Diploma in Electrical & Electronics

Programme Contents :-

First Year		
Sr. No.	**Name of Subject**	**Credits**
1	English-I	
2	Applied Mathematics	
3	Applied Physics	
4	Applied Chemistry	
5	Applied Mechanics	
6	Elements of Mechanical Engineering	
7	Engineering Drawing	
8	Concepts in Information Technology	
9	Workshop Technology	
10	Business Communication	
11	Study Through ICT* Technology	
12	Assignment Work	
13	Extra-Curricular Activities & Project Work	

Second Year		
Sr. No.	**Name of Subject**	**Credits**
1	English-II	
2	Applied Mathematics-II	
3	Basics of Civil Engineering	
4	Electrical Instruments & Measurements	
5	Electrical Estimating & Costing	
6	Electrical Engineering Design & Drawing-I	
7	Computer Application for Engineering	
8	Electrical Circuits & Analysis	
9	Electrical Power	
10	Electrical Machine	
11	Study Through ICT* Technology	
12	Assignment Work	
13	Extra-Curricular Activities & Project Work	

Third Year		
Sr. No.	**Name of Subject**	**Credits**
1	English-III	
2	Digital Electronics	
3	Utilization of Electrical Energy & Traction	

4	Modern Electric Traction System	
5	Microprocessors	
6	Generation, Protection Switchgear & Economics	
7	Entrepreneurship Development & Management	
8	Electrical Engineering Design & Drawing - II	
9	Project Work	
10	Study Through ICT* Technology	
11	Assignment Work	
12	Extra-Curricular Activities & Project Work	

Detailed syllabus: -

First Year:

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Subject Name: English-I

1. **Functional Grammar:** Patterns & Parts of speech Subject, Predicate, Noun, Pronoun, Adjective, Adverb, Verb, Verb phrases, Conjunction, Interjection.
2. **Vocabulary:** Word formation, Prefix, Suffix, Compound words, Conversion, Synonyms, Antonyms, Homophones and Homonyms, How to look up a dictionary.
3. **Communication:** Meaning & importance of communication, Barriers to effective communication, Channels of communication, Language as a tool of communication.
4. **Requisites of Sentence writing:** Fragmented sentences, A good sentence, expletives, Garbled sentences, Rambling sentences, Loaded sentences, Parallel Comparison, Squinting construction, Loose & periodic sentences.

Subject Name: Applied Mathematics

5. Quadratic Equations
6. Arithmetic Progressions
7. Geometric Progressions
8. Partial Fractions
9. Permutations
10. Combinations
11. Binomial Theorem (For Positive Integral Index)
12. Binomial Theorem (For Fractional Index)
13. Measurement of Angles
14. Trigonometric Functions
15. Trigonometric Functions of Sum and Difference of Two Angles
16. Transformation Formulae
17. Trigonometric Functions of Multiple and Sub-Multiple Angles
18. Relations Between the Sides and the Trigonometric Ratios of the Angles of a Triangle
19. Area of a Triangle
20. Solution of Triangles
21. Cartesian Coordinates (Two Dimensions)
22. Locus
23. Straight Lines
24. Circles
25. Plotting of Curves
26. Translation of Axes
27. Parabolas
28. Ellipses
29. Hyperbolas
30. Polar Coordinates

Subject Name: Applied Physics

1. **Units and Dimensions:** Fundamental and Derived Units in SI System, Dimensions of Physical Quantities, Principle of Homogeneity Dimensional Equation, Applications of Dimensional Analysis: Checking the Correctness of Physical Equations, Derivation of Simple Physical Relations, Limitation of Dimensional Analysis, Significant Figures and Error Analysis.
2. **Force and Motion:** Scalars and Vectors, Velocity & acceleration, Equations of Motion, Newton's Law of Motion, Force & its Derivation from Newton's Laws of Motion, Composition and resolution of forces, Parabolic Motion Horizontal Projection and Projection at an angle, Time of Flight, Horizontal Range and Maximum Horizontal Range, Simple Problems, Centripetal Acceleration, Centripetal and Centrifugal Forces, Concept of Friction and its Application, Application to Banking of roads.
3. **Work, Power and Energy:** Work and its Units, Work Done on Bodies Moving on Horizontal and Inclined Planes (Consider Frictional Forces Also). Concept of Power and its Units, Calculations of Power (Simple Cases), Concept of Kinetic Energy and Potential Energy Expressions for P.E and K.E, Conservation of Energy in the Case of Freely Falling Bodies, Principle of Conservation of Energy.
4. **Rotational and Simple Harmonic Motions:** Definition of Moment of Inertia, Moment of Inertia of Disc, Ring, & Sphere, Torque and Angular Momentum and Their Inter Relation, Principles of Conservation

(Angular Momentum and its Applications). Kinetic Energy of Rolling Body, S.H.M – Derivation of Displacement, Velocity, Acceleration, Time Period and Frequency, Motion of Cantilever, Free, Forced and Resonant Vibrations (No Derivation).

