

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme				Credit
Theory			L	T	P	SESSIONAL EXAM				SUB TOTAL
						TA	CT	TO T	ESE	
1	HS1511	MANAGEMENT SCIENCE	2	1	-	15	10	25	50	75
2	EE1512	ANALOG ELECTRONICS	2	1	-	15	10	25	50	75
3	EE1513	CONTROL ENGINEERING	3	1	-	30	20	50	100	150
4	EE1514	ELECTRICAL MACHINES II	3	1	-	30	20	50	100	150
5	EE1515	POWER SYSTEMS II	3	1	-	30	20	50	100	150
6	EE1516	DIGITAL ELECTRONICS & LOGIC DESIGN	3	1	-	30	20	50	100	150
PRACTICAL/DRAWING/DESIGN										
7	EE1517-P	ANALOG ELECTRONICS LAB	-	-	3	25	-	25	25	50
8	EE1518-P	ELECTRICAL MACHINES II LAB	-	-	3	25	-	25	25	50
9	EE1519-P	POWER SYSTEMS II LAB	-	-	3	25	-	25	25	50
10	EE1520-P	DIGITAL & LOGIC DESIGN LAB	-	-	3	25	-	25	25	50
11	HS1521-P	GENERAL PROFICIENCY V	-	-	-	-	-	50	-	50
		TOTAL	16	6	12	-	-	-	-	1000

TA-TEACHERS ASSESSMENT

CT-CLASS TEST

ESE- END SEMESTER EXAMINATION

TOTAL MARKS: 1000

TOTAL PERIODS: 34

TOTAL CREDITS: 32

Basic Concepts and Functions of Management Planning

Nature, Purpose and Objectives of Planning, Organizing: nature and Purpose, Authority and Responsibility, Staff bug, Supply of Human Resources, Performance Appraisal, Controlling: System and Process of Controlling, Control Techniques.

Human Resource Management

Nature and Scope of Human Resource Planning, Training and Development, Recruitment and Selection, Career Growth, Grievances, Motivation and its types, Need For Motivation, Reward and Punishment, Models for Motivation, Leaders:

Kind of Leaders, leadership styles, Roles and Function of Leaders, Conflict Management, Kinds and Cause of Conflict, Settlement of Conflict, Group and Team \working, Organizational Design and Development.

Marketing Management

Marketing Environment: Consumer Markets and Buyer Behavior, Marketing Mix, Advertising and Sales Promotion, Channels of Distribution.

Financial Management and Accounting Concepts

Book Keeping, Financial Statement Analysis, Financial Ratios, Capital Budgeting, Break-Even Analysis.

Production/Operation Management:

Planning and Design of Production and Operation Systems, Facilities Planning, Location, Layout and Movement of Materials, Materials Management and Inventory.. Control, Maintenance management, PERT & CPM.

Management Information System:

Role of information in decision making, Information system planning, Design and Implementation, Evaluation and Effectiveness of Information System.

Statistical Quality Control, TQM and ISO Certification

Social and Ethical Issues in Management,

Ethics in management, Social Factors, Unfair and Restrictive Trade Practices. Strategic and Technology Management:

Need, Nature. Scope and Strategy, SWOT analysis, value and concepts

Review of construction, operation and characteristics of Diode and BJT's

Region of operation, Biasing. Bias stability, Current mirror biasing. Transistor as amplifier, Load line analysis, Design for maximum symmetrical swing, thermal stabilization, FET, JFET and MOSFET devices. Device structure characteristics and equations: FET as an amplifier; Common Source, Common Drain and Common Gate configurations,

Small Signal Analysis:

Mid-frequency response of BJT and FET circuits; Hybrid parameter models and analysis; Low frequency response including the effects of emitter bypass and coupling capacitors; High frequency response.

Multistage Transistor Circuits:

Differential amplifier, Cascade amplifier; internal details of Op-amps; some linear and non-linear applications of Op-amps; Schmitt trigger using Op-amp;

Lower Amplifiers:

Class A, Class B, and Class C operation; Push Pull Amplifier: Complementary symmetry configuration. **Feedback in Amplifiers:**

Different types of feedback; stability and oscillation: Wien bridge. Phase Shift, Colpitts and Hartley Oscillators;

Operational Amplifiers (741) — use and its applications

Introduction to and use of Circuit Simulation Software (SPICE) with an Op-amp;

List of Experiments:

- To design and test of a multistage RC-coupled amplifier with given specifications.
- To design and test a current mirror using BJTs
 - (a) Set up an RC oscillator using a BJT to give sinusoidal output at 2 kHz.
 - (b) Set up a Wien Bridge oscillator using a BJT to give sinusoidal Output at 2 kHz.
- To design and test a series voltage regulator with short circuit protection.
- To design and test a complementary symmetry power amplifier and observe its performance.
- To implement a summer and integrator by using op-amp-.

Suggested Books & References:

- Sedra Adel, S. and Smith Kenneth C., "*Microelectronic Circuits Engineering*", June 1997.
- Sedra, K. C., "1995 Problems Supplement to Microelectronic Circuits", Oxford University Press, 1995.
- Roberts, G. W. and Sedra, A. S., "SPICE (The Oxford Series in Electrical and Computer Engineering)", Second Edition, 1996.
- Millman & Taub, "Pulse Digital Switching Waveforms" McGraw Hill.

Introduction to Control Problem

Scope of control, Parts of a Control System, Mathematical modeling of physical systems — Mechanical, Electrical, Thermal and Hydraulic systems, Differential Equation; Systems with dead-time, System response, Control hardware and their models: Potentiometers, Synchros, LVDDT, DC and AC Servomotors, Tacho-generators, Electro-hydraulic vales, Hydraulic servomotors, Electro-pneumatic valves, Pneumatic actuators; Closed-loop systems; Block diagram and Signal Flow Graph analysis, Transfer function.

