

NORTH GUJARAT UNIVERSITY.

B.E. FIRST YEAR (ALL)

105 : ELEMENTS OF ELECTRICAL ENGINEERING AND ELECTRONICS

1.	D.C.CIRCUITS: Resistances, types of resistances, color coding effect of emperature, temperature coefficient of resistance, resistances in series, resistances in parallel, star/delta transformation, Kirchhoffs laws, superposition theorem Thevenin's Theorem.
2.	Work Power and Energy : Heating effect of electric current, Joule's Law of electric heating, thermal efficiency, and relationship between various units, practical applications.
3.	Capacitor : Capacitance, capacitors - types and color coding, parallel plate capacitor, capacitance of composite medium, capacitors in series, capacitors in parallel, energy stored in a capacitor, charging and discharging.
4.	Magnetic Circuits : Magnetic circuit, terminology, comparison between electric and magnetic circuit, fringing effect, composite magnetic circuit, series / parallel magnetic circuits, magnetization curve.
5.	Electromagnetic induction : Faraday's laws of electromagnetic induction, Lenz's law, statically induced emf, dynamically induced emf, self inductances, mutual inductance, coefficient of coupling, inductances connected in series, inductance connected in parallel, energy stored in an inductance, rise and decay of current in inductive circuit, hysteresis and eddy current loss.
6.	A. C. Fundamentals : Generation of alternating emf, emf equation, terminology waveform, alternation, sinusoidal waveform, instantaneous value, amplitude, cycle, time period, frequency, phase and phase difference, form factor and crest factor, average value and RMS value of different waveforms, complex algebra, vector representation of a.c. quantities.
7.	Single Phase A. C. Circuits : Purely resistive circuit, purely inductive circuit, purely capacitive circuit, resistance and inductance in series, resistance and capacitance in series, power factor, apparent power, active power, reactive power, resistance - inductance - capacitance in series circuit, resonance in series circuit, band width, Q-factor, parallel circuits, series - parallel circuits, resonance in parallel circuit, comparison between series and parallel resonance.
8.	Poly Phase Circuits : Introduction, Generation of three phase emf, Phase sequence. Advantages of 3phase system, Interconnection of three phases, Star Delta connection, Relationship between line and phase quantities, Power measurement in 3-phase circuit.
9.	Semi Conductor Devices : PN junction * its properties, applications of diode as a rectifier, characteristics and application of zener, diode, transistor characteristics, transistor configuration, opto electronic devices- photo diode, phototransistor, LED and opto coupler, CRO & its applications.

REFERENCES:

1. A text book of Electrical Technology -I - B.L. Theraja
2. A text book of Electrical Technology - IV - B.L. Theraja
3. Electronics Principals - Albert Malvino.
4. Elements & Electrical Engineering & Electronics - U.A. Patel.

NORTH GUJARAT UNIVERSITY.
B.E. SECOND YEAR, SEMESTER III (ELECTRICAL)
EE 301: ENGINEERING MATHEMATICS - III

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	---	3	100	--	--	100

SYLLABUS

1. Theory of complex variables: Analytic functions, Cauchy-Riemann equation, harmonic functions, line integral, Cauchy's theorem and Cache's integral, simple form of conformal transformation with Application of the solution of two-dimensional problems.
2. Finite differences and difference equations: Finite differences, interpolation, Newton's and Lagrange's formula, difference equation with constants co-efficient, solution of ordinary and partial differential equations with boundary conditions by finite difference method.
3. Numerical methods: Roots of algebraic equations, solution of linear simultaneous equations, numerical differentiation and integration, numerical methods to solve first order; first degree ordinary differential equations.
4. Laplace transforms: Definition, Laplace transform of elementary functions, properties of Laplace transform, inverse Laplace transform, transform of derivatives, transform of integration, multiplication by TN, division by t, convolution theorem, unit-step and heaviside's unit function, dirac-delta function, periodic functions, solution of ordinary
 Linear differential equations, simultaneous equation with constant co-Efficient applied to electrical circuits.
5. Fourier series: Definition of periodic function, Euler's formula, functions having points of discontinuity, change of intervals, odd and even functions, expansion of odd or even periodic functions, half range sine and cosine series, elements of harmonic analysis.
6. Fourier transforms Definition, Fourier integral, Fourier sine and cosine integration, complex form of Fourier integral, Fourier transforms, Fourier sine and cosine transform inverse Fourier transforms.
7. Statistics: Probability, Total probability, Independent events, theorem of compound probability, Bay's theorem, random variable, discrete probability distribution, continuous probability distribution, expectation, moment generating function, repeated trials, Binomial, Poisson's and normal distribution applications, calculation of errors, probable error, standard error.

* Books:

- 1) Applied Mathematics vol.-I & II by P.N.Wartikar & J.N.Wartikar.
- 2) Higher Engineering Mathematics by B.S.Grewal.
- 3) Engineering mathematics by Shrivastva.
- 4) Text Book of Engineering Mathematics by A.B.Mathur & V.P.Jaggi.

NORTH GUJARAT UNIVERSITY
B.E. SECOND YEAR, SEMESTER III (ELECTRICAL)
EE302: LINEAR ELECTRONICS

Teaching Scheme

Examination Scheme

Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	25	25	150

SYLLABUS

1. P.N Junction diode: Rectifier diode, switching diode, breakdown diode, varactor diode, solar cells, photo detector, light emitting diode.
 2. Rectifying Circuit and D.C. power supplies: Half, full and bridge rectifiers and their analysis, principal of 3 phase rectifiers and filter circuits, diode as clipper and clampers, zener diode as a voltage regulator.
 3. Transistor: Basic transistor amplifier, CB, CE, CC configuration characteristics and analysis photo transistor.
 4. Transistor biasing and thermal stability: Stability factors, collector to base bias, emitter bias, voltage divider bias, bias compensation.
 5. Transistor h parameter circuits: General idea of h parameter and their application in each configuration of amplifier.
 7. Low and high frequency response of transistor amplifier.
 8. Field effect transistor: Types, characteristic and their application.
 9. Transistor as amplifiers: Class A, class B and push-pull amplifier.
- * Termwork and Lab work shall be based on above theory.
- * Books:
- 1) Integrated Electronics - Milman & Halkias
 - 2) Electronic devices and circuits - Allen Motorshed.
 - 3) Solid state electronic devices - Ben G Streetman.

NORTH GUJARAT UNIVERSITY
B.E. SECOND YEAR, SEMESTER III(EC)
EC305: ELECTRICAL ENGINEERING

Teaching Scheme		Examination Scheme					
Theory	Practical	Marks	Hrs	Sessional	Practical	Term work	Total mark
4	2	100	3	0	25	25	150

1. **D.C. generator:** - general principal, construction, types, losses, condition for maximum efficiency, characteristic.
2. **D.C. motor:** -general principles, parts back emf, voltage equations, condition for maximum power, torque speed regulation, characteristic, losses, efficiency, speed control, starter.
3. **Transformers:-** Equivalent circuit, open circuit and short circuit test, regulation, losses and efficiency, all day efficiency, sumpner test on single phase Transformers. Construction, principal and operation of three phase Transformers. Open delta Scott connection.
4. **Induction Motors:** - Three phase induction motor types, derivation of torque equation, effect of slip on rotor current and torque, slip torque characteristic, induction motor as generalized transformers, equivalent circuit, starter, speed control, capacitor start single phase induction motor, stepper motor.
5. **Electrical measurements:** - Moving iron and moving coil instrument, principle, construction errors, dynamometer type instrument for measurement of current and power, their construction and sources of errors, power factor meter and frequency meter.
6. **Illumination:** -study of illumination parameter, Lamp, luminaries, design of building lighting installation.
7. **Substation:** - Types of sub- station sub station equipment and layout. Classification of distribution system, a/c distribution calculation.