5. **Heat- Temperature and its Measurement:** Concept of Heat and Temperature on the Basis of K.E. of Molecules, Unit of Heat Basic Principles of Measurement of Temperature, Thermocouple, Bimetallic and Resistance, Pyrometers and Thermometers Criteria for the Selection of Thermometers.
6. **Expansion of Solids:** Coefficient of Linear, Surface and Cubical Expansions and Relation Amongst Them, Thermal Stresses (Qualitative Only) and their Applications.
7. **Heat Transfer:** Three Modes of Transfer of Heat, Coefficient of Thermal Conductivity, its Determination by Searle's Method and Lee's Disc Method, Conduction Through Compound Media (Series and Parallel for Two Materials Only), Heat Radiation, Characteristics of Heat Radiations, Prevost's Theory of Heat Exchange, Black Body Radiations, Emissivity and Absorptivity Kirchhoff's Law and Stefan's Law of Radiation.

Subject Name: Applied Chemistry

1. **Structure of Atom:** Chemistry as Important Branch of Science, Basic Concept of Elements Mixture and Compound, Chemical Equation, its Balancing, Implications and Limitations, Recapitulation of Fundamental Particles of Atom i.e., Electron, Proton and Neutron, Bohr's Model of Atom, Line Spectrum of Hydrogen, Modern Concept of Atom-Four Quantum Numbers, Shells, Subshells, Orbital (Shapes of s & p Orbital), Pauli's Exclusion Principle, Aufbau Energy Ranking Rule, Orbital Concept Types of bonds co-valency, formation of s-s, s-p, p-p, bonding with examples, Hybridization sp, sp^2, sp^3, (Consider BeF_2, BF_3, CH_4) molecules, Brief Concept of Modern Periodic Table of Elements.
2. **Chemical Equation, Oxidation & Reduction:** Concept of Oxidation & Reduction, Electronic Concept of Oxidation & Reduction, Redox Reactions (Direct and Indirect), Oxidation Number Balancing of Simple Redox Reactions by Oxidation Number.
3. **Ionic Equilibrium:** Ionization, Degree of Ionization, Focus Effecting Ionization, Ionization of Water, Ionization Equilibrium in Aqueous Solutions, Common Ion Effect.
4. **Acids and Bases:** Concept of Acids and Bases, Their Strength in Ionization Constant, PH Value, Acid Base Titration, Choice of Indicators, Hydrolysis, Buffer Solution.
5. **Electrolysis:** Concept of Electrolysis, Faraday's Law of Electrolysis, Engineering Applications (Electro-Metallurgy, Electroplating & Electro-Refining)
6. **Water:** Hard and Soft Water, Removal of Hardness by: Soda Lime Process, Permutit's Process, Ion Exchange Method., Disadvantages of Hard Water in Industrial User, Boiler Scales, Priming, Foaming Corrosion and Caustic Embrittlement, Expressing the Degree of Hardness of Water in (With Simple Problems): Clark's Degree, O' Hener's Method, Determination of Degree of Hardness by (With Simple Problems): Soap Titration Method, O' Hener's Method: Water for Drinking Purposes.
7. **Solutions & Colloids:** Solute, Solvent, Solution & Colloids, Particle Size and Colloidal State, Tyndell Effect, Brownian Movement, Coagulation.

Subject Name: Applied Mechanics

1. **Introduction:** Concept of Mechanics and Applied Mechanics, Explanation of Mechanics and Applied Mechanics, Its Importance and Necessity, Giving Suitable Examples on Bodies at Rest and in Motion, Explanation of Branches of this Subject, Concept of Rigid Bodies.

2. **Laws of Forces:** Force and its Effects, Units and Measurement of Force, Characteristics of Force Vector Representation, Bow's Notation, Types of Forces, Action and Reaction, Tension, Thrust and Shear Force, Force Systems: Coplanar and Space Force Systems, Coplanar Concurrent and Non-Concurrent Forces, Free Body Diagrams, Resultant and Components Concept of Equilibrium, Parallelogram Law of Forces, Equilibrium of Two Forces, Superposition and Transmissibility of Forces, Newton's Third Law, Triangle of Forces, Different Cases of Concurrent Coplanar, Two Force Systems, Extension of Parallelogram Law and Triangle Law to Many Forces Acting at One Point-Polygon Law of Forces, Method of Resolution into Orthogonal Components for Finding the Resultant, Graphical Methods, Special Case of Three Concurrent, Coplanar Forces, Lami's Theorem.
3. **Moments:** Concept of Moment, Varigon's Theorem- Statement Only, Principle of Moments- Application of Moments to Simple Mechanism, Parallel Forces, Calculation of their Resultant, Concept of Couple Properties and Effect, Moving a Force Parallel to its Line of Action, General Cases of Coplanar Force System, General Conditions of Equilibrium of Bodies Under Coplanar Forces.
4. **Friction:** Concept of Friction, Laws of Friction, Limiting Friction and Coefficient of Friction, Sliding Friction.
5. **Centre of Gravity:** Concept of Gravity, Gravitational Force, Centroid and Center of Gravity, Centroid for Regular Lamina and Center of Gravity for Regular Solids, Position of Center of Gravity of Compound Bodies and Centroid of Composition Area, CG of Bodies with Portions Removed.
6. **Laws of Motion:** Concept of Momentum, Newton's Laws of Motion, Their Application, Derivation of Force Equation from Second Law of Motion, Numerical Problems on Second Law of Motion, Piles, Lifts, Bodies Tied with String, Newton's Third Law of Motion and Numerical Problems Based on it, Conservation of Momentum, Impulsive Force (Definition Only).
7. **Simple Machines:** Concept of Machine, Mechanical Advantage, Velocity Ratio and Efficiency of a Machine, their Relationship, Law of Machine, Simple Machines (Lever, Wheel and Axle, Pulleys, Jacks Winch Crabs Only).

Subject Name: Elements of Mechanical Engineering

1. **Source of Energy:** Introduction, Types of Energy.
2. **Steam and its Properties:** Introduction to Steam, Terms Related to Steam Formation.
3. **Boiler:** Classification of Boilers, Merits and Demerits, Boiler Mounting.
4. **Prime Movers:** Definition of Prime Movers, Impulse and Reaction Turbines, Open and Close Cycle Gas Turbine.
5. **Internal Combustion Engines:** Heat Engine, External and Internal Combustion Engine, Classification of IC Engines, Principle Parts of IC Engines.
6. **Refrigeration and Air Conditioning:** Types of Refrigeration System, VCRS, Air Conditioning.
7. **Welding, Soldering and Brazing:** Welding, Classification of Plastic and Fussion Welding, Arc Welding, Types of Electrode, Brazing and Soldering.
8. **Machine Tools:** Introduction, Classification of Lathes, Major Parts of a Lathe, Specification of Lathe, Drilling Machine Operations, Milling and Down Milling, Grinding Machines.
9. **Lubrication and Bearings:** Introduction to Lubrication, Function and Properties of Lubricants Classification of Bearings.
10. **Power Transmission:** Belt Drives, Belt Material, Gear Train, Types of Gears, Compound Gear Train.
11. **Mechatronics:** Concept of Mechatronics System, Elements of Measurement System, Types of Control Systems, Microprocessor Based Controllers.

Subject Name: Engineering Drawing

1. **Drawing Office Practice:** Importance of Engineering Drawing, Importance of Legible Lettering and Numbering, Dimensioning, Scales, Geometrical Construction, Conics, Geometric Curves.
2. **Orthographic Projections, Projection of Simple Objects in three views.**
3. **Projection of Solids and Section of Solids:** Projection of Simple Solids, Sectional View.
4. **Pictorial Drawing:** Isometric Drawings.
5. **Development of Surfaces.**
6. **Practice on AutoCAD:** AutoCAD Commands, Exercise.

Subject Name: Concepts in Information Technology

1. **Information Concepts & Processing:** Definition of Information, Data VS Information, Introduction to Information System, Information Representation Digital Media, Images, Graphics, Animation, Audio, Video etc. Need a Value & Quality of Information the concept of Information entropy & Numerical.
2. **Computer Appreciation:** Definition of electronic Computer, History, Generation, Characteristics & Application of Computers, Classification of Computers, RAM, ROM, Computer Hardware, CPU, Various I/O Devices, Peripherals, Storage Media, Software Definition and Concepts.
3. **Data Communication & Networks:** Computer Networks, Networking of Computers, Introduction to LAN, WAN, MAN, Network Topologies, Basic Concepts in Computer Networks, Introduction to GPRS, CDMA, GSM & FM Technologies.
4. **Introduction to Internet Technologies:** HTML, DHTML, WWW, FTP, TELNET, Web Browser, Net Surfing, Search Engines, E-Mail, ISP, E-Commerce, Public Key, Private Key, Safety of Business Transaction on Web.
5. **Concepts in Operating System:** Elementary Concepts in Operating System, GUI, Introduction to DOS, MS Windows.