Basic characteristics of Feedback Control Systems

Stability, Steady-state accuracy, Transient accuracy, Disturbance rejection, Sensitivity and Robustness; Basic modes of feedback control: Proportional. Integral and Derivative, Feed-forward and multi-loop Control Configurations; Stability concept, Relative stability, Routh Stability criterion.

Time response of second-order systems, steady-state errors, and error constants; Performance in time-domain; Root locus method of design; Lead and Lag compensation.

Frequency-response analysis

Relationship between time and frequency response, Polar plots, Bode's plot, stability in frequency domain, Nyquist plots, Nyquist stability criterion; Performance specifications in frequency-domain; Frequency-domain methods of design, Compensation and their realization in time and frequency domain; Lead and Lag compensation.

Op-amp based and digital implementation of compensators; Tuning process controller; State variable formulation and solution.

State variable Analysis

Concepts of state, State variable, State model, State models for linear continuous time functions, Diagonalization of transfer function, solution of state equations, Concept of controllability and observability;

Introduction to Optimal control and Non-linear control

Optimal Control problems, Regulator problem, Output regulator, Trekking problem; Non-linear system — Basic concept and analysis;

Suggested Books & References:

- Gopal, M., "Control Systems: Principles and Design", Tata McGraw Hill, 1997.
- Kuo, B. C., "Automatic Control System", Prentice Hall, Sixth Edition, 1993.

- Ogata, K., "Modern Control Engineering", Prentice Hall, Second Edition, 1991.
- Nagrath & Gopal , "Modern Control Engineering", New Ages International.

3-phase Induction Motor:

Review of Constructional details, Poly-phase Distributed AC Windings, production of EMF, Coupled circuit equations, Steady state analysis Equivalent circuit, Phasor diagram, Power flow diagram and torque-slip characteristics; Starting and speed control; Effect of rotor resistance, deep and double cage rotor; Speed control schemes including solid state and vector control; Braking.

Effect of space/time harmonics and analysis; Testing, Losses and Efficiency; Induction generators — Grid connected and Self excited mode; Applications;

Single Phase Motors:

Induction Types double field revolving theory, equivalent circuit, Characteristics, Starting of single-phase motor, Shaded pole machines.

Synchronous type Hysteresis motor, Reluctance motor, Stepper motors. Variable reluctance and permanent magnet type, Permanent Magnet Synchronous motor, Brushless motor.

Special Electric Motors

Switched reluctance motor, Linear machines-Power energy and levitation types; Permanent Magnet DC motors.

Machines for control Systems

Disc motors, Printed Circuit Motors, Servo motors --- AC and DC, Tacho-generators, Synchros, Disk Machines.

PRACTICAL: EE 1507-P ELECTRICAL MACHINES II LAB (0 — 0 — 3)

List of Experiments:

- Parallel operation of two identical three-phase transformers.
- No-load short-circuit and zero power factor test on synchronous machine.
- Determination of torque-speed characteristics of a 3-phase induction machine in braking, motoring and generating regions and its calibration.
- Study of the effect of rotor resistance on the load characteristics of wound rotor Induction motor:
- Speed control of Induction Motor — conventional and electronic control. Solid state speed control using (i) V constant, (ii) V/f constant, (iii) Slip-energy injection.
- Load characteristics of Induction generator working in (i) Grid connected mode, (ii) Self-excited mode.
- Determination of equivalent circuit and parameters of single-phase Induction Motor. Prediction of torque-speed characteristics and verification of load test.
- Load characteristics of Universal Motor, operating on DC and AC supply. Comparison of performance with the two results.
- Starting of Slip-ring Induction Motor by using (a) three-phase variac, (ii) Star connected rheostat, (iii) Oil-immersed rotor resistance starter.
- Experimental determination of performance characteristics of two-phase servo motor.
- Determination of equivalent circuit parameters of 3-phase Induction Motor by (i) No-
- load test, (ii) Blocked rotor test; and to draw the circle diagram of 3-phase Induction Motor.
- Determination of Torque and slip rate characteristics of Stepper Motor and determination of operating range.
- Load characteristics of hysteresis motor and shaded pole motor.
- Characteristics of Permanent Magnet Motor.
- Characteristics of Switched Reluctance Motor.

Suggested Books & References:

- McPherson, George, *"Introduction to Electric Machines and Transformers"*, John Wiley and Sons, 1980
- Naser Syed, A., *"Electric Machine and Transformer"*, New York, Macmillan, 1984.

- Sen, P. C., "Thyristor DC Drives", New York, Wiley, 1991.
- Sen, P. C., "*Principles of Electric Machines and Power Electronics*", (Second Edition), John Wiley & Sons 1997.
- Say, M. G., "*Alternating Current Machines*", (5th Edition), ELBS, 1986.
- Fitzgerald, Kingsley C. and Umans, S. D., "*Electric Machinery*", (5th McGraw-Hill Book Co., 1992).
- McPherson, G. and Laramore **R. D.**, "*An Introduction to Electrical Machines and Transformer*", (2nd Edition), John Wiley & Sons, 1990.
- Say M. G., and Taylor, E. O., "*Direct Current Machines*" 3rd Ed. Pitman 1961.
- Del Toro, V., "*Electrical Machines & Power Systems*", 1985, Prentice Hall, Inc., Englewood Cliffs, 1985.
- Del Toro, V., "*Electromechanical Devices for Energy Conversion & