14
	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Nagrath & Gopal "<i>Control System</i>", TMH. 2. Majumdar S. R., "<i>Pneumatic Systems</i>", Tata McGraw Hill, New Delhi. 	
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Esposito A., "<i>Fluid Power with Applications</i>", Prentice Hall of India, New Delhi. 2. Groover, M.P., "<i>Automation, Production Systems & Computer Integrated Manufacturing</i>", Prentice Hall of India, New Delhi. 	

SYLLABUS
DIPLOMA

Class	Diploma (EX/CSE/ME/CE)	L	T	P	C
Semester/Year	V/III	3	0	0	3
Subject Name	Sensor Network				
Subject Code	DOC20S507				
Paper	English				
	Hindi				
Max. Marks	100				
Course Objectives:					
<ol style="list-style-type: none"> 1. To learn about the issues and challenges in the design of wireless ad hoc networks. 2. To understand the working of MAC and Routing Protocols for ad hoc and sensor networks 3. To learn about the Transport Layer protocols and their QoS for ad hoc and sensor networks. 4. To understand various security issues in ad hoc and sensor networks and the corresponding solutions. 					
Course Outcomes:					
At the end of the course, the student should be able to:					
CO1. Identify different issues in sensor networks.					
CO2. To analyze protocols developed for sensor networks.					
CO3. To identify and understand security issues in sensor networks.					
CO4. Sensor data acquisition, processing and handling.					
CO5. Communication architecture and protocols for WSN (MAC, Link, Routing).					
Unit	Syllabus	Periods			
UNIT - I	Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.	8			
UNIT - II	Architectures Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.	12			
UNIT - III	Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name	12			

	Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.	
UNIT - IV	Infrastructure Establishment Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.	10
UNIT - V	Sensor Network Platforms and Tools Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level Software platforms, Node-level Simulators, State-centric programming.	10
	TEXT BOOKS: <ol style="list-style-type: none"> 1. Holger Karl & Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley, 2005. 2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach”, Elsevier, 2007. 	
	REFERENCE BOOKS: <ol style="list-style-type: none"> 1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, and Applications”, John Wiley, 2007. 2. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003. 	

SYLLABUS DIPLOMA

Class	Diploma (EX/CSE/ME/CE)	L	T	P	C
Semester/Year	V/III	3	0	0	3
Subject Name	Space Science				
Subject Code	DOC20S508				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objectives:

Students will be able to:

1. To impart knowledge in concepts of Interplanetary Space.
2. To understand fundamental Particles and basic forces.
3. To understand Kepler's Laws.

Course Outcomes:

Students will be able to:

- CO1.** Introduction to Planetary and Interplanetary Space.
CO2. Structure of Earth's Atmosphere.
CO3. Students should able to apply Observational and Experimental tools for Astronomy and space Science.
CO4. Students should able to fundamental Particles and basic forces.
CO5. Student should able to electromagnetic spectrum and Astronomer's tools.

Unit	Syllabus	Periods
UNIT-I	Solar System, Kepler's Laws, Earth-Moon System, Solar and Lunar types, Exploration of Solar System by Telescopes, Rockets and Satellites.	8
UNIT-II	Structure of Earth's Atmosphere- Lower, Middle and Upper Troposphere (0-10 km), Stratosphere (10-50km), Ionosphere (50-1000 km), Proton sphere (10,000 to 60,000 km towards sun), Interplanetary space (Beyond 60,000 km towards the sun), Earth as a Magnetic Comet.	8
UNIT-III	In-situ measurements of chemical, physical and dynamical parameters using Kites, Balloons, Aero planes, Rockets and Satellite Payloads.	7
UNIT-IV	Protons, Electrons, Neutrons, Neutrinos, Mesons, leptons, and quarks. The concept of Basic forces viz., strong, weak, electromagnetic and gravitational forces.	7

UNIT-V	The nature of light: Light as an electric vibration, the electromagnetic radiation from a heated object, Doppler shift. Optical telescopes, (Galilean, Newtonian, Cassegranian & Hubble Space Telescope), Magnifying power & Resolving power of telescopes, UV, x-ray, IR, Radio & gravitational Astronomy, Spectroscope.	8
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Text Books:

1. Ionospheric Radio Propagation by Kenneth Davis. National Bureau of Standards, Monograph 80 (1965), US Government Printing office, Washington D.C.
2. Physics of the Upper Atmosphere edited by J. A. Ratcliffe, Cavendish Laboratory, University of Cambridge. Academic Press New York and London (1960).

Reference Books:-

1. Research in Geophysics: Vol.1- Sun, Upper Atmosphere and space edited by Hugh Odishaw, National Academy of Sciences. Washington D.C.
2. Source book on the Space Sciences - Samuel Glasstone, Princeton, New Jersey.
3. The Upper Atmosphere - S K Mitra, The University of Michigan, Asiatic Society, 2010.

