VEER NARMAD SOUTH GUJARAT UNIVERSITY

B.E.-II (Electronics & Communication Engg.)

Semester - VI

Pulse & Linear Circuits

Electrical Drives And Utilization of Electrical Power

Electrical Power Systems II

Power Station Practice

Electrical Measurements & Instruments II

Control Systems II

VEER NARMAD SOUTH GUJARAT UNIVERSITY

B.E.-III (Electrical Engg.)

Semester - VI

ECE 601 ELE Pulse & Linear Circuits

	Lecture	Tutorial	Practical
Teaching Hours	3	0	2
Examination Scheme Marks	100		Continuous Evaluation 20 Examination 30

Multivibrators :-
Complete analysis & design for Monostable, Astable & Bistable multivibrator – triggering – symmetrical & asymmetrical, Binary & decade counter , Schmitt Trigger ckt

Review of digital logic family :-
Introduction to integrated circuits for digital & linear systems. Review of digital IC families & their comparison, TTL, I2L, ECL, CMOS and MOS integrated circuits, their characteristics & guidelines for operation & interfacing.

Voltage Regulators :-
Voltage regulator circuit, Introduction to various elements of regulator, comparison elements & D.C. amplifier elements, control elements, switch mode regulators, Use of op-amp and linear ICs as voltage-regulator. Over voltage & short ckt. Protection, Typical design examples using voltage regulator ICs.

Operational Amplifiers :-
Characteristics & specifications of operational amplifier concept of off-set voltage & currents Applications of operational amplifier as inverting & non-inverting amplifiers, comparators, Differentiators, Integrators, Log amplifiers, Instrumentation amplifiers, Triangular & square wave generators, active rectifiers & peak detectors, oscillators Active filters.

Timer IC Circuits & its Application.

IC phase-locked loop & their applications

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ELE 602 ELE Electrical Drives And Utilization of Electrical Power

	Lecture	Tutorial	Practical
Teaching Hours	3	1	0
Examination Scheme Marks	100	25	Continuous Evaluation 00 Examination 00

Electrical drives and introduction :-
Electric drives, advantages of electrical drives, parts of elecrtical drives, choice of electrical drives, status of AC and DC drives.

Dynamics of electrical drives :-
Fundamental torque equation, speed-torque convention and multi quadrant operation, types of load, load with translational motion, load with rotational motion, load torque that vary with time, dynamics of motor load combination, nature and classification of load torque, measurement of moment of inertia, calculation of acceleration time in transient operation, acceleration time for specific nature of motor and load torque, load equalization, stability of electrical drives.

D.C. motor drives :-
D.C. motors and their performance :- basic relation and characteristic of shunt, separately, series and compound motors, modified speed-torque characteristics of dc shunt and series motor.

Speed control of D.C. motors :-
shunt motor- armature voltage control, field control, Ward-Leonard method; series motor- series resistance, shunted motor connection, shunted armature connection, shunt motor connection of series motor.
Starting effect of starting on power supply, motor and load, methods of starting, energy relation during starting, methods of reducing energy loss during starting.

Electric braking :-
types of braking- regenerative braking, rheostatic braking and
plugging, braking of dc motors during lowering of loads, braking while stopping.
Transient analysis :-
transient analysis of separately excited motor during starting and dynamic braking.

A.C. motor drives :-
3-phase Induction motor and their performance: steady state characteristic, modified speed-torque characteristic.
Speed control of induction motor :- pole changing, stator voltage control, supply frequency control, rotor resistance control, and injected emf in rotor circuit.

Starting of induction motor :-
Starting: effect of starting on power supply, motor and load, methods of starting, energy relation during starting, methods of reducing energy loss during starting, optimum value of slip at maximum torque for minimum accelerating time.

Electric braking of induction motor :-
regenerative braking, plugging, ac and dc dynamic (rheostatic) braking.
Transient analysis of induction motor :-
under starting and plugging.
3-Phase synchronous motor : steady state and torque angle characteristic, modified speed-torque characteristic, starting, pulls in and rheostatic braking.

Traction drives :-
Electric traction services, nature of traction load, main line and suburban train configuration, braking, power factor and harmonics, calculation of traction drive rating and energy consumption, important features of traction drives, traction motors, traction drives, conventional dc and ac traction drives.

Heating and welding :-
Advantages and methods of electric heating, resistance oven, induction heating, dielectric heating, arc furnaces and electric welding.

Illumination :-
Different types of lamps, lighting calculation, factory, flood and street lighting.

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ELE 603 ELE Electrical Power Systems II

	Lecture	Tutorial	Practical
Teaching Hours	3	1	0
Examination Scheme Marks	100	25	Continuous Evaluation 00 Examination 00

Representation of power system components :-
Introduction, single phase solution of balanced three phase networks, the one line diagram and the impedance or reactance diagram, per unit (PU) system, complex power, synchronous machine, representation of loads.

Symmetrical fault analysis :-
Introduction, transient on a transmission line, short circuit of a synchronous machine on no load, short circuit of a loaded synchronous machine, selection of circuit breakers

Symmetrical components (review) :-
Symmetrical component transformation, phase shift in star- delta transformers, sequence impedance of transmission lines, sequence impedance and sequence network of power system, sequence impedance and network of synchronous machine, sequence impedance of transmission lines, sequence impedance and networks of transformers, construction of sequence networks of power systems.

Unsymmetrical fault analysis :-
Symmetrical component analysis of unsymmetrical faults, single line to ground (LG) fault, line to line (LL) fault, double line to ground (LLG) fault, open conductor faults, bus impedance Matrix method for analysis of unsymmetrical shunt faults.

Power system stability :-
Introduction, dynamics of a synchronous machine, power angle equation, power angle curve, simple systems, steady state stability, transient stability, equal area criteria, numerical solution of swing equation, some factors affecting transient stability.

Power system transients :-
Types of system transients, travelling waves or propagation of surges, circuits with distributed constants, the wave equation, reflection and refraction of travelling waves, behaviour of travelling waves at line termination, at lumped reactive junction and at T junction, Bewley lattice diagram.

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ELE 604 ELE Power Station Practice

	Lecture	Tutorial	Practical
Teaching Hours	3	0	2
Examination Scheme Marks	100	00	Continuous Evaluation 20 Examination 30

Steam power station :-
Main flow circuits of thermal power station, thermodynamic cycles of steam flow, general layout of power stations, power station auxiliaries, cooling system of alternators, flue gas flow arrangement, circulating water system, cooling tower.

Hydroelectric power plant :-
Selection of site, water power equations, types of dams, arrangement and layouts of hydroelectric station, classification of plants, water turbines, properties of water wheels, specific speed on the basis of discharge, combined steam and hydro plants, pumped storage hydro station.

Nuclear power station :-
Atomic structure, isotopes, energy release by fission, chain reaction, atomic reactor, fuels, moderators and coolants, types of reactors, fast breeder reactor, radioactivity and hazards.

Diesel and gas turbine station :-
Field of use, general layout and principle of operation.

Non conventional method of power generation :-
MHD generation, wind power, tidal power, solar power, solar cell, and fuel cell.

Combinations of different types of power plants :-
Types of power station, advantages of combined working of different types of power station, need for coordination of different types of power station, run-off river plant in combination with steam plant, hydro-electric plants with ample storage in combination with steam plants, pumped storage plant in combination with ordinary hydro-electric plant, co-ordination of hydro-electric and gas turbine plant, co-ordination of hydro-electric and nuclear power station, co-ordination of different types of power plants in power station.

Protection against over voltages :-
Voltage surge, causes of over voltages, internal causes of over voltages, lightening, mechanism of lightening discharge, types of lightening strikes, harmful effects of lightening, protection against lightening, the earthing screen, overhead ground wires, lightening arresters, types of lightening arresters, surge absorber.

Power station control :-
Excitation systems, excitation control, field protection, commissioning of alternators, power supply for station auxiliaries, power station control.

Neutral grounding :-
Methods of neutral grounding, solidly grounded, resistance ground, reactance ground, earthing transformer, arcing ground.

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ELE 605 ELE Electrical Measurements & Instruments II

	Lecture	Tutorial	Practical
Teaching Hours	3	1	2
Examination Scheme Marks	100	25	Continuous Evaluation 20 Examination 30

HIGH VOLTAGE MEASUREMENT AND TESTING :-
Generation of high voltage DC and high Voltage AC voltages and impulse voltages for testing purpose, measurement of high voltage a.c and d.c., and impulse voltage, H. V. testing of insulators, bushings and cables, testing of electrical Strength of insulating oils, partial discharge measurements.

LOCALIZATION OF CABLE FAULTS :-
Blavier, earth overlap & voltage drop tests for ground faults, loop tests for locating ground fault and short circuit faults : Murray's method, Varley's method and inverted loop method, localization of open circuit faults, induction method, test for flashing fault, pulse echo technique of localizing faults, treatment of fault.

MEASUREMENT SYSTEMS :-
Performance and characteristics : Elements of generalized measurement system, input-output configuration of instruments and measurement systems, methods of connection for interfering and modifying inputs, static performance characteristics of measurement system, noise, signal to noise ratio,
sources of noise.

ERRORS IN MEASUREMENTS :-
Limiting errors, relative errors, types of errors: Gross; systematic and random, statistical treatment to data, probability function.

TEST INSTRUMENTS :-
Electronic voltmeters and their merits,DC amplifier voltmeter, AC voltmeter using rectifiers, true r.m.s. responding voltmeter, Q meter, rf power and voltage measurement.

Cathode ray oscilloscope :
Introduction, CRT, oscilloscope block diagram, functions of each block, dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, application of oscilloscope, introduction to function generator.

SENSORS AND TRANSDUCERS :-
Generalized instrumentation system, role of transducer as input device, classification of transducers, theory and applications of resistance, inductance and capacitance transducers, LVDT, measurement of non electrical quantities : pH of electrolytes; temperature (by thermocouple) and speed of shaft, basic signal conditioning circuits for transducers.

DATA TRANSMISSION AND RECORDING :-
Cable transmission of analog voltage and current signals, cable transmission of digital data, fiber optic data transmission, radio telemetry, pneumatic transmission of data.
Recorders : Strip chart recorders : galvanometer type and potentiometer type, x-y plotter, magnetic tape recorders, introduction to bar codes, line printer, inkjet printer, disk file and floppy discs, and digital tape recording.

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Semester - VI

ELE 606 ELE Control Systems II

	Lecture	Tutorial	Practical
Teaching Hours	3	1	2
Examination Scheme Marks	100	25	Continuous Evaluation 20 Examination 30

MATHEMATICAL BACKGROUND-MATRICES :-
Definition of Matrices; Matrix Algebra; Matrix Multiplication and Inversion; Rank of a Matrix; Differentiation and Integration of Matrice.

ROOT LOCUS TECHNIQUES :-
Basic Properties of Root Loci; Construction of Root Loci; Effects of Adding Poles and Zeros.

DESIGN OF CONTROL SYSTEMS :-
Introduction; Design with PD, PI and PID Controllers; Time Domain Design- Phase Lead, Phase Lag and Lag-Lead Compensators, Frequency Domain Design-Phase Lead, Phase Lag and Phase Lag-Lead Compensators; Effects and Limitations of These Compensators; Pole-Zero Cancellation Design-Notch Filters; Design of Robust Control Systems; State Feedback Control-Pole Placement Design, State Feedback with Integral Control.

STATE SPACE ANALYSIS OF CONTROL SYSTEMS :-
State Variables; State-Space Representation of Electrical and Mechanical and Electromechanical Systems; State Space Representation of Nth Order Linear Differential Equation; Transformation to Phase Variable Canonical Form; Relationship Between State Equations and Transfer Functions; Characteristic Equation; Eigen Values and Eigen Vectors; Transformation to Diagonal Canonical Form; Jordan Canonical Form; Controllability Canonical Form; Observabilty Canonical Form; Decomposition of Transfer Function-Direct, Cascade and Parallel Decomposition; State Diagram; Solution of the Time-Invariant State Equation; State Transition Matrix and its Properties; Transfer Matrix; Transfer Matrix of Closed Loop Systems

CONTROLLABILTY AND OBSERVABILITY :-
Concept of Controllability and Observability; Kalman's Theorems on Controllability; and Observability, Alternative Tests (Gilbert's Method) of Controllability and Observability; Principle of Duality; Relationship among Controllability, Observability and Transfer Function.

LIOPUNOV STABILITY ANALYSIS :-
Stability of Equilibrium State in the Sense of Liopunov; Graphical Representation of Stability; Asymptotic Stability and Instability; Sign-Definiteness of Scalar Function; Second Method of Liopunov; Stability Analysis of Linear Systems; Krasovskii's Theorem; Liopunov Function Based on Variable Gradient Method.