BOOKS: -

1. Electrical technology By B.L.Theraja
2. Electrical measurement measuring instrument By A.K. Shawhany
3. Electrical power By S.L.Uppal
4. Electrical technology By H. Cotton

NORTH GUJARAT UNIVERSITY
B.E. SECOND YEAR, SEMESTER III (ELECTRICAL)
EE303: ELECTRICAL MEASUREMENT AND MEASURING INSTRUMENT.

Teaching Scheme Examination Scheme

Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	25	25	150

SYLLABUS

1. Unit Dimension and Standards: MKS system, unit dimensional analysis, standards and sub standards, and Absolute measurement of current and resistance.
2. Galvanometer and Detectors: Operating, Controlling and Damping torque D.C. PMMC Galvanometers, A.C. vibration galvanometer, Moving coil and moving magnet galvanometer, duddell's oscillograph, tuned detectors.
3. Potentiometers: D.C. vernier Potentiometers, A.C. polar & co-ordinate types of Potentiometers.
4. Instruments: Construction, working principle of P.M.M.C, M.I, Electrostatics, Induction, Rectifier and Hot wire instruments, Their use in measurement of Current, Voltage, Power, Frequency and Resistance.
5. Bridge measurement: General 4-arms bridge networks for measurement of impedance, Theory and vector diagram of De sauty's, Wien's, Anderson's, Maxwell's, Hay's, Owen's and Schering bridge ckts.
6. Electrical Measurement: General law of measurement, low, medium and high resistance measurement, Kelvin's double bridge, Ohmmeters, Q-meters, Megger, Megaohm bridge, measurement of dielectric loss, power factor & permittivity of dielectrics.
7. High voltage measurement: Principle and equipment for measurement and testing of high voltage circuits.
8. Instrument Transformers: Use of instrument transformer, Transformation ratio and burden, Construction theory of operation and characteristic of C.T. and P.T.
9. Watt Meters and Energy Meters: Principle working and use of dynamo meter type watt meter, Methods of connection, Errors and compensation, Working principle and use of induction type energy meter, Adjustment, Compensation and errors, Testing of energy meter.
10. Digital Meters: Their operating Principles, VTVM, Digital Voltmeter and Multimeters. Magnetic measurement: Determination of B-H curve, A.C magnetic testing. Termwork and Lab work shall be based on above theory.

*** BOOKS:**

- 1) A course in electrical and electronics measurement and instruments
By A.K.Sawhney - Dhanpat rai Sons.
- 2) A Electrical Measurements and Measuring Instruments
By T.W.Golding and Widdies - Wheeler Publication.
- 3) A Electrical Measurements and Measuring Instruments
by Rajendraprasad - Khanna Publication.

NORTH GUJARAT UNIVERSITY.
B.E. SECOND YEAR, SEMESTER III (ELECTRICAL)
EE304 : ELECTRICAL POWER - I

Teaching Scheme

Examination Scheme

Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	25	25	150

SYLLABUS

1. Conventional methods of generation: Thermal, Diesel, MHD, Gas, Hydro and Nuclear power plants. Equipment layout of the above plants. Station auxiliaries and their arrangements, Cooling system etc, Combined cycle power generation (Co-Generation).
2. Distribution (A.C and D.C both): Types and comparison of distribution systems, insulator used in transmission and distribution system, various types of pole used, construction detail of distribution system, underground cables, its types, construction, laying and fault detection, calculation of capacitance and insulation resistance, Comparison of different DC and AC distribution system from use of copper and line loss etc point of view.
3. Mechanical design of transmission line: Sag calculation, support at equal and unequal levels, stringing charts, preparation of sag templates.
4. Substation: Types of Sub-station, Equipments and layout of Sub-station.
5. Generation and Distribution economics: Cost of generating stations, fixed, capital and running cost, running charges, tariffs, load curve, demand factor, diversity of load, diversity factor, plant factor, capacity factor, connected load factor, load duration curve, integrated load duration curve.
6. Consideration of effect of low power factor: Advantage of power factors improvement, methods of improving power factor, the most economical power factor.
7. Neutral Earthing: Introduction, Equipment Earthing: plate and pipe earthing, substation earthing.
8. Industrial visits to Power station and Substation and that should be part of

Termwork.

* Termwork and lab work shall be based on above theory.

* Books:

- 1) Electrical Power - Dr. S.L. Uppal.
- 2) Course in Electrical Power - Soni, Gupta and Bhatnagar.
- 3) Transmission and Distribution - H. Cotton.
- 4) Electrical Power - V.K. Mehta.

NORTH GUJARAT UNIVERSITY
B.E. SECOND YEAR, SEMESTER III (ELECTRICAL)
EE305: ELECTRICAL MACHINES-I

Teaching Scheme

Examination Scheme

Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	50	50	200

SYLLABUS

1. D.C. Machines: Construction, field magnet, armature, commutator, brushgear, Armature winding (Lap and wave), Principle of operation, EMF equation, elementary concept, armature reaction and commutation, interpoles and compensating winding, Types of D.C. Generator and characteristics, Efficiency of D.C machines.
 2. D.C Motor : Torque equation, different types and characteristics of D.C. Motors, starters, speed control.
 3. Transformer: Construction and principle of single-phase transformer, operation on-load and No-load vector diagrams, equivalent circuit, OC and SC test, efficiency and regulation. Construction of 3-phase transformers, Basic connections such as star-star, delta-delta, star-delta and delta-star connection.
 4. Alternator: Construction and principle of operation, EMF equation, synchronous impedance, methods of voltage regulation.
 5. Synchronous motor: Principle and operation, phasor diagram, operation with constant excitation, constant power, method of starting.
 6. Polyphase induction motor: Rotating magnetic field, construction and principle, phasor diagram, Torque-slip Characteristic, losses and efficiency, power equation, Methods of Starting, Starting torque, Running torque and their ratios.
- * Termwork and labwork shall be based on the above theory.
- * Books :
- 1) Electrical technology vol-II - B.L.Theraja.
 - 2) Electrical machine A.C - Rajput.
 - 3) Electrical machine D.C - Rajput.
 - 4) Electrical Machine - M.G. Say

NORTH GUJARAT UNIVERSITY.

B.E. SECOND YEAR, SEMESTER IV (ELECTRICAL) EE401 : THERMAL AND HYDRAULIC PRIME MOVERS

Teaching Scheme Examination Scheme

Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	25	25	150

SYLLABUS

1. STEAM TURBINES: Classification, velocity diagrams, and performance, losses, governing condensers.
2. IC ENGINES: Classification, fuels cooling, lubrication and performance.
3. GAS TURBINES: Cycles, specific output, efficiency and improvement methods.
4. AIR MOTORS AND COMPRESSORS: Working principle, operation.
5. HYDRAULIC PRIMEMOVERS: Dynamic Behaviour, fluid velocity triangles, work done, efficiency, waterwheels and their classification, hydraulic turbines and their classification, working principle and performance, draft tubes, governing and characteristics.

* Termwork and Lab work shall be based on above theory.

* BOOKS:

- 1) Heat Engines by R.C.Patel
- 2) Heat engines By Ballaney

NORTH GUJARAT UNIVERSITY.

B.E. SECOND YEAR, SEMESTER IV (ELECTRICAL) EE402: ELECTRICAL MACHINES-II

Teaching Scheme

Examination Scheme

Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	25	25	150

SYLLABUS

1. Material used in electrical machines: Frame structure materials, material for magnetic circuits, Special magnetic alloy and permanent magnetic Material, insulating material for transformer and machine winding and properties, classification as per ISS Proportion of conducting Material generally used in Electrical m/cs.

2. Magnetic circuit: Magnetic circuit of electrical m/c, Flux density distribution, waveforms, Reluctance of air gap, calculation of MMF for Armature teeth, Real and apparent flux density, MMF of armature core, pole And yoke, Effect of saturation.

3. Windings: D.C. Armature windings, Simple Lap and Wave windings, D.C. Field windings, Calculation of Ampere-turns for series and shunt coil, Interpole windings.