SYLLABUS

Electrical & Electronics Engineering

Class	DIPLOMA	L	T	P	C
Semester/Year	V/III	0	0	0	2
Subject Name	Summer Internship-II				
Subject Code	DEX20S509				
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:

- CO 1:** Observe various activities in field.
- CO 2:** Examine the utility of general and specific Software tool for Development.
- CO 3:** Differentiate the construction projects individually and in team.
- CO 4:** Develop the writing and communication skills for various engineering problems.
- CO 5:** Adapt lifelong learning for benefit of society.

Syllabus

Each candidate shall have to undergo 15 days in-house summer internship at the institute after the completion of their 4th 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	V/III	0	0	4	2
Subject Name	Major Project-I				
Subject Code	DEX20S510				
Paper	English				
	Hindi				
Max. Marks	50				

Course Objectives:

1. To develop an Application of Electrical and 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:

CO1: Recognize various engineering problems and techniques to solve them.

CO2: Reproduce the solution of the problems upon the need of society.

CO3: Cooperate to work within group.

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

CO5: Display lifelong learning.

Syllabus

Each candidate shall work on a unique project of Electrical and 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				
Semester/Year	V/III				
Subject Name	MICROCONTROLLER APPLICATIONS				
Subject Code	DEX20S511				
Paper	English				
	Hindi				
Max. Marks	50				

List of experiments

1. Interpret details of Hardware kit for Microcontroller and practice to write and execute programs.
2. Identify different menus available in a simulator software RIDE/KEIL and demonstrate their use.
3. Develop and execute Assembly language programs using Arithmetic Instructions and demonstrate outcome for a given input data.
4. Develop and execute Assembly language programs using Logical Instructions and demonstrate outcome for a given input.
5. Develop and execute an Assembly language program for Addition of series of 8 bit nos, 16 bit result and demonstrate outcome for a given input data.
6. Develop and execute Assembly language program for addition/ subtraction of 16 bit no/ multi- byte nos. and demonstrate outcome for a given input data
7. Develop and execute Assembly language program for Block transfer from and to Internal/ External memory using directives and demonstrate outcome for a given input data.
8. Develop and execute Assembly language program Largest/smallest of given series of no from Internal/External memory and demonstrate outcome for a given input data.
9. Develop and execute Assembly language program arrange no in ascending/descending order from Internal/ External memory and demonstrate outcome for a given input data.
10. Develop and execute Assembly language program for LED blinking/LED sequences using delay/timer mode.
11. Develop and execute Assembly language program to interface LED with microcontroller.

SYLLABUS

Electrical & Electronics Engineering

Class	DIPLOMA	L	T	P	C
Semester/Year	V/III	0	0	2	1
Subject Name	Switchgear and Protection				
Subject Code	DEX20S512				
Paper	English				
	Hindi				
Max. Marks	50				

List of experiments

1. To study over current relay testing.
2. To study under voltage and Over voltage relay testing.
3. To study Differential relay testing.
4. To study magnetization curve for CT.
5. To study vector phasor characteristics of PT.
6. To study Selection of LT and HT circuit breakers (ratings), Selection of MCCB for motors.
7. To study Alternator Protection. Faults.
8. To study functions of protective system.

SYLLABUS

Electrical & Electronics Engineering

Class	DIPLOMA	L	T	P	C
Semester/Year	VI/III	3	0	0	3
Subject Name	BUILDING ELECTRIFICATION				
Subject Code	DEX20S601				
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. Design electrical installation systems in building complexes.

Course outcomes:

- CO1:** Select accessories, wires, cables and wiring systems for electrification.
CO2: Design electrical wiring installation system for residential unit.
CO3: Design proper illumination scheme for residential unit.
CO4: Prepare wiring layouts on wiring board.
CO5: Locate and diagnose faults in electrical wiring installation.

Unit	Syllabus	Periods
UNIT-I	<p>Wiring Tools and Accessories: Various tools required for wiring- screwdrivers, pliers, Try square, saws, hacksaw, chisel, hammers, mallet, all punch, hand drill machine, portable drilling machine, files, plumb bob, line thread, electricians knife, test lamp, tester and their BIS specifications, application, care & maintenance of tools. Classification of electrical accessories- controlling, holding, safety, and outlet BIS symbols of following electrical accessories. Switch – Their types according to construction such as surface switch, flush switch, and pull switch, rotary switch, knife switch, pendent switch, Main-switch (ICDP, ICTP). Their types according to working such as single pole, double pole, two-way, two-way centre off, intermediate, series parallel switch. Holders- Their types such as bayonet cap lamp holder, pendent holder, batten lamp holder, angle holder, bracket holder, tube light holder, screw type Edison and goliath Edison</p>	12

	lamp holder, swivel lamp holder. Socket outlets and plugs- Two pin, three-pin, multi pin sockets, two-pin and three-pin plug. Others- Iron connector, adaptor, and ceiling rose, distribution box, neutral link, bus bar chamber. Wooden/ mica boards, Molded / MS Concealed boxes of different sizes. Modular accessories.	
UNIT-II	Electrical Wires and Underground Cables: Conductors: - wire, cable, bus bar, stranded conductor, cable, armored cable, flexible cable, solid conductor, PVC wires, CTS wire, LC wire, FR (Fire retardant) wire, Size of wire according to BIS. Tools used for measurement of wire size, Wire jointing methods. Classification of cables, low tension, high tension, and extra high tension cables, solid, oil filled and gas filled type. Cable insulation materials –vulcanized rubber (VIR), polyvinyl chloride (PVC), cross linked polythene (XLPE), impregnated paper, Selection of suitable cable size and type from standard data. Cable jointing methods Cable laying methods. Factors determining selection of electric cables.	10
UNIT-III	Wiring Methods and wiring layout: Factors determining the selection of wiring methods. Classification of wiring methods. PVC casing-capping wiring- wiring rules according to IS: 732-1983. Conduit wiring- Types of conduit, comparison between Metal and PVC conduit, types of conduit wiring (Surface/Concealed). Conduit wiring accessories, BIS rules for Metal and PVC conduit wiring. Comparison of various wiring systems. General BIS rules for domestic installations. Design, working and drawing of following electrical circuits: Simple light and fan circuits, Stair case wiring, Go-down wiring circuit, Bedroom lighting circuit, Corridor lighting circuit, Series parallel circuit, Master switch control circuit, Different lighting circuit using-Intermediate switch, Callbell circuit using bell indicator, Design of wiring circuits according to user's requirement.	12
UNIT-IV	Residential Building Electrification: Domestic Dwellings/Residential Buildings: reading of Civil Engineering building drawing, Interpretation of electrical installation plan and electrical diagrams, electrical symbols as per IS: 732. Electrical installation for residential building as per part I section 9 of NEC-2011. Difference between residential and industrial load, rules/requirements related to lighting load followed in electrical installations, Positioning of equipment. Lighting and power circuits: Light and fan circuit, Power circuit. Wiring and circuit Schematic diagram according to IS: 2042(Part-I)-1962: multiline and single line representation. Load assessment: Selection of size of conductor, Selection of rating of main switch and protective switchgear. Design and drawing, estimation and costing of a residential installation having maximum 5 KW load; Sequence to be followed for preparing estimate; Calculation of length of wire and other materials, labour cost. Testing of wiring installation as per IS: 732-1982: Insulation resistance - between earth and conductors, between conductors, polarity test of single pole switches. Testing of earth continuity path. Residential building Service Connection- types Underground and overhead. Calculation of Material required for service connection.	15
UNIT-V	Protection of Electrical Installation: Fuse in electric circuit: fuse element, fuse current rating, minimum fusing current, cut-off current, fusing factor, Fuse material. Types of fuses – Rewirable, cartridge fuses (HRC and LRC), Fuse material Selection of fuse. Miniature circuit Breaker (MCB)-Construction,	

	<p>Principle rating and uses, Earth Leakage Circuit Breaker (ELCB)-Construction, Principle rating and uses. System and equipment earthing and its requirements, Earth, earth electrode, earth current, earth terminal, earthing wire, earthing lead, fault current, leakage current, Measurement of earth resistance using earth tester, Methods of reducing earth resistance, Methods of earthing as per IS 3043: 1987 and their procedure- Driven pipe, pipe and plate earthing, modern methods of earthing. Illumination in Residential Installation: Concept of Luminous flux.</p>	15
	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Singh, Surjit, Electrical Estimating and Costing, Dhanpat Rai and Co. New Delhi, ISBN: 1234567150995 2. Gupta, JB: A Course in Electrical Installation Estimating and Costing, SK Kataria and Sons, New Delhi, ISBN: 978-93-5014-279-0. 3. Bureau of Indian Standard, IS: 732-1989, Code of practice for electrical wiring installation. 	
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Raina, K.B. and S.K. Bhattacharya, Electrical Design Estimating and Costing, New Age International Ltd., New Delhi, ISBN 978-81-224-0363-3. 2. Allagappan, N. S. Ekambarram, Electrical Estimating and Costing, New Delhi, ISBN-13: 9780074624784. 3. Singh, Surjit, Electrical Estimating and Costing, Dhanpat Rai and Co. New Delhi, ISBN: 1234567150995. 4. Gupta, JB: A Course in Electrical Installation Estimating and Costing, SK Kataria and Sons, New Delhi, ISBN: 978-93-5014-279-0. 5. Bureau of Indian Standard, IS: 732-1989, Code of practice for electrical wiring installation. 6. Bureau of Indian Standard, SP30 National Electrical Code 2010. 7. Bureau of Indian Standard, SP 72 National Lighting Codes 2010. 	

SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA					
Semester/Year	VI/III		3	0	0	3
Subject Name	Electric Vehicles					
Subject Code	DEX20S602					
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 types of Biomass and Micro hydropower plants.

Course outcomes:

- CO1:** Interpret the salient features of Hybrid electric vehicles.
CO2: Interpret the Dynamics of hybrid and Electric vehicles
CO3: Maintain the DC-DC converters in EV applications.
CO4: Maintain the DC-AC converters in EV applications.
CO5: Select the batteries for EV applications.

Unit	Syllabus	Periods
UNIT-I	Introduction to Hybrid Electric Vehicles: Evolution of Electric vehicles. Advanced Electric drive vehicle technology Vehicles-Electric vehicles (EV), Hybrid Electric drive (HEV), Plug in Electric vehicle (PIEV),.Components used Hybrid Electric Vehicle. Economic and environmental impacts of Electric hybrid vehicle Parameters affecting Environmental and economic analysis Comparative study of vehicles for economic, environmental aspects.	8
UNIT-II	Dynamics of hybrid and Electric vehicles: General description of vehicle movement. Factors affecting vehicle motion- Vehicle resistance, tire ground adhesion, rolling resistance, aerodynamic drag, equation of grading resistance, dynamic equation. Drive train configuration, Automobile power train, classification of vehicle power plant Performance characteristics of IC engine, electric motor, need of gear box Classification of motors used in Electric vehicles. Basic	10

	architecture of hybrid drive trains, types of HEVs Energy saving potential of hybrid drive trains. HEV Configurations-Series, parallel, Series-parallel, complex.	
UNIT-III	DC-AC Converters for EV and HEV Applications: EV and HEV configuration based on power converters Classification of converters unidirectional and bidirectional Principle of step down operation. Boost and Buck- Boost converters Principle of Step Up operation. Two quadrant converters; multi quadrant converters. DC-AC Converters. Principle of operation of half bridge DC-AC inverter (R load, R-L load) Single phase Bridge DC-AC inverter with R load, R-L load. Electric Machines used in EVs and HEVs, principle of operation, working & control Permanent magnet motors, their drives, switched reluctance motor Characteristics and applications of above motors	12
UNIT-IV	Batteries: Overview of batteries. Battery Parameters, types of batteries. Battery Charging, alternative novel energy sources-solar photovoltaic cells, fuel cells, super capacitors, flywheels. Control system for EVs and HEVs, overview, Electronic control unit ECU Schematics of hybrid drive train, control architecture. Regenerative braking in EVs.	10
UNIT-V	Electric Machine: Electric Machines used in EVs and HEVs, principle of operation, working & control Permanent magnet motors, their drives, switched reluctance motor Characteristics and applications of above motors.	8
	Text Books: 1. Rashid, M.H. Power Electronics: Circuits, Devices and Applications, 3 rd edition, Pearson. 2. Moorthi, V. R. Power Electronics: Devices, Circuits and Industrial Applications, Oxford University Press. 3. Krishnan, R. Electric motor drives: modeling ,analysis, and control, Prentice Hall.	
	Reference Books: 1. A.K. Babu, Electric &Hybrid Vehicles, Khanna Publishing House, New Delhi (Ed.2018). 2. Fuhs, A.E. Hybrid Vehicles and the Future of Personal Transportation, CRC Press. 3. Gianfranco, Electric and Hybrid Vehicles: Power Sources, Models, Sustainability, Infrastructure And The Market, Pistoia Consultant, Rome, Italy. 4. Ehsani, M. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press. 5. Husain, I. Electric and Hybrid Electric Vehicles, CRC Press. 6. Chan C. C. and K. T. Chau, Modern Electric Vehicle Technology, Oxford Science Publication. 7. Lechner G. and H. Naunheimer, Automotive Transmissions: Fundamentals, Selection, Design and Application, Springer. 8. Rashid, M.H. Power Electronics: Circuits, Devices and Applications, 3 rd edition, Pearson.	

SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA				L	T	P	C
Semester/Year	VI/III				3	0	0	3
Subject Name	Biomass and Micro-hydro Power Plants							
Subject Code	DEX20S603							
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 types of Biomass and Micro hydropower plants.

Course outcomes:

- CO1:** Select the relevant biomass power plant.
CO2: Undertake the preventive maintenance of different types of bio mass gasifies.
CO3: Undertake the breakdown maintenance of different types of bio mass gasifies.
CO4: Maintain the optimized working of large wind power plants.
CO5: Maintain the optimized working of small wind turbines.

Unit	Syllabus	Periods
UNIT-I	Basics of Biomass based Power Plants: Properties of solid fuel for biomass power plants: bagasse, wood chips, rice husk, municipal waste. Properties of liquid and gaseous fuel for biomass power plants: Jatropha, bodies algebra gas 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 a Agro-chemical based (e.g. bio-diesel) power plant. Selection of biomass power plants.	8
UNIT-II	Biomass Gasification Power Plants: The basic principle to convert Agriculture and forestry products and wood processing re- mains (including rick husks, wood	

	powder, branches, off cuts, corn straws, rice straws, wheat straws, cotton straws, fruit shells, coconut shells, palm shells, biogases, corncobs) into combustible gas. General Construction and working of a typical gasifier. Power generating in gas engine: Strengths and limitations of Agriculture and forestry products gasifier. Preventive maintenance steps different types of biomass gasifiers.	12
UNIT-III	Different Types of Gasifiers: Construction and working of the following types of gasifiers: Rice Husk Gasification Power Plant and their specifications Straw Gasification Power Plant and their specifications. Bamboo Waste, Bamboo Chips Gasification Power Plant and their specifications. Coconut shell, coconut peat, coconut husk, Gasification Power Plant and their specifications Bagasse/Sugar Cane Trash Gasification Power Plant and their specifications. Gobar gas plant and its specifications. Break down maintenance of biomass power plant at the module level.	15
UNIT-IV	Micro-hydro Power Plants: Locations of micro hydro power plant. Energy conversion process of hydro power plant. Classification of hydro power plant: High, medium and low head. General Layouts of typical micro-hydro power plant. Strengths and limitations of micro hydro power plants.	10
UNIT-V	Different types of Micro hydro power plants: Construction and working of High head – Pelton turbine and their specifications Construction and working of Medium head – Francis turbine and their specifications Construction and working of Low head – Kaplan turbine and their specifications Preventive and breakdown maintenance of micro hydro power plants. Safe Practices for micro hydro power plants.	10
	Text Books: 1. Rachel, Sthuthi, Earnest, Joshua; -Wind Power Technologies, PHI Learning. 2. O.P. Gupta, Energy Technology, Khanna Publishing House, ISBN: 978-93-86173-683.	
	Reference Books: 1. Khoiyangbam, R S Navindu; Gupta and Sushil Kumar; Biogas Technology : Towards Sustain- able Development; TERI, New Delhi; ISBN:9788179934043. 2. David M. Buchla; Thomas E. Kissell; Thomas L. Floyd - Renewable Energy Systems, Pearson Education New Delhi, ISBN: 9789332586826. 3. Kothari, D P.eta L: Renewable Energy Sources and Emerging Technologies, PHI. 4. Rachel, Sthuthi, Earnest, Joshua; -Wind Power Technologies, PHI Learning. 5. O.P. Gupta, Energy Technology, Khanna Publishing House, ISBN: 978-93-86173-683.	

SYLLABUS

Electrical & Electronics Engineering

Class		DIPLOMA	L	T	P	C
Semester/Year		VI/III	3	0	0	3
Subject Name		Illumination Practices				
Subject Code		DEX20S604				
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. Design illumination schemes and associated electrification of buildings.

Course outcomes:

CO1: Select relevant lamps for various applications considering illumination levels.

CO2: Select the lighting accessories required for selected wiring scheme.

CO3: Design relevant illumination schemes for interior applications.

CO4: Design Illumination schemes for various applications.

CO5: Design Illumination schemes for various outdoor applications.

Unit	Syllabus	Periods
UNIT-I	Fundamentals of illumination: Basic illumination, Terminology, Laws of illumination, Polar curves, polar curve: its meaning and applications for designing the lamp. Concept of Photometry, Measurement of illumination, Lighting calculation methods, Watt /m ² method, Lumens or light flux method, Point to point method, Standards for illumination.	8
UNIT-II	Types of lamps: Incandescent lamp, ARC lamps AC and DC arc lamps, Fluorescent lamp. Types of other lamps: Mercury vapour lamp, HPMV lamp, Mercury iodide lamp, Sodium vapour lamp, Halogen Lamps, Ultraviolet Lamps,	10

	Neon Lamps. Neon Sign Tubes. Metal halides, HID and Arc lamps LED lamps, CFL, Lasers Selection Criteria for lamps.	
UNIT-III	Illumination Control and Control Circuits: Purpose of lighting control, and Dimmer, Resistance type Salt water Dimmer Working principle and operation of Dimmer. Transformer and their types, Dimmer Transformer, Auto transformer dimmer, Two winding transformer dimmer. Electronic Dimmer: working principle and operation. Thyristor operated dimmer. Triac operated dimmer. Control of Enhance Lighting, Methods used for light control, Control circuits for lamps (refer): ON/OFF control. Control circuits for lamps: single lamp controlled by single switch, two switches. Single Lamp control by two point method, three point method and four point method.	15
UNIT-IV	Illumination for Interior Applications: Standard for various locations of Interior Illumination. Design considerations for Interior location of residences (1/2/3/4BHK), Commercial, Industrial premises Illumination scheme for different Interior locations of Residential, Commercial, industrial unit.	10
UNIT-V	Illumination for Interior Applications: Factory Lighting, Street Lighting (Latest Technology), Flood Lighting Railway Lighting. Lighting for advertisement/ Hoardings/ sports lighting, Agriculture and Horticulture lighting, Health Care Centres / Hospitals, Decorating Purposes, Stage Lighting, Aquariums and Ship-yards, Special purpose lamps used in photography video films.	10
	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Simons, R. H., Bean, Robert; Lighting Engineering: Applied Calculations, Architectural Press. ISBN: 0750650516. 2. Casimer M Decusatis, Handbook of Applied Photometry, Springer, ISBN1563964163. 	
	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Lindsey, Jack L, Applied Illumination Engineering, The Fairmont Press Inc. 2. Simons, R. H., Bean, Robert; Lighting Engineering: Applied Calculations, Architectural Press. ISBN: 0750650516. 3. Casimer M Decusatis, Handbook of Applied Photometry, Springer, ISBN1563964163. 4. Butterworths, Lyons Stanley, Handbook of Industrial Lighting, Butterworth's. 5. Simpson Robert Slighting Control Technology and Applications, Focal Press. 6. Kao Chen, Energy Management in Illuminating Systems, CRC Press. 	

SYLLABUS
Electrical & Electronics Engineering

Class		DIPLOMA	L	T	P	C
Semester/Year		VI/III	3	0	0	3
Subject Name		Electric Traction				
Subject Code		DEX20S605				
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 traction systems.

Course outcomes:

- CO1:** Interpret the traction layout and its systems.
CO2: Maintain the power supply arrangements.
CO3: Maintain the function of the overhead equipment or electric traction.
CO4: Maintain the different components of the electric locomotive.
CO5: Maintain the traction motor and train lighting system.

Unit	Syllabus	Periods
UNIT-I	Basics of Traction: General description of Electrical Traction system in India. Advantages and Disadvantages of Electric Drive, Diesel Electric Drive, Battery Drive Problems associated with AC traction System and remedies for it. Voltage balance, current balance, production of harmonics, induction effects. Metro rail system features.	8
UNIT-II	N Power Supply Arrangements: Constituents of supply system. Substation: layout, list of equipment and their functions. Feeding post: list of equipment and their functions. Feeding and sectioning Arrangements. Sectioning and paralleling post. Sub sectioning and Paralleling post. Sub sectioning post. Elementary section Major equipment at substation, Miscellaneous equipment at control post or Switching station Protection system for traction transformer and 25kVcentenary construction.	10

UNIT-III	Overhead Equipment: Different types of overhead equipment's Pentagonal OHE Centenary Construction. Different Types of Centenary according to speed Limit OHE Supporting Structure, Cantilever assembly diagram. Overhead system. Trolley collector, Bow collector, Pantograph Collector Types and construction of pantograph.	10
UNIT-IV	Electric Locomotive: Classification and Nomenclature of Electric Locomotive. Block diagram of AC locomotive Power Circuit of AC Locomotive. Equipment (List and Function only) used in auxiliary circuit of AC Locomotive Loco bogie classification according to wheel arrangements. Maintenance of AC systems.	10
UNIT-V	Traction Motors and Train Lighting: Desirable characteristics of traction motor. Types of motors used for traction with their characteristics and features Control of motors used for traction and methods to control Requirements of braking, types of braking. Electric braking, Regenerative braking. Systems of train lighting, single battery, double battery parallel block system SG, HOG, End on generation Signaling and Supervisory Control Requirements of signaling systems Types of signals, track circuits Advantages of remote control. Systems of remote control, equipment and network Metro rail-supply systems, advantages, schemes in India.	15
	Text Books: 1. Surya narayana N.V., New Age International Publishers, Reprint2010. 2. Open Shaw Taylor, Orient Longman ltd., Utilisation of electrical energy.	
	Reference Books: 1.G.C. Garg, Utilization of Electric Power & Electric Traction, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-86173-355) Revised Ed.2018. 2.Gupta J.B., S. K. Kataria and Son, Utilization of Electric power and traction. 3.Partab H., Dhanpat Rai and Co,' Art and Science of Utilization of Electrical Energy. 4.Partab H., Dhanpat Rai and Co, Modern Electric Traction. 5.Surya narayana N.V., New Age International Publishers, Reprint2010. 6.Open Shaw Taylor, Orient Longman ltd., Utilisation of electrical energy.	

SYLLABUS
Electrical & Electronics Engineering

Class	Diploma (EX/CSE/ME/CE)	L	T	P	C
Semester/Year	VI/III	3	0	0	3
Subject Name	Entrepreneurship and Start-ups				
Subject Code	DOC20S606				
Paper	English				
	Hindi				
Max. Marks	100				
Course Objectives:					
<ol style="list-style-type: none"> 1. Acquiring Entrepreneurial spirit and resource fullness. 2. Familiarization with various uses of human resource for earning dignified means of living. 3. Understanding the concept and process of entrepreneurship - its contribution and role in the growth and development of individual and the nation. 4. Acquiring entrepreneurial quality, competency, and motivation. 5. Learning the process and skills of creation and management of entrepreneurial venture. 					
Course Outcomes:					
At the end of the course, the student should be able to:					
CO1. Understanding the dynamic role of entrepreneurship and small businesses.					
CO2. Organizing and Managing a Small Business.					
CO3. Financial Planning and Control.					
CO4. Forms of Ownership for Small Business.					
CO5. Strategic Marketing Planning.					
Unit	Syllabus				Periods
UNIT - I	Introduction to Entrepreneurship and Startup: <ul style="list-style-type: none"> • Definitions, Traits of an entrepreneur, Entrepreneurship, Motivation. • Types of Business Structures, Similarities/ differences between entrepreneurs and managers. 				10

UNIT - II	Business Ideas and their implementation: <ul style="list-style-type: none"> • Discovering ideas and visualizing the business • Activity map • Business Plan 	8
UNIT - III	Idea to Start-up: <ul style="list-style-type: none"> • Market Analysis – Identifying the target market, • Competition evaluation and Strategy Development, • Marketing and accounting, • Risk analysis. 	10
UNIT - IV	Management: <ul style="list-style-type: none"> • Company’s Organization Structure, • Recruitment and management of talent. • Financial organization and management 	10
UNIT - V	Financing and Protection of Ideas: <ul style="list-style-type: none"> • Financing methods available for start-ups in India. • Communication of Ideas to potential investors–Investor Pitch • Patenting and Licenses. • Exit strategies for entrepreneurs, bankruptcy, and succession and harvesting strategy. 	10

TEXT BOOKS:

1. The Startup Owner’s Manual: The Step- by-Step Guide for Building a Great Company Steve Blank and Bob Doff K & S Ranch ISBN – 978-0984999392.
2. The Lean Start-up: How today’s Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses Eric Rise Penguin UK ISBN – 978-0670921607.

REFERENCE BOOKS:

1. Demand: Creating What People Love Before They Know They Want It. Adrian J. Slywotzky with Karl Weber Headline Book Publishing ISBN – 978-0755388974.
2. The Innovator’s Dilemma: The Revolutionary Book That Will Change the Way You Do Business Clayton M. Christensen Harvard business ISBN: 978-142219602.

SYLLABUS

Electrical & Electronics Engineering

Class	Diploma (EX/CSE/ME/CE)	L	T	P	C
Semester/Year	VI/III	3	0	0	3
Subject Name	Energy Conservation, Management & Audit				
Subject Code	DOC20S607				
Paper	English				
	Hindi				
Max. Marks	100				

Course Objectives:

Students will be able to:

1. To impart knowledge in concepts energy conservation.
2. To understand fundamental energy efficiency in boilers, furnaces, steam systems.
3. To understand Energy Audit.

Course Outcomes:

Students will be able to:

- CO1.** Introduction of energy conservation.
- CO2.** Energy efficiency in thermal & electrical utilities.
- CO3.** Objective and principles of Energy Management.
- CO4.** Energy Economics.
- CO5.** Climate Policy.

Unit	Syllabus	Periods
UNIT-I	Principles of energy conservation, Energy Conservation Act 2001 and its features, Electricity Act-2003 & its features, Energy consumption pattern, Resource availability, Energy pricing, Energy Security, Estimation of energy use in a building. Heat gain and thermal performance of building envelope -Steady and non-steady heat transfer through the glazed window and the wall -Standards for thermal performance of building envelope, Evaluation of the overall thermal transfer.	8
UNIT-II	Energy efficiency in boilers, furnaces, steam systems, cogeneration utilities, waste heat recovery, compressed air systems, HVAC&R systems, fans and blowers, pumps, cooling tower Energy efficiency for electric motors, lighting systems, Characteristics of Light, Types of Lighting, Incandescent Lighting, Fluorescent Lighting, Vapor Lighting, Street	10

	Lighting, LED Lighting, Lighting Design, Light Dimming, Tips for Energy Conservation, Products for Energy Conservation in lighting system.	
UNIT-III	Definition, objective and principles of Energy Management, Need of Energy Audit and Management, types of energy audit, audit process, Guidelines for writing energy audit report, data presentation in report, findings recommendations, impact of renewable energy on energy audit recommendations and energy audit report, energy audit of building system, lighting system, HVAC system, Water heating system, heat recovery opportunities during energy audit, Industrial audit opportunities, Instruments for Audit and Monitoring Energy and Energy Savings.	9
UNIT-IV	Kyoto protocol, Clean development mechanism (CDM), Geopolitics of GHG control; Carbon Market.	7
UNIT-V	Simple Payback Period, Time Value of Money, Internal Rate of Return, Net Present Value, Life Cycle Costing, Equivalent uniform annual cost (EUAC), Life cycle cost, Discounting factor, Capital recovery, Depreciation, taxes and tax credit, Impact of fuel inflation on life cycle cost, Cost of saved energy, cost of energy generated, Energy performance contracts and role of Energy Service Companies (ESCOs).	8

Text Books:

1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.
2. Clark R.S., Marine Pollution, Calderon Press Oxford (TB).
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai.
4. De A.K., "Environmental Chemistry", Wiley Eastern Ltd.

Reference Books:

1. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards', Vol I and II, Enviro Media (R).
2. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.
3. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam.

SYLLABUS

Electrical & Electronics Engineering

Class		Diploma (EX/CSE/ME/CE)	L	T	P	C
Semester/Year		VI/III	3	0	0	3
Subject Name		Management Information System				
Subject Code		DOC20S608				
Paper	English					
	Hindi					
Max. Marks		100				
Course Objectives: The overall aim of this course is to provide students with an understanding at how to use and manage information system in order to revitalize business processes, improve business decision making, and gain competitive advantage.						
Course Outcomes: At the end of the course, the student should be able to: CO1. Know about MIS, MIS Theory, and Systems Approach. CO2. Understand the concept of decision making and MIS. CO3. Learn about conceptual system design, detailed system design. CO4. Understand implementation, evaluation and maintenance of MIS. CO5. Identify the major management challenges to building and using information systems in organizations.						
Unit	Syllabus					Periods
UNIT - I	Introduction of MIS What is MIS, Decision support systems, systems approach, The systems view of business, MIS organization within the Company. Management organizational theory and the systems approach: Development of organizational theory, Management and organizational behaviour, Management information and the systems approach.					10
UNIT - II	Information systems for decision-making: Evolution of an information system, Basic information systems, Decision making and MIS, MIS as technique for making programmed decisions, design assisting information systems.					10