Subject Name: Workshop Technology

1. **Carpentry and Painting Shop:** Introduction to Wood Work, Preparation of Dovetail Joint, Preparation of Mitre Joint, Preparation of Lengthening Joint etc…
2. **Fitting Shop:** Drill, Taps and Dies, Using a Hand Tap, Care and Maintenance of Measuring Tools, Height Gauge, Files, Preparation of Job Involving Threads, Using a Pipe Threading Set, Care of Pipe Cutters and Threading Sets.
3. **Welding Shop:** Gas Welding, Operation and Maintenance of Oxygas Equipment, Equipment Setup, Maintaining the Equipment, Oxygas Welding Techniques, Common Welding Joints Generally Made by Gas Welding, Proper Edge Preparation and Fit Up, Welding Procedure.
4. **Electric Shop:** Importance of Three Phase Wiring and Its Effectiveness, Two-Wattmeter Method of Power Measurement in a Three Phase Circuit, Connecting Single Energy Meter and testing it, Reading and Working out the Power and costing of Energy in a Single Phase Circuit.
5. **Electronic Shop:** Wire Rope, Various Types of Plugs, Sockets, Connectors Suitable for General Purpose Audio Video Use, Demonstrate the skill to make Facilities Solder Joint, Installation and Soldering of Printed Circuit Components, Soldering of PCB Components, Application of Solder and Soldering Iron Tip.

Subject Name: Business Communication

1. **Corresponding: (Official, Business and Personal):** One Letter from Each Category.
2. **Grammar:** Tenses, Narration, Punctuation.
3. **Essay.**
4. Reports.
5. Notices.
6. Note-Making and Summarizing.
7. Business Correspondence.

Second Year

Second Year		
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1	English-II	
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3	Basics of Civil Engineering	
4	Electrical Instruments & Measurements	
5	Electrical Estimating & Costing	
6	Electrical Engineering Design & Drawing-I	
7	Computer Application for Engineering	
8	Electrical Circuits & Analysis	
9	Electrical Power	
10	Electrical Machine	
11	Study Through ICT* Technology	
12	Assignment Work	
13	Extra-Curricular Activities & Project Work	

Subject Name: English-II

1. **Functional Grammar:** Articles, Preposition, Tenses: Functions, Synthesis, Transformation, Spotting errors and correction of sentences.
2. **Pre- Requisites of Technical written Communication:** One word substitution, Spelling rules, Words often confused & misused, Phrases.
3. **The Structure of sentences/ clauses:** Adverb clause, Adjective clause, Noun clause. Sentences: Simple, Double, Multiple and complex, Transformation of sentences: simple to complex & vice versa, simple to compound & vice-versa, Interrogative to assertive & to negative & vice-versa.
4. **Technical Communication:** Nature, Origin and Development, Salient features, Scope & Significance, Forms of Technical Communication, Difference between Technical Communication & General writing, Objective Style vs. Literary Composition.

Subject Name: Applied Mathematics-II

5. **Complex Numbers:** Complex Numbers, phasor and Application of Complex Number in R.L.C. Circuits.
6. **Differential Calculus:** Functions and Limits, Differentiation, Approximation of Errors by Differentials.

7. **Integral Calculus:** Indefinite Integral, Definite Integrals, Area Bounded by a Curve and Axes, Average Value and Root Mean Square Value of a function, Finite Differences and Numerical.
8. **Partial Differentiation:** Partial Differentiation.
9. **Solution of Ordinary Differential Equations:** Differential Equations, Linear Differential Equations, Applications of Differential Equations to R-L-C Electric Circuits.