4. A.C. Armature windings: Lap and wave windings, single layer and double layer windings, Fractional slot winding.

5. D.C machines: Cross-magnetizing and demagnetizing effect in DC machines, armature reaction, Commutation and Method of improving commutation.

6. Machine faults: Common faults in electrical m/cs and their rectification, Commutation faults, faults location in armature winding.

* Termwork and lab work shall be based on above theory.

* Books:

- 1) Electrical machine designs - A. K. Sawhney.
- 2) Design and performance of A.C. machines - M. G. Say.
- 3) Design and performance of D.C. machines - Clayton.

NORTH GUJARAT UNIVERSITY.

B.E. SECOND YEAR, SEMESTER IV (ELECTRICAL) EE403: NETWORK ANALYSIS

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	25	25	150

SYLLABUS

1. Conventions for describing Networks: Reference Direction for current and voltage, active element for convention, the dot convention for coupled Ckt., Network topology, Tie set and cut set tables.
2. Network equation: Kirchoff's laws, No. Of network equation, source transformation, formulation of network equations, loop and node variable analysis.
3. Initial condition in network: Initial condition in elements, Geometric interpretation of derivatives, procedure for evaluating initial condition.
4. Differential equations in circuits: Solution using classical and Laplace transform methods.
5. Transform of special signal waveform: The shifted unit steps function, The ramp and impulse function, waveform synthesis, and the initial and final value theorem.
6. Impedance function and network theorem: The concept of complex frequency Transform impedance and transform Ckt., series parallel combination of elements, Superposition and Reciprocity theorem, Thevinin and Norton's theorem, Maximum power transfer Theorem.
7. Network function: Network function of one-port and two-port, calculation of networks functions, Ladder and general N/W, Restriction on pole-zero location for driving point and transfer functions.
8. Two port parameters: Relationship of two port variables, Admittance, impedance, Transmission and Hybrid parameters, Relationship between parameter sets, Parallel connection of two port networks.
9. Sinusoidal steady-state analysis: Use of complex number on steady-state solution phasor and phasor diagrams.

* Termwork and labwork shall be based on above theory.

* Books:

- 1) Network Analysis by Van Valkenburg.
- 2) Network Analysis by G.K.Mithal.
- 3) Network Analysis by Administer.
- 4) Network Synthesis by Van Valkenburg.

NORTH GUJARAT UNIVERSITY.
B.E. SECOND YEAR, SEMESTER IV (ELECTRICAL)
EE404: CONTROL THEORY

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	2	100	25	25	150

SYLLABUS

1. Principal of automatic control: Open loop and close loop control, servo mechanism, DCS, SD, multivariable system and non engineering control systems diagram, signal flow graph, transformation, system representation by different equation, system transfer function.
 2. Mathematical Models of Physical Systems: Differential equations of physical systems. Transfer functions Block Diagram algebra signal flow graph analysis.
 3. Feedback Characteristics of Control System: Feedback and non-feedback Systems; use of Feedback for reduction of parameter variation and effects of disturbance signals; regenerative feedback.
 4. Control System & Components: Construction and operation of D.C and A.C Servomotor, Potentiometers, Synchros, Tacho generators, Amplidyne; A.C. and D.C. Position control System.
 5. Time Domain Analysis: Standard test Systems; Time response of first order systems; Time response of second order systems; steady state error and error constants effects of adding to a system; Design Specification of second order system; Design Considerations of higher order systems; performance indices.
 6. Frequency Domain Analysis: Correlation between time and frequency response; Polar plots; Bode plots; All pass and minimum Phase Systems; log magnitude versus phase plots, Phase margin and Gain margin.
 7. Stability and Frequency Domain Analysis: Concept of stability, Necessary Conditions for stability, Harwitz stability Critarion; Routh stability criterion; Nyquist stability Critarion; Relative stability closed loop
Frequency response performance; Specification and their determination using frequency response plots, Compensation Techniques, Phase lead, Phase lag and lag-lead compensation, Cascade and Feedback compensation.
 8. Roots Locus Technique: Concept of root Locus; Construction rules, root contours.
- * Termwork and labwork shall be based on above theory.
- * **BOOKS:**
1. Control System Engineering by Nagrath & Gopal Wiley Eastern Ltd.
 2. Automatic Control System by B.C. kuo
 3. Modern Control Engineering by K.Ogata

NORTH GUJARAT UNIVERSITY
B.E. SECOND YEAR, SEMESTER IV (ELECTRICAL)
EE405: ELECTRICAL POWER-II

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	25	25	150

SYLLABUS

1. **SHORT AND MEDIUM TRANSMISSION LINES:** Transmission line constants, calculations of line parameters, simple arrangement and multi Ckt. line, symmetrical and unsymmetrical spacing, gmd, gmr of ms conductor, bundle conductor, transposition, Ferranti effect, skin effect, effect of earth on line capacitance.
2. **LINE PERFORMANCES:** Effect of Capacitance's, Charging Currents, calculations by nominal T and n methods, regulations and efficiency.
3. **LONG TRANSMISSION LINE:** Regulation and efficiency, calculation by rigorous solutions, equivalent Ckt. using generalized constants improve line performances using synchronous condenser, series and parallel compensation, corona calculations,
4. **CIRCLE DIAGRAM:** Sending end, receiving end and universals circle diagrams.
5. **SYSTEM MODELING:** P.U system and its merits and demerits, One-line diagram, equivalent P.U representation of given system.
6. **SYMMETRICAL FAULT ANALYSIS:** Transient on Transmission line, Short circuit of an unloaded and loaded synchronous machine, Reactance of a synchronous machine, Bus impedance matrix, Algorithm for short circuit studies.
7. **SYMMETRICAL COMPONENTS:** Symmetrical components, Transformation, Phase shift in star-delta transformers, sequence impedance of power system components, Sequence network of a power system.
8. **UNSYMMETRICAL FAULT ANALYSIS:** Symmetrical component analysis of unsymmetrical faults like L-G, L-L, and L-L-G. Bus impedance matrix method.

* Termwork and Lab work shall be based on above theory.

* Books:

- 1) Electrical Power by S.L.Uppal
- 2) Electrical Power system Analysis by Stevenson.
- 3) Electrical Power by V.K.Mehta
- 4) Electrical Power by Soni, Gupta and Bhatnagar.
- 5) Electrical Power by C.L.Wadhwa.

NORTH GUJARAT UNIVERSITY.
B.E.SECOND Year, SEMESTER IVth (MECHANICAL)
ME405: ELECTRICAL TECHNOLOGY-II

Teaching Scheme			Examination Scheme					
Theory Hrs.	Tut Hrs.	Pract Hrs	Theory Hrs	Theory Marks	Sessional Marks	Pra/Oral Marks	Term work Marks	Total
4	--	2	3	100	--	25	25	100

1. Economics of power: Load curves and other related factors, Cost of generation, Depreciation, Load duration curves Different types of tariffs, Different types of distribution systems, Causes and effects of low power factor, Methods of improving power factor.
2. Switchgear and Protection: HRC fuse, Circuit breaker- construction, working principle and types, Relaying scheme, Classification of relays.
3. Drives: Fundamental of Electric Drive dynamics, group and individual drive, Characteristics of Electric Drives, Electrical characteristics of D.C. motors, Induction motors and Synchronous motors, Braking of D.C. motors, Induction motors and Synchronous motors,
4. Speed Control of Electric Drive: Basic parameters, speed control of D.C. motors, application of rotating amplifiers for speed stabilization and control, speed control of induction motors.
5. Heating of Electric Motor and Selection of their Rating: Heating and cooling of electric motors, Temperature rise of electric motors, service conditions for electric drives, Types of duty for electric drives, Load equalization, calculation for fly wheel, motors for particular application, electric propulsion in ship, Applications of 3 phase A.C. Commutator motors for special purpose drives, Tacho generator.
6. Substations: Classification of sub station, capacity and number of transformers, arrangement of sub station, primary distribution circuit, insulation testing of sub station, equipment and earthing of Equipments.
7. Motor control: Electronics control of D.C. and A.C. motors.
8. Digital circuits: Transistor as a switch, logic gates (AND, OR, NOT, NOR, NAND gates), Flip-flops, registers, Counters.
9. Heating and Welding: Electric heating and its advantages, Induction and dielectric heating, High frequency heating, Resistance welding, Basic concepts, Different types of resistance welding, timing circuits for complete operation cycle control (Sequence, Weld, Hold, off time interval).
10. Ultrasonic and Transducers: Generation of ultrasonic waves, Types of generation, Application of US waves in communication, material testing, flow detection, study of structure of matters, fatigue detection, Resonance detector, cutting and machining, Separation, degreasing of liquids, Physic, thermal and biological effects, Application in soldering, welding and drying, Measurement of non-electrical quantities like Elongation, displacement, force, pressure, temperature, radioactivity, Light etc.

√ Lab work and term work shall be based upon above theory.

√ **BOOKS**

1. Electrical Power by S.L.Uppal
2. Electrical measurement and Measuring Instruments By Shawhney.
3. A Course in Electrical Power by Soni, Gupta and Bhatnagar.
4. Industrial electronics By G.K.Mithal.
5. Principle of power system by V.K.MEHTA.

NORTH GUJARAT UNIVERSITY
B.E. THIRD YEAR, SEMESTER V (ELECTRICAL)
EE501: BUSINESS ORGANISATION AND PROJECT PLANNING

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	--	3	100	--	--	100

SYLLABUS

1. National income, Economic planning and public finance.
2. Organisation: Concept, Principles, Line and staff functions, Organisation structure and its importance, system concepts of organisation.
3. Management concept and function: Concept and functions - planning, Organizing, Directing, Coordinating, Controlling, Motivating, Principle of measurement, Traditional v/s modern management, Approaches, Decision making, Delegation.
4. Productivity and its Techniques: Concepts, Gains of productivity, Productivity and economic development, Role of management in promotion of productivity, Selected productivity techniques, Work study, Time study & Work management, Quality control, CPM and PERT
5. Personnel Management: Personnel function, Manpower assessment, Recruitment training and development, Wages and salaries, Participative management, Performance appraisal and counseling, Discipline improvement, Grievance handling, Union - management, Industrial relation, Trade unionism in India.
6. Human side of management: Understanding of human Behaviour, Group dynamics, Interpersonal Behaviour, Motivation, Communication, Leadership
7. Financial Management: Financial management and quantitative techniques, Management accounting, Breakeven analysis, Preparation & analysis of balance sheet, Capital budgeting, Cost accounting, Cost and budgetary contract.
8. Marketing Management: Introduction to marketing management concepts & approach, Product development & diversification, Industrial marketing.

*** BOOKS:**

1. Management Analysis Concepts and Causes, by Massie (PHI)
2. Personnel Management by R.S.Davar
3. Economics Theory by Devet & Verma
4. Business Organisation and Management by Shukla.

NORTH GUJARAT UNIVERSITY
B.E. SECOND YEAR, SEMESTER V (ELECTRICAL)
EE502: ENGINEERING ELECTROMAGNETICS

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	--	3	100	--	--	100

SYLLABUS

1. Vector Analysis: Scalars & vectors, Dot & cross products, Co-ordinate systems & conversions.
2. Coulomb's Law & Electric Field Intensity: Coulomb's law, Fields due to different charge distributions
3. Electric Flux Intensity, Gauss's Law and Divergence: Concept of electric flux density, Gauss's law & its application, Differential volume element, Divergence, Maxwell's first eqn. & divergence theorem.
4. Energy & Potential: Energy expended in moving a point charge in electrical field, Line integral, Definition of potential difference & potential, Potential field of a point charge & system of charges, Potential gradient, Dipole, Potential density in electrostatic field.
5. Conductors, Di-electric & Capacitance: Definition of currents & current density, Continuity eqn., Metallic conductors & their properties, Semi conductors, Dielectric materials, Characteristics, Boundary conditions, Capacitance of a parallel plate capacitor, Coaxial cable & spherical capacitor.
6. Poisson's & Laplace Equation: Poisson & Laplace's eqn., Uniqueness theorem, Examples of solutions of Laplace & Poisson eqn.
7. Steady Magnetic Field: Bio-sawert law, Ampere's circular law, Concept of curl, Stoke's theorem, Definition of magnetic flux & magnetic flux density, Scalar & vector magnetic potential.
8. Magnetic Forces, Materials & Inductance: Force on a moving charge, Force on a differential current element, Force and torque on a close circuit, Magnetization and permeability, Magnetic boundary condition, Magnetic circuit inductance & mutual inductance.
9. Time Varying Field Maxwell's Equation: Faraday's law, Displacement current, Maxwell eqn. in point & integral form.
10. The Uniform Plane Waves: Wave motion in free space, Perfect dielectric, Lossy dielectric pointing vector, Power consideration, Propagation in good conduction, Phenomena of skin effect, Reflection of uniform plane waves.

- * **BOOKS:** 1) Engineering Electromagnetics-William Hayt Jr.-V edition, Mcgraw Hill
 2) Electromagnetics-john d. Kraus-III edition, McGraw Hill
 3) Electromagnetic concepts & application-Stanley Marshall & Gabriel G. Skitek, IIIrd
 4) Elements of Engg.Electromagnetics by N.Narayarao

NORTH GUJARAT UNIVERSITY
B.E. THIRD YEAR, SEMESTER V (ELECTRICAL)
EE503: INTEGRATED ELECTRONICS

Teaching Scheme		Examination Scheme			
Theory	Pract	Theory Marks	Pract	T.W	Total
4	2	100	25	25	150

SYLLABUS

1. Operational Amplifiers: Introduction, Block diagram representation of a typical Op-Amp, Analysis of Op-Amp C circuits, Types, Pin configuration and power supplies, Nomenclature used.

2. Ideal Op-Amp: Equivalent circuit, Open loop op-Amp configuration, Inverting and non-Inverting amplifiers, Differentiating amplifiers, Feedback amplifiers, Closed loop gain in Inverting and non-Inverting modes, Differential amplifier with one, two and three Op-Amps.

3. Op-Amp parameters: Offset voltage and currents, Bias current, Drift, PSRR, CMRR offset null, Methods for making offset null.

AC performance: Bandwidth, Slewrate and Frequency response.

5. Op-Amp applications: DC and AC amplifiers, Peaking, Summing, Scaling and Averaging amplifiers, Instrumentation amplifiers, Differential input and output amplifier, V to I and I to V converters, Integrator, Differentiator, Comparator, Non-linear amplifier, Phase-shift Oscillator, Wien bridge oscillator, Square, Triangle and Saw tooth Wave generator, Voltage controlled oscillator, Zero crossing detector, Window detector and introduction to analog computers.

6. Timer IC: 555 Timer IC, Pin diagram and configuration, Internal block diagram, Multi vibrators and industrial application of 555.

7. Voltage Regulator and power amplifier IC: Three terminal regulator ICs, Basic block schematic 78XX and 79XX series voltage regulators, Adjustable output voltage regulator like LM317, LM340 and LM337 series power supply ICs, Their use and basic design consideration for designing regulated power supply, Power amplifier IC LM380.

8. Transistor oscillators and multivibrator: Effect of positive feedback, RC phase shift and Wien bridge oscillator, transistor as a switch, transistor as a multivibrator. (Astable, bistable and monostable).

9. Feedback amplifiers: Concept of feedback, Voltage and current shunt and series feedback amplifiers.

* Books:

- 1) Op-Amp and Linear integrated circuits By R.A.Gayakwad.
- 2) Op-Amp and Linear Integrated circuits By Robert. F. Conglin PHI.
- 3) Application of Analog Integrated circuits By Sidney Soclof PHI.
- 4) Integrated Electronics By Millman and Halkias.