	Strategic and project planning for MIS General business planning, appropriate MIS response, MIS planning-general, MIS planning-details.	
UNIT - III	Conceptual System Design Define the problems, Systems objectives, Establish system constraints, Determine information needs, Determine information sources, Develop alternative conceptual designs and select one, Document the system concept, Prepare the conceptual design report.	10
UNIT - IV	Implementation, Evaluation and Maintenance of the MIS Plan the implementation, Acquire floor space and plan space layouts organized for implementation, Develop procedures for implementation, Train the operating personnel, Computer related acquisitions, Develop forms for data collection and information dissemination, Develop the files, Test the system, Cutover, Document the system, Evaluate the MIS, Control and maintain the system.	12
UNIT - V	Pitfalls in MIS Development Fundamental weaknesses, Soft spots in planning, Design problem, Implementation the TAR PITF.	8

TEXT BOOKS:

1. Ladon K.C., Landon, J.P., Management Information Systems, 4th edition, Prentice-Hall of India.
2. Murdick R.G., Russ J.B., Clagget J.R., Information Systems for modern management.
3. Kanter J., Managing with Information, 4th edition, Prentice-Hall of India.

REFERENCE BOOKS:

1. Effy OZ, Management Information Systems, 3rd edition, Thomson.
2. Jawadekar W.S., Management Information System.
3. Brien J.A.O., Irwin, Management Information Systems, McGraw Hill.
4. Dour's G.B., Olson M.H., Management Information Systems, 2nd edition, McGraw Hill.
5. Thireramp R.J., Decision Support Systems for Effective Planning and Control, PHI.
6. Sadagopan S., Management Information Systems, 4th edition, Prentice-Hall of India.

SYLLABUS
Electrical & Electronics Engineering

Class	DIPLOMA					
Semester/Year	VI/III		L	T	P	C
Subject Name	Major-Project-II					
Subject Code	DEX20S609					
Paper	English					
	Hindi					
Max. Marks	100					

Course Objectives:

1. To develop an Application of Electrical and Electronics engineering problems & have a feel of real life situations in planning & development of projects.
2. To impart training of handling various types of Electrical and Electronics engineering problems by use of software's and hardware.
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.

Course outcomes:

- CO1:** Recognize various engineering problems and techniques to solve them.
CO2: Reproduce the solution of the problems upon the need of society.
CO3: Cooperate to work within group.
CO4: Develop the writing and communication skills for various engineering problems.
CO5: Display lifelong learning.

Syllabus

Each candidate shall work on a unique project of Electrical and 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				
Semester/Year	VI/III				
Subject Name	Summer Internship-III				
Subject Code	DEX20S610				
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:

- CO1:** various activities in field.
CO2: the utility of general and specific Software tool for Development.
CO3: the construction projects individually and in team.
CO4: the writing and communication skills for various engineering problems.
CO5: lifelong learning for benefit of society.

Syllabus

Each candidate shall have to undergo 15 days in-house summer internship at the institute after the completion of their 5th 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		VI/III	0	0	2	1
Subject Name		BUILDING ELECTRIFICATION Lab				
Subject Code		DEX20S611				
Paper	English					
	Hindi					
Max. Marks		50				

List of Experiments

1. Prepare series testing board.
2. Select the electric wire using measuring and testing instruments for particular applications.
3. Identify cables of different current ratings.
4. Prepare wiring installation on a board showing control of one lamp, one fan and one socket from one switch board in PVC surface conduit wiring system.
5. Prepare wiring installation on aboard.
6. Control one lamp from two different places using PVC surface conduit wiring system.
7. Prepare wiring installation on a board. Control one lamp from three different places using PVC surface conduit wiring system.
8. Prepare wiring installation on aboard.
9. Perform go-down wiring for three blocks using PVC casing capping.
10. Design 2 BHK residential installation scheme and estimate the material required. And draw the details required for installation on A4 size sheet.
11. Test wiring installation using megger.



SYLLABUS

Electrical & Electronics Engineering

Class	DIPLOMA	L	T	P	C
Semester/Year	VI/III	0	0	2	1
Subject Name	Electric Vehicles Lab				
Subject Code	DEX20S612				
Paper	English				
	Hindi				
Max. Marks	50				

List of Experiments

1. To study Electric drive vehicle technology Vehicles-Electric vehicles.
2. To study HEV Configurations-Series, parallel, Series-parallel, complex.
3. To study DC-AC Converters Principle of operation of half bridge DC-AC inverter.
4. To study Control system for EVs and HEVs.
5. To study Electric Machines used in EVs and HEVs.
6. To study Performance characteristics of IC engine.
7. To study of vehicles for economic, environmental aspects.