Subject Name: Basics of Civil Engineering

1. **Surveying and Civil Engineering Materials:** Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples. Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections.
2. **Building Components and Structures:** Foundations: Types, Bearing capacity – Requirement of good foundations. Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

Subject Name: Electrical Instruments & Measurements

1. **Philosophy of Measurement:** Introduction, Measurement, Errors, Instruments, Permanent Magnet Moving Coil (PMMC), Moving Iron Instruments, Electro Dynamometer Type Instruments, Hot Wire Instruments, Thermocouple Instruments.
2. **Transducer:** Primary and Secondary Transducer, Selection Criteria of Transducer, Thermal Conductivity Measures, UAV, Manometer, Pirani Gauge or Thermal Conductivity Gauge, Ionization, Diaphragm, Bellows, Temperature Measurement, Level and Flow Measurement, Sensors.
3. **Basic of Control System:** Basic Control Principles, Basic Proportional Control, Practical Proportional Control, Reset and Rate or Integral Action, Multiple Control Modes, Typical Negative Feedback control Schemes.
4. **Measurement of Electrical Quantities:** DC and AC Potentiometer, Maggar, Methods for Measurement of Low and High Resistance Analyzers, Digital Display System and Indicators, Light Emitting Diodes (LED).
5. **Interfacing Systems:** GPIB Devices, Device Addresses, Physical Connection, Telemetering, SCADA and Telemetry Fundamentals, Remote Terminal Unit Structure (RTU), Data Acquisition concepts.
6. **Process and Instrument Diagram:** Introduction, Process Legend.

Subject Name: Electrical Estimating & Costing

1. **Electric Symbol:** Introduction, Table of Electrical Wire Symbols, Switch Symbols and Relay Symbols, Ground Symbol, Resistor Symbols, Capacity Symbol, Inductor / Coil Symbols, Power Supply Symbols, Meter Symbol, Lamp / Light Bulb Symbols, Diode / Led Symbol, Transistor Symbols, Misc, Symbols, Antenna Symbol, Logic Gates Symbols, Ohm's Law, Sensors (Input Devices), Output Device.

2. **Indian Electricity Rules (1956):** Introduction, Indian Electricity Rules (1956), Rules.
3. **Specification of Electrical Items:** Switch, Disconnect or Fuse – Switch and Switch – Fuse, Fuse, Busbar Chamber, Distribution Board – General, Fluorescent Lamps, High Pressure Discharge Lamp and Luminaire, Floodlight Accepting Linear Metal Halide / Linear High, Tungsten Halogen Lamp, Electronic choke for TL Storage Water Heater, Solid State Soft Motor Starter.
4. **Systems of Internal Wiring, Earthing and Testing of Installation:** Introduction, Methods of Wiring, Factors to be taken while selecting electric wire, Electric Shock, Earthing, Installation of Earthing System, Earthing Conductor, Inspection and Testing.
5. **Domestic, Commercial and Industrial Installation Estimates:** Introduction, Domestic Electric Installation and Estimates, Steps to be followed in Preparing Electrical Estimates, Industrial Installation Estimation.

Subject Name: Electrical Engineering Design & Drawing-I

1. **Engineering Drawing and Importance of Drawing :**Drawing Board, Drawing Sheet Paper and Layout, Drawing Pins, U Chips and Cello Tape, T-Square, Set Square, Compass, French Curves, Templet, Divider, Protractor, Free Hand Sketch and Lettering.
2. **Indian Electricity Rules and Specification:** Introduction, Specification.
3. **Electrical and Electronics Symbols:** Common Symbols, Wiring, Switches, Socket Outlets, Lighting Fixtures, Electrical Appliances, Clock and Fire Alarms, Indicating Instruments, Semiconductor Devices, Transistors, Electron Tube.
4. **Study of Hand Tolls for Wiring:** Introduction, Hand Tools for Wiring.
5. **Simple Household Circuits:** Simple Light Circuit, Staircase Circuit, Single and Double Staircase Circuit, Light and Fan Circuit.
6. **Alarm circuit without and With Relays:** Circuit for Controlling one bell Using two push Buttons, Circuit for two Ordinary Bells, Bell Response Circuit for Three Rooms, Circuit for Traffic control at Road Crossings.
7. **Orthographic Projections of Electrical Parts:** End Cover of an Induction Motor, Rotor of a Squirrel – cage Induction Motor, Motor Body Slip Rings, Pin – Type Insulator.

Subject Name: Computer Application for Engineering

1. **Information Storage and Retrieval**
   - Need for Information storage and retrieval.
   - Creating database file.
   - Querying database file on Single and Multiple Keys.
   - Ordering the data on a selected key.
   - Programming a very simple application.
2. **Programming in 'C'**
   - Basic Structure of C Programs.
   - Executing C programs.
   - Constants, variables and Data Types.
   - Operators and expressions.