NORTH GUJARAT UNIVERSITY.
B.E. THIRD YEAR, SEMESTER V (ELECTRICAL)
EE504 : ELECTRICAL MACHINE DESIGN-I

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	4	4	100	50	50	200

SYLLABUS

1. Starters: Necessity of Starter, Types of Starters for A.C and D.C Motors, Their Merits and Demerits, Construction and design of starter, Calculation of Nos. of Steps and Resistance.
2. Field regulators: Use of Field Regulators, Construction and Design of Field Regulators.
3. Inductance coils: Construction and Design future.
4. Transformer: Design of core, coil, insulation, tank, cooling system etc. Analytical evolution of various parameter from design data, Design of Small Transformers.
5. Relays: Relay design
6. Magnetic Clutches and Electromagnets: Their use as a Lifting Magnet, Design of Meanest and Clutches, Lifting Power of A Magnet.
7. Commentators: Their use, construction and Design Future.
8. Heating elements: Characteristic of metal used for heating elements, Design of heating elements.
9. Modern Armature: Construction and Winding Technique for Domestic motors, Universal motors, Fan and Toy motors.

* Termwork and Lab work shall be based on above theory.

* Book:

1. Electrical machine design By A K Sawhney
2. Electrical machine design manual By M G Say

* Reference Book:

1. Modern armature construction By Phillot
2. Electromagnetic device By Harbert Roters INDIA

NORTH GUJARAT UNIVERSITY.
B.E. THIRD YEAR, SEMESTER V (ELECTRICAL)
EE505: COMPUTER PROGRAMMING

Theory	Pract	Theory Marks	Pract	T.W	Total
4	4	100	50	50	200

SYLLABUS

A) PROGRAMMING IN "C" LANGUAGE.

1. Introduction
2. General program structure, console I/O, Constant and variable, Operators.
3. Control constructs, Functions and macros, Arrays and strings, Pointers.
4. Structures and union, File I/O preprocessors, Directive library functions.
5. Introduction to c++ and Object oriented Programming.

B) PROGRAMMING IN FORTRAN

1. Introduction
2. General program structure, input/output in Fortran, General Syntax and Errors, Constant and variable, Arithmetic and Logical Operators.
3. Branching and looping statements, Conditional and Unconditional Jumps, Format statements, Subscripted Variable, Subroutines subprogram.
4. File handling in Fortran, Creating, Editing, Linking and Execution of Fortune Programs.

C) NUMERICAL METHODS

1. Interactive methods for solution of nonlinear equations
2. Solution of simultaneous eqn.
3. Differentiation and integration
5. Solution for differential equation.

*** BOOKS:**

1. ANSI C with MICROSOFT C 5.1 and QUICK 2.0, BY Balasubramanian
2. Programming in C by Balaguruswamy.
3. Programming in Fortran 77 By K.D.Sharma.
4. Computer oriented Numerical Methods, by V.Rajaraman PHI

NORTH GUJARAT UNIVERSITY.
B.E. THIRD YEAR, SEMESTER VI (ELECTRICAL)
EE601: ELECTRICAL MACHINE-III

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	4	3	100	50	50	200

SYLLABUS

1. Transformers: Various connections like Scott, Star-Delta, Star-Star, Delta-Star, Delta-Delta etc., Their Merits and Demerits, Parallel operation of Transformer, Conditions to be Satisfied For satisfactory parallel operation, Auto transformer, Voltage controls, Transients Behaviour of Transformer, On-load and Off-load tap changers, Sumpner's Test, Efficiency Calculation, parallel operation.

2 3-Phase Induction Motors : Principal of operation, Equivalent circuit and its solution, Torque-slip characteristics, Circle diagrams, various types of harmonics, Effect of harmonics on Motor operation, High torque cage motors, Unbalance operation of Induction motor.

3 Single phase Induction motor : Double field revolving theory, Equivalent circuit, Experimental determination of motor parameters, Method of starting, Repulsion motor, commutator motors, Circle diagram and performance from circle diagram including torque-slip curve.

4 Voltage Regulators: 3-Phase and 1-Phase Induction Regulators, Their construction and Operating Principle, Storage motor.

* Termwork and Lab work shall be based on above theory.

* Books :

1. Theory performance & design of A.C. machines by M.G.Say
2. Electrical Machines vol I&II BY Kostonko
3. Electrical Machines By Dr. Bhimbhra
4. Electrical Machines By Nagrath and Kothari

NORTH GUJARAT UNIVERSITY.
B.E. THIRD YEAR, SEMESTER VI (ELECTRICAL)
EE602 : POWER ELECTRONICS AND INSTRUMENTATION

Teaching Scheme

Examination Scheme

Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	25	25	150

SYLLABUS

1. Optoelectronic Devices: Photo diodes, Phototransistors, Photoconductive and photo voltaic cells, LEDS, LCDS, Lasers, Seven-segment display and applications.

2. Thyristor: Construction, working principle and operation characteristics, Turn on and Turn off methods, Two transistor analogy, Series and parallel operation, di/dt and dv/dt calculation, Snubber circuit and its design, Phase control of SCR using UJT, Ratings, Protection ckts, DIAC and TRIAC construction and characteristic, Phase control of TRIC using DIAC.

3. Polyphase Rectifiers: Analysis and performance of single phase and three phase halfwave and fullwave rectifiers with resistive and inductive load, M phase rectifier ckts, Free wheeling diode, Relation using diodes and controlled rectifiers, Zero voltage switching.

4. Thyristor Voltage choppers Jone's chopper for DC motor drive, Morgan's chopper, Operation and design of John's commutation circuit.

5. Single phase and Three phase line commutated inverters: Parallel capacitor commutated inverter circuit, Their analysis, PWH inverters, Mc Murray inverters, its operation and design, Commutation methods and design of commutation principle of cycloconverters.

6. Speed control of DC motors: By armature control, VDR method, Satiabre reactor method, chopper speed control, Thyristor DC motor starters.

7. Speed control of AC motors: Variable voltage and frequency control, Power recovery control, Chopper control of rotor circuit of slip ring IM, Comparison of AC and DC drives and their choice.

8. Transducers: Their Principles, General characteristics, Strain gauge transducer, Load cells, force, weight and torque measurements, Piezoelectric transducers, Measurement of displacement, pressure, flow and level measurement, Temperature measurement, Thermocouples and Thermister.

9. Recorders: X-Y strips chart, Circular type graphic recorder, indicating, recording and controlling instruments, multichannel recorders.

10. Electric welding: Welding Equipments and their electronic control Timing circuit.

* Termwork and Lab work shall be based on above theory.

* BOOKS: 1. Industrial Electronics by G.K.Mithal
 2. Electronics in Industry by Chute & Chute
 3. Thyristor and Application by M.R.Ramamoorthy
 4. Electric Instrumentation by H.S.Kalsi.

NORTH GUJARAT UNIVERSITY.
B.E. THIRD YEAR, SEMESTER VI (ELECTRICAL)
EE603: ELECTRICAL ESTIMATING COSTING AND APPLIANCES

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	25	25	150

SYLLABUS

1. Wires: Gauge (size) measurement, standard wire, types and joints, wiring system and its types, Electrical shock and shock treatment.
 2. General specification: Generator set, switches and O.C.B, LT OCB, HT with HRC fuses, ring main switches, feeder panels, transformers, OH lines, poles, insulators, stay wires, ACSR, GI wire, Specification for internal wiring, fuse board, distribution board, energy meter, fuse wire, socket outlets, main switch, HT/LT underground cables.
 3. Estimation and calculation for internal wiring, HT, LT., OH and UG lines: Estimating, pricing, labor rates, conductor size, current capacity, voltage drop, minimum size, conductor size for domestic wiring and exercise. Underground and overhead lines, estimation for internal wiring.
Procedure and points, exercise types of industrial wiring, exercise, service lines, IER rule-58, 77, and 79, overhead service mains.
 4. Estimation for 11 kV feeder and substation.
 5. Extracts from Indian Electricity (amended) Rules-1972.
 6. Electrical Appliances: Home appliances like Fan, Geyser, Water and Room heater, Toaster, Iron, Bulb and Fluorescent tube lights etc, Their construction, working and wiring diagram, Faults, causes and remedies in home appliances.
- * Termwork and Lab work shall be based on above theory.
- * Books:
1. Electrical estimating and costing By Uppal.
 2. Electrical Appliances by K.B.Bhatia.

NORTH GUJARAT UNIVERSITY.
B.E. THIRD YEAR, SEMESTER VI (ELECTRICAL)
EE604: BASIC MICROPROCESSOR AND DIGITAL ELECTRONICS

Teaching Scheme Examination Scheme

Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	25	25	150

SYLLABUS

1. Microprocessor Architecture & Microcomputer Systems: Microprocessor architecture & its operation, Memory, Input/output interfacing devices.
2. Architecture: Instruction set & timing diagrams of 8085 microprocessor, 8085 architecture, Instruction classification of 8085, and Instruction timing & operation status.
3. Assemble Language Programming of 8085: Programming techniques, Concepts, Timing delays stack & subroutines, Code conversions.
4. Parallel Input/output and Interfacing: Basic interface concepts, Interfacing input & output devices like keyboard & display, Memory mapped I/O, Interfacing memory.
5. Interrupts: 8085 interrupts, Restart as software instructions, Study of programmable interrupt controllers 8259.
6. Programmable Peripheral Interface: 8255 programmable peripheral interface, Interface of A/D converter with microprocessors, 8253 programmable interrupt timer, and 8279 keyboard & display controllers.
7. Number Systems & Codes: Binary, Octal hex number systems, Signed numbers, Codes, Error codes.
8. Boolean Algebra & Logic Gates: Basic theorems & properties of Boolean algebra, Boolean functions, Canonical & standard forms, Digital logic gates, Simplification of Boolean functions, Karnaugh map & tabulation methods.
9. Combinational Ckt Design: Adders, Subtractors, Parallel adder, Decimal adder, Magnitude comparator, Decoders, Multiplexers, Code conversions.
10. Sequential Ckt Logic Design: Flip flop, Analysis of clocked sequential ckts, State reduction and assignment, Excitation tables, and Shift registers, Ripple and synchronous counters.

* Termwork and Lab work shall be based on above theory.

* BOOKS:

1. Microprocessor Architecture, Programming and Applications - R.S.Gaonker - Willey eastern Ltd.
2. Microprocessor principles and Application-Ajit pal TMH publishing co.ltd.
3. Fundamentals of microprocessors and microcomputers By Dr.Badri Ram Dhanpatrai & sons
4. Introduction to microprocessor-A.P.Mathur-TMH Publications
5. Digital logic & comuter design-Morris Mano-PHI
6. Modern digital Electronics-R.P.Jain-TMH Publication

NORTH GUJARAT UNIVERSITY.
B.E. THIRD YEAR, SEMESTER VI (ELECTRICAL)
EE605: ENERGY CONSERVATION AND RENEWABLE ENERGY SOURCES

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	--	3	100	--	--	100

SYLLABUS

1. Energy situation: Non-conventional renewable energy sources, Potential of renewable energy sources.
 2. Solar radiation, Terrestrial solar radiation, Radiation balance, generalized transmission scattering by atmosphere, Absorption of solar radiation, Direct solar radiation.
 3. Low temperature solar radiation collector, Flat plate collectors, Optical characteristic of the absorber and cover, HWB collector model, Low temperature application of solar energy, solar swimming system, solar drying, basic drying parameters, Design calculation of solar drier, solar heat pump, solar refrigeration and air-conditioning.
 4. Solar thermal generation.
 5. Photovoltaic energy conservation.
 6. Wind energy, tidal and ocean thermal energy conversion, Geothermal energy conversion.
 7. Energy conservation: Energy audit approaches at unit level, industrial engineering approaches for energy conservation, such as P.F improvements, power factor controller, selection of electrical drives and their ratings, high efficiency motors, voltage regulation, maintenance and lubrication of drives, vibration, reduction in transmission and distribution, lightning system with good design, illumination systems, efficient electrical drives for fans, pumps, compressors and Refrigeration system, domestic and industrial load shedding.
 8. Use of computers in energy audit, calculation and costing, project cost evaluation by ROI, Payback terms, energy balance and organisation for energy management, conservation measures and diagnostic review.
 9. Visit to conventional, non-conventional power station, visit of industry.
- * Termwork and Lab work shall be based on above theory.
- * Books:
1. Renewable energy sources and conservation technology By N.K.Bansal, Kleemann and Meliss.

NORTH GUJARAT UNIVERSITY.
B.E. FOURTH YEAR, SEMESTER VII (ELECTRICAL)
EE701: ELECTRICAL MACHINE - IV

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	4	3	100	50	50	200

SYLLABUS

1. D.C Machines: Special Machines like amplidyne, metadyne, balancers, boosters, welding machines, Brake test, Swinburne's test, Hopkinson test, Regenerative Hopkinson Test, Field's test, Retardation test, Separation of losses.

2. Alternator: Types of alternator, Construction, EMF equation, Harmonics, armature reaction in cylindrical and salient pole machines, Two reaction theory, Equivalent circuit of cylindrical and salient pole machines, Condition for maximum power, Synchronizing of alternator and distribution of load, Infinite Bus Behaviour, Synchronizing power and torque, determination of voltage regulation by different methods, Short circuit behaviors.

3. Synchronous motor: Principle of reversibility, Voltage equation, Phasor diagram, Electrical and mechanical power equation, 'V' curves and 'O' curves, Power flow equation, Synchronous Condensers, 3-Phase Synchronous, Induction Motor, Starting and Circle diagram.

* Termwork and Lab work shall be based on above theory.

* Books:

1. Theory performance & design of A.C. machines by M.G.Say
2. Theory performance & design of D.C. machines by Clayton
3. Electrical Machines By Dr. Bhimbhra
4. Electrical Machines By Nagrath and Kothari
5. A.C machines By Kostenko

NORTH GUJARAT UNIVERSITY.
B.E. FOURTH YEAR, SEMESTER VII (ELECTRICAL)
EE702: ELECTRICAL POWER UTILISATION

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	--	3	100	--	--	100

SYLLABUS

1. Economic aspect: Tariffs of Different type, Indian conditions, Energy Cost reduction, Power Factor Improvement, Economic choice of equipment, Causes and Remedies for Low power factor.
2. Heating and Welding: Principle and theory of induction heating, Effect of frequency, Applications and merits of induction heating, Principle and theory of dielectric heating, Electrodes used, Methods of coupling of electrodes to R.F. generator thermal losses in dielectric heating and application, Resistance Welding, Types of welding, Energy storage welding.
3. Electrolysis: Law of Electrolysis, Its application in Metal Extrusion and in Chemical Industry, Power requirement for Electrolysis and Efficiency.
4. Illumination: Terms and Definition, Flood and Factory Lighting, Layouts, and their design features, Photometry, Polar curves and their Application, Different types of Illumination Fittings, Types of Lamps, Discharge Lamps, Mercury vapor lamp, Sodium lamp, Fluorescent lamp.
5. Electric Drive: Concept of Electric Drive, Comparison of electric drive with other drives and their merits and demerits, Load Characteristics, Starting and Running Characteristics, Speed control, starting, Electric breaking, Mechanical features, Rating & Service capacity, Load equalization, automatic electric drive, Particular application of electric drive, Typical controls, Servo drive and their applications.
6. Electric Traction : System in India, Comparison of Different system and their merits and demerits, Speed Time curves and analysis, Specific energy consumption, Mechanics of train motion, Power supply for traction motors, Traction motor and their characteristics, Control of traction motor and control Equipments, Transmission system, Traction equipment and accessories.