- Managing Input-Output operations like reading a character, writing a character, formatted input, Output through Print, Scan getch, putch statements etc.
- Decision making and branching using IF.....else, switch go to statements.
- Decision Masking and looping using do-while and for statements.
- Array-one dimensional and two dimensional.
- File

3. **Computer Application Overview**
   - Commercial and Business data Processing application.
   - Engineering Computation.
   - CAD, CAM, CAE, CAI
4. **Typical Applications**
   - Use of Various application Software available in the field of Electronics Engineering.

Subject Name: Electrical Circuits & Analysis

1. **Basic Semiconductor and PN Junction Theory:** Conduction in Solid, p-Type and n-Type Semiconductor, p n Junction, drift Current, Reverse and Forward bias, Energy band in solids, Intrinsic and Extrinsic semiconductor, Electric Field, Junction breakdown mechanism, Diode as rectifiers.
2. **Semiconductor Diodes:** Diode Characteristics and Parameters, Graphical Analysis of Diode Circuits, Rectification, Diode Logic Circuit and Frequency Response, Power dissipation in diode, diode clipping and clamping circuits.
3. **Bipolar Junction Transistor:** Transistor Operation, Transistor currents, Common Base Common Emitter, Common Collector Characteristics, Transistor Voltage Amplification, T-Equivalent Circuit, r-Parameter, h-Parameter.
4. **Transistor Biasing:** D.C Load Line and Bias Point, Fixed current Bias, Emitter Current bias, Comparison of Basic Bias Circuit, Thermal Stability, AC Bypassing, The AC load Line, Biasing transistor switching circuits.
5. **Basic Transistor Circuit:** Common Emitter Circuit, Common Emitter h-Parameter Analysis, Common Collector Circuits, Comparison of CE, cc and CB Circuits.
6. **Field Effect Transistor:** The n-Channel JEFT, Characteristics of an n-Channel JET, The p-Channel JEFT, FET Voltage Amplification, JEFT Construction, FET Equivalent Circuit, MOSFET Enhancement MOSFET, Power MOSFETs.

Subject Name: Electrical Power

1. **Transmission System:** Layout of transmission system, Constructional features of line, Electrical features of line, HVDC transmission lines.
2. **Distribution System:** Layout of HT and LT distribution system, Construction of LT and HT undergone power cables, Estimation of LT and HT overhead distribution lines.
3. **Sub Stations:** Brief Idea of substations, Layout of 33/11 KV distribution substation and various accessories and equipments, Estimation of 11KV/400 V pole mounted substation.
4. **Faults:** Common type of faults in lines, Location and testing of faults in undergone lines, Maintenance schedule of lines.

Subject Name: Electrical Machine

1. **General Treatment of Electrical Machines:** Definition of Motor and generator, Torque due to alignment of fields and the concept of torque angle, Electromagnetic Force of an electrical machine.
2. **DC Machines:** Main constructional features, Function of commutator for motoring and generating action, Factors determining induced emf, Trouble shooting on a dc motor.
3. **Transformers (Single Phase):** Definition and principle, application, Constructional features of transformer, EMF Equation, Phasor diagram for a transformer on load, Voltage regulation and calculation.
4. **Three Phase Transformers:** Construction of three phase transformers: Construction of three phase transformers, Type of three phase transformers, Difference between power and distribution transformers, Conditions for parallel operation, On load tap changer, Cooling of transformers, conservator, breather, bushing, temperature gauges etc.

Third Year

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1	English-III	
2	Digital Electronics	
3	Utilization of Electrical Energy & Traction	
4	Modern Electric Traction System	
5	Microprocessors	
6	Generation, Protection Switchgear & Economics	
7	Entrepreneurship Development & Management	
8	Electrical Engineering Design & Drawing - II	
9	Project Work	
10	Study Through ICT* Technology	
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Subject Name: English-III

1. **The Seven C's of the Effective Communication:** Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness.
2. **Communication:** Its interpretation: Basics, Nonverbal Communication, Barriers to Communication.
3. **Business Communication at Work Place:** Letter Components and Layouts, Planning a letter, Process of Letter writing, Email Communication, Memo and Memo Reports, Employment Communication, Notice Agenda and Minutes of Meeting, Brochures.
4. **Report Writing:** Effective Writing, Types of Business Reports, Structure of Reports, Gathering Information**,** Organization of the Material, Writing Abstracts and Summaries, Writing Definitions, Visual Aids, User Instruction Manual.
5. **Required Skills:** Reading Skills, Note-making, Précis Writing, Audio Visual Aids, Oral Communication.