* Book :

Utilization of Electric power by O.P Taylor

Electrical Power by S.L.Uppal

Utilization of Electric energy by Garg and Girdhar

Electrical Power by Soni, Gupta and Bhatnagar.

NORTH GUJARAT UNIVERSITY.
B.E. FOURTH YEAR, SEMESTER VII (ELECTRICAL)
EE703 : ELECTRICAL POWER SYSTEM DESIGN

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	50	50	200

SYLLABUS

1. Transmission Line Design: Electrical and Mechanical Design of Transmission Lines, Selection of Voltage, Checking design from the constraints like Voltage regulation, Surge Impedance Loading, Corona Loss, Loss, Efficiency of Line, Calculation of Tower size, Calculation of sag, Insulation Coordination, Radio Interference, Crossing of Lines, Transmission line Equipments.
2. Design of Distribution System: Types of Distributor, Selection of different parameters and their effect on distribution of power, Primary and Secondary Distributor Design, Method to Improve Voltage regulation of a Feeder, Use of Double circuit line, boosters etc.
3. Sub-Station: Types of Sub-station and their layouts.
4. HVDC Transmission: Concept of HVDC, Merits and Demerits of HVDC Lines, Equipment and layout of HVDC Sub-station.
5. Rural Electrification: Demand of power, Forecasting of load in rural area, Steps for Electrifying Rural areas, Hurdles in Electrifying rural areas.
6. Town and industrial Electrification: Load determination, Forecasting, planning for meeting load requirements, Underground Distribution.
7. Design of EHV Lines.

* Termwork and Lab work shall be based on above theory.

* Books:

1. Elements Of Electrical Power System Design by M. V. Deshpande
2. Modern power systems By Nagrath.
3. Electrical power By Soni, Gupta and Bhatnagar.
4. Electrical power By S.L.Uppal.

NORTH GUJARAT UNIVERSITY.
B.E. FOURTH YEAR, SEMESTER VII (ELECTRICAL)
EE704: SWITCHGEAR AND PROTECTIVE DEVICES

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	50	50	200

SYLLABUS
SWITCHGEAR

General Principle of Arc Formation and extinction, Arc Control Devices.

2. Circuit Breakers : Circuit breaker rating, Circuit constants and circuit condition, Restriking voltage, Automatic switching, Air break, Bulk Oil, minimum oil, Air blast, SF₆, Vacuum and DC CB, Comparative merits and demerits of different circuit breakers, Auto re closing, Metal Clad switchgear, Testing and Maintenance of switchgear equipment.

PROTECTION

3. Introduction : Requirement of protective system, Primary and auxiliary protection, Essential requirement of protective system, Basic terminology and methods of discrimination.

4. Operating principles and constructional features of electromagnetic relays : Classification of relay, Principle, Types of electromagnetic relays, Induction relay, Torque, Induction relay.

5. Relay application and characteristics : General equation of electromagnetic relays, Over current relay, Instantaneous over current relay, Plug setting and time multiplier settings, Directional relays, Differential relays, Distance relay etc and their application.

6. Apparatus protection scheme : Generator protection, Motor protection, Line protection, Transformer protection, Feeder protection, Bus zone protection, Carrier protection.

7. Testing and maintenance of protective gear : Classification of relay testing, General method of testing, Protective gear, CT and PT test.

8. General principle of static relay : Introduction, Application and their future prospectus, Microprocessor based relay.

9. Visit to Power station and sub-station to show the actual Equipments used in the field and their operation.

* Termwork and Lab work shall be based on above theory.

* Books :

- 1) Protection & Switchgear by Ravindranath Chandar
- 2) Switch Gear and Protection by S.S.Rao
- 3) Art and Science of Protective relaying By Masson.

NORTH GUJARAT UNIVERSITY.
B.E. FOURTH YEAR, SEMESTER VII (ELECTRICAL)
EE705 : ELECTIVE - I (HIGH VOLTAGE)

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	50	50	200

SYLLABUS

1. Breakdown mechanism of Gases : Townsend breakdown characteristic, Gas discharge characteristics, Townsend's criterion of breakdown, Streamer theory of breakdown, Corona, Paschein's law.
2. Breakdown mechanism of Liquids : Various liquid dielectrics, Reconditioning of dielectric oil, Theories for conduction and breakdown for commercial oil.
3. Breakdown mechanism of Solids : Intrinsic breakdown, Electromechanical breakdown, Thermal breakdown, Erosion breakdown, Electromechanical breakdown, Treeing and tracking, Internal discharge, Various solid dielectrics.
4. Generation of high voltage : High voltage DC and AC generation at power frequency and at high frequency, Impulse voltage generation.
5. Measurement : Measurement of HVAC, HVDC and Impulse voltages.
6. Testing : Non destructive testing, Three electrode system for Solid and Liquid dielectric testing, Measurement of Insulation resistance, Dielectric constant by Schering's bridge, Earthing and Shielding, Partial discharge measurement, R.F measurement, Destructive testing of insulators, Impulse testing of Bushings, Cables, Transformers, CBs and LA.

* Termwork and Lab work shall be based on above theory.

* Book :

- 1) High Voltage Engineering by N.P. Chourasia
- 2) High Voltage Engineering by R.S. Jha
- 3) Extra high voltage AC transmission Engineering By R.K.Begamudre.
- 4) Electrical Measurement and Measuring Instruments By Golding.E.W.

NORTH GUJARAT UNIVERSITY.
B.E. FOURTH YEAR, SEMESTER VII (ELECTRICAL)
EE705 : ELECTIVE - I (MICRO PROCESSOR BASIC ENGINEERING)

Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	50	50	200

SYLLABUS

1. 8086 FAMILY ASSEMBLY LANGUAGE PROGRAMMING : Introduction, Objectives, Program development steps, Constructing the machine codes for 8086 instructions, Writing programs for use with an assembler, Assembly language programs development tools.

2. PROGRAMMING TECHNIQUES LOOPS, PROCEDURS, MACROS, INSTRUCTION & ASSEMBLER DIRECTIVES : Simple sequence programs, Flags jumps & WHILE-DO implementation, REPEAT-UNTIL implementation & examples, Debugging assembly language programs, IF-THEN, IF-THEN-ELSE, and multiple IF-THEN-ELSE programs, Writing & using procedures, Writing and using assembler macros, Instruction descriptions, Assembler directives.

3. 8086 SYSTEM CONNECTIONS, TIMING & TROUBLE SHOOTING : 8086 hardware review, Addressing memory & ports in microcomputers systems, 8086 timing parameters, Trouble shooting simple 8086 based microcomputer.

* Termwork and Lab work shall be based on above theory.

* Books :-

- 1) Microprocessor Programming and Interfacing (8086) By D.Hall
- 2) Microprocessor Interfacing By Liu and Gibson
- 3) Assembly language programming 8086 -Norton.

NORTH GUJARAT UNIVERSITY
B.E. FOURTH YEAR, SEMESTER VII (ELECTRICAL)
EE706 : PRE-PROJECT WORKS

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
--	2	--	--	50	50	100

SYLLABUS

Students will select the subject and prepare guidelines for their project work based upon following topics:

1. Literature survey/ Design/ Fabrication/ Testing/ Evaluation of an Electronic Subsystem.
2. Repairing & Preparation of maintenance chart/ Fault banding procedure for existing Electronic Equipments.
3. Software development work related to analysis/ synthesis/ design for selected advance topics in electrical engineering.
4. Student shall have to participate in seminar on their respective topics.