6. **Mechanics of Writing:** Transitions, Spelling Rules, Hyphenation, Transcribing Numbers, Abbreviating Technical and Non-Technical Terms, Proof Reading.

Subject Name: Digital Electronics

1. **Multiplexers and De-Multiplexers:**

- Basic Functions and Block Diagram of MUX and DEMUX. Different Types.

2. Latches and Flip Flops:

- Concept and Types of Latch With Their Working and Applications
- Operations Using Waveforms and Truth Tables of RS, T, D, JK, Master/ Slave JK Flip Flops.
- Difference between a Latch and a Flip Flop

3. **Counters:**

- Binary Counters
- Divide by N Ripple Counters (Including Design), Decade Counter.
- Pre Settable and Programmable Counters
- Down Counter, Up down Counter
- Synchronous Counters (Only Introduction)
- Difference between Asynchronous and Synchronous Counters
- Ring Counter with Timing Diagram

4. **Shift Register:**

- Introduction and Basic Concepts Including Shift Left right.
- Serial in Parallel Out, Serial in Serial Out, Parallel in Serial Out, Parallel in Parallel Out.
- Universal Shift Register
- Buffer Register, Tristate Buffer Register

5. **Memories:**

- Basic RAM Cell, N X M Bit RAM, Expansion of Word Length and Capacity, Static and Dynamic RAM. Basic idea of ROM, PROM, ERPOM, and EEPROM.

6. **A/D and D/A Conversion:**

- General Principle of A/D and D/A Conversion and Brief Idea of Their Applications. Binary Resistor Ladder Network Methods of D/A Conversion. Dual Slope and Successive Approximation Types of ADCs.

Subject Name: Utilization of Electrical Energy & Traction

1. **Illumination:** Nature of Light, Curve of Relative sensitivity of human eye and wave length, Definition, flux, solid angle, luminous intensity, Calculation of number of light points for interior illumination, Different sources of light, Main requirements of proper lighting, Principles of street lighting.
2. **Electrical Heating:** Introduction, Advantages of Electrical Heating, Heating Methods, Resistance Heating, Dielectric Heating.

3. **Electric Welding:** Welding methods, Principles of resistance welding, welding equipment, Principle of arc production, electric arc welding principle, characteristics of arc; carbon and metallic arc welding, power supply, advantages of coated electrode, comparison of AC and DC welding, welding control and welding control circuits.
4. **Electrochemical Process:** Need of electro-deposition, Applications of Faraday's laws in electro-deposition, Objectives of Electroplating, Factors governing electro deposition, Equipments and accessories and its applications, Principle of anodizing and its applications, Electroplating on non-conducting materials.
5. **Electrical Circuits Used in Refrigeration and Air Conditioning and Water Coolers:** Brief description of vapour compression refrigeration cycle, refrigerator, air-conditioner and water cooler.
6. **Electrical Drives:** Advantages of Electric Drives, Characteristics of Different mechanical loads, Types of motors used in electric drive, Electric braking, Plugging, Rheostatic Breaking.

Subject Name: Modern Electric Traction System

1. **Electric Traction:** Types of electric traction, system of track electrification, Traction mechanics – types of services, Speed time curve and its simplification, average and schedule speeds, Tractive effort specific energy consumption, diesel traction system.
2. **Power Controlling Component:** Salient features of traction drives, Series-parallel control of dc traction drives and energy saving, Power Electronic control of DC and AC traction drives.
3. **Traction Drives:** Electric Traction Systems, Speed time curves, preliminary investigation of energy consumption and ideal speed torque characteristics of Traction motors.
4. **Protection of AC and DC Motors:** Constructional and Design aspects of AC 1 phase and 3 phase induction motors, DC motors, constraints and comparison with respect to commercial machines.
5. **Applications:** Battery operated vehicles for city service, light weight batteries, diesel-electric traction systems for main line service and controllers, mechanics of train movement.

Subject Name: Microprocessors

1. **Introduction:** A brief history of computers and networks, History of Microprocessor.
2. **Basic of Computer Hardware:** Parts of computer, processors, buses, register set, stack pointer, external storage, Input / Output overview, Data representation, Interrupts, Compiler, Interpreter, Assembler, Linker, Object and Source Code.
3. **8085 8-Bit Microprocessor:** Pin and Functional Description, Basic System Timing, 8085 Instruction Format, Addressing Modes of 8085, Flow Charts, Designing of a Counter.
4. **80C86 CMOS 16-Bit Microprocessor:**Pin and Functional Description, External Interface, Read / Modify / Write, Basic system timing, 8086 in maximum and minimum mode, 8088 8-bit Microprocessor, The 8088 Compared to the 8086.

Subject Name: Generation, Protection Switchgear & Economics

1. **Power Generation:** Generating Electrical Energy, Generating Stations, Hydro Electric Power Station, Diesel Power Station, Nuclear Power Station.
2. **Basics of Switchgear:** Introduction, Fuses, Isolators, Earthing Switches, Contractors, Circuit Breaker, Insulating Fluids, Initiation of an Arch in circuit Breakers, Arc Interruption, Current Interruption, Parallel Capacitance, Current Chopping, Resistance Switching, Capacitance Current Breaking.
3. **High Voltage Circuit Breakers:** Introduction, Oil Circuit Breakers, Air Circuit Breakers, Air Blast Circuit Breaker, Vacuum Breaker, High Voltage Direct Breaker, Circuit Breaker Testing.
4. **Protective Relays:** Basic Idea of Relay Protection, Nature and Cause of Faults, Primary and Backup Protection, Operation of Protective System, Relay Classification, Principle Types of Electromagnetic Relays, Induction Relays, Torque, Equation of Electromagnetic Relays, Instantaneous Over Current Relays, Application of Time Current Relays.
5. **Classification of Relays over their Construction:** Attracted Armature Type Relay, Induction Disc, Induction Cup Relay, Moving Coil Relay, Thermal Rays, Transductor Relays, Static Relays, Semiconductor Diodes, Transistor, Bipolar Junction Diode, Rectifier Bridge Relay.
6. **Economics of Power System:** Cost of Electrical Energy, Expressions of Electrical Energy, Methods of Determining Depreciation, Tarrif Plans, Desirable Characteristics of a Tariff Plan, Describe the types of tariffs.

Subject Name: Entrepreneurship Development and Management

1. **Entrepreneurship:** Definition of Entrepreneur, Internal and External Factors, Functions of an Entrepreneur, Entrepreneurial Motivation and Barriers, Classification of Entrepreneurship, Theory of Entrepreneurship, Concept of Entrepreneurship, Development of Entrepreneurship, Culture, Stages in Entrepreneurial Process.
2. **Creativity and Entrepreneurship Plan:** Idea Generation, Screening and Project Identification, Creative Performance, Feasibility Analysis: Economic, Marketing, Financial and Technical, Project Planning: Evaluation, Monitoring and Control Segmentation, Creative Problem Solving: Heuristics, Brainstorming, Synectics, Value Analysis, Innovation.
3. **International Entrepreneurship Opportunities:** The Nature of International Entrepreneurship, Importance of International Business to the Firm, International Versus Domestics' Entrepreneurship, Stages of Economic Development, Institutional Support for New Ventures: Supporting Organizations, Incentives and Facilities, Financial Institutions and Small Scale Industries, Govt. Policies for SSIs.
4. **The Personal Enterprise Environment:** Family and Non Family Entrepreneur, Role of Professionals, Professionalism Vs Family Entrepreneurs, Role of Woman Entrepreneur, Venture Capital, Nature and Overview, Venture Capital Process, Locating Venture Capitalists.

Subject Name: Electrical Engineering Design & Drawing - II

1. **House Wiring:** Definition and Positioning of Equipment, Arrangement of Apparatus, Locations of Various Outlets in House Wiring, Selection of Wires, Sub – circuits, Dividing the Electrical Installation into Sub – Circuits and Preparing an Installation Board.
2. **Service Line Connections:** Service Line, Types of Service Connections, Schedule of Material and Cost for Giving Service Connections.

3. **Wiring of Motors:** Wiring of Motors, Main Components used in Industrial Power Wiring, RCCB, ELCB, Mccb, Load Changeover Switches, Power Wiring Estimate, Lighting / Fan Wiring.
4. **Conductor Control Circuits:** Control Circuits, Conductor Control Circuit Components, Motor Control Circuits, Star – Delta Starters.
5. **Sub –** Stations: Classification of Sub-Stations, Lighting Arresters (LA) or Surge Diverters, Isolators, Circuit Breakers, Instrument Transformers, Bus Bars.

Note:-

The Normal Rule and Regulation pertaining to the Examination and other issues will be applicable in Faculty of Engineering & Technology as per Arunachal University of Studies Act 2012, Subsequent Statute and Rules & Regulations