NORTH GUJARAT UNIVERSITY
B.E. FOURTH YEAR, SEMESTER VIII (ELECTRICAL)
EE801 : ELECTRICAL MACHINE DESIGN-II

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	4	4	100	50	50	200

SYLLABUS

1. D.C. Machines : Design of poles, Field windings, Inter poles, compole winding, Commutator, brushgear etc. Performance Prediction.
 2. Induction Motor : Design of main dimension, stator winding, airgap etc, Analytical evolution of various parameter from design data.
 3. Synchronous Machines : Design of main Dimension, Slot, Armature Winding, Field Poles etc., Analytical evolution of various parameter from design data.
- * Termwork and Lab work shall be based on above theory.
- * Books :
- 1) Performance and Design of AC Machines by M.G.Say
 - 2) Performance and Design of DC Machines by Clayton
 - 3) Electrical Machine Design by A.K.Sawhney.

NORTH GUJARAT UNIVERSITY
B.E. FOURTH YEAR, SEMESTER VIII (ELECTRICAL)
EE802 : COMMISSIONING OF ELECTRICAL EQUIPMENTS

Teaching Scheme			Examination Scheme			
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	50	50	200

SYLLABUS

1. Preparation of alternator prior to putting into commercial service : Preparation and drying out of alternator winding, IR measurement, HV test, Measurement of temperature of winding, Alternator protective gear test, Earth leakage protection, Phase sequence and synchronizing, Starting time and pick up of load, Neutral point earthing.

2. Parallel operation of alternator : Load sharing, Voltage control, PF control, Frequency control, Interconnection.

3. Alternator troubles : Instability and loss of field, Alternator instability, Heating and cooling of windings, Wear and Troubles of slipping, bearings, Unbalance rotor and transient torque.

4. Commissioning of AC motor : Insulation test, Air gapes, bearings, Preliminary running, starting and speed control, Induction motor rotor and stator interaction, Balance and vibration, Ventilation and cooling, Starters, Synchronous motor, AC motor troubles, Insulation failure due to transient over voltage, Low starting torque, Pull out and Stalling torque, Low PF, Excessive slip, Crawling, Single phasing, Unbalance operation of AC motors.

5. Commissioning of Transformers : Insulation resistance and HV test of transformer winding, Conditioning of coil insulation and oil, Drying out of transformers, Connection and Phasing groups, Cooling and Rating, Temperature measurement and protection, Parallel operation of transformers, Correct pairing of transformer, Transformer troubles, Instrumentation transformers their rating, testing, terms related and troubles.

6. Commissioning of DC generator : Voltage buildup, Parallel operation, Voltage regulation, Commutation problem, Troubles.

7. DC motors : Factors affecting speed control, torque, breaking.

8. Commissioning of Circuit breakers : Fire protection, Oil and compound filling, Insulation resistance, HV test, Mechanical operation and adjustment, Relay tests, Preliminary operational tests of CB, Short circuit, Rating, Time for fault clearing.

9. Industrial visit should be arranged to enhance the practical knowledge.

* Termwork and Lab work shall be based on above the

* Books

1) Commissioning of Electrical Plants and Associated problems by Richardson.

2) Commissioning of Electrical Equipments by S.Rao

NORTH GUJARAT UNIVERSITY
B.E. FOURTH YEAR, SEMESTER VIII (ELECTRICAL)
EE803 : INTER CONNECTED POWER SYSTEM

Teaching Scheme Examination Scheme

Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	50	50	200

SYLLABUS

1. General system modeling : Per unit system, Power transfer through Line, Universal circle diagram, MVAR control, Voltage control methods.
2. Load flow study : Introduction, Network model formulation, Formation of bus admittance matrix, Load flow problem, Load flow solution, Different methods for that and their comparison.
3. Economic operation of power system : Economic operation of generators with in the plant, Transmission losses as a function of plant generation, Economic distribution of load between plants, Co-ordinating transmission losses, Krone's method for evaluating loss co-efficient, Penalty factor, Algorithm of different scheme, Automatic Load dispatching.
4. Load frequency control : Introduction, Single area control of frequency, Modeling of turbine governor, turbine and generator, Steady state analysis, Principle of frequency control, Flat and selective frequency, Tie line control methods.
5. Power System stability : Stability problem, Classification, Power angle characteristics, Steady state and transient stability and their limits.
6. Dynamics of Synchronous Machine and swing equation : Effect of saliency and Saturation, Control of power flow, Synchronizing power co-efficient, Equal area criterion and its application to determine stability in different situation, Critical clearing time and angle, Swing equation and its numerical solution.

* Termwork and Lab work shall be based on above theory.

* Books:

- 1) Modern Power system analysis by Nagrath and Kothari.
- 2) Power system analysis by Stevenson.
- 3) Electric Power system by C.L.Wadhva.

NORTH GUJARAT UNIVERSITY.
B.E. FOURTH YEAR, SEMESTER VIII (ELECTRICAL)
EE804 : ELECTIVE - II [POWER SYSTEM OPERATION & CONTROL

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	50	50	200

SYLLABUS

1. Economic operation in generating plant : Optimal unit commitment using Dynamic programming method, Reliability and security constraints, UC table, Startup condition, Hydro thermal co-ordination.
 2. Load frequency control : Frequency control of two area system.
 3. Power system short circuit study : Short circuit study of unsymmetrical faults, Algorithm, Bus impedance matrix method.
 4. Power system stability study : Stability study of multimachine system.
 5. Neutral grounding : Effectively grounded system, Ungrounded system, Resonant grounding, Methods of neutral grounding, generator neutral breaker, grounding practices.
 6. Insulation co-ordination and over voltage protection : Volt-time curve, Over voltage protection, ground wires, surge protection of rotating machines and transformers.
 7. Load flow study : N-R method, Voltage control profile, Use of regulating transformer, De coupled load flow problems, Fast de coupled load flow study, Voltage control method.
 8. Application of computer in power system operation and control.
- * Termwork and Lab work shall be based on above theory.
- * Book :
- 1) Power System operation by Skrotzky
 - 2) Modern power system analysis By Nagrath and Kothari.
 - 3) Electrical power system By C.L.Wadhwa.

NORTH GUJARAT UNIVERSITY.
B.E. FOURTH YEAR, SEMESTER VIII (ELECTRICAL)
EE804 : ELECTIVE - II [ADVANCED MICROPROCESSOR

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
4	2	3	100	50	50	200

SYLLABUS

1. INTERRUPTS & INTRUPT SERVICE PROCEDURES : 8086 interrupts & interrupts responses, Hardware interrupt applications.

2. DIGITAL INTERFACING, PARALLEL PORTS, KEYBOARD DISPLAYS : Programmable parallel ports & handshake I/O, Interfacing microprocessor to keyboards, Interfacing to alphanumeric displays, Interfacing microcomputer ports to high power devices, Optical motor shaft encoders.

3. ANALOG INTERFACING & INDUSTRIAL CONTROL : Review of operational amplifier characteristics & circuits, Sensors & transducers, D/A converter operation, Interfacing & applications, A/D converter types, Specification & interfacing, A microcomputer based scale, A microcomputer based industrial process control system, An 8086 based process control system, Developing the prototype of a microcomputer based instruments, Digital filters.

4. MICROCONTROLLERS:

* Termwork and Lab work shall be based on above theory.

* Books :-

- 1) Microprocessor Programming and Interfacing (8086) By D.Hall
- 2) Microprocessor Interfacing By Liu and Gibson

NORTH GUJARAT UNIVERSITY.
B.E. FOURTH YEAR, SEMESTER VIII (ELECTRICAL)
EE805 : PROJECT

Teaching Scheme		Examination Scheme				
Theory	Pract	Theory Hrs.	Theory Marks	Pract	T.W	Total
--	4	--	--	100	100	200

SYLLABUS

Students will carry out project work based upon following guidelines :

1. Literature survey/ Design/ Fabrication/ Testing/ Evaluation of an Electrical Subsystem.
2. Repairing & Preparation of maintenance chart/ Fault finding procedure for existing Electrical and Electronic equipments.
3. Software development work related to analysis/ synthesis/ design for selected advance topics related to electrical engineering.

Term work will consist of exhaustive write up covering all aspects of the work done by the student on the selected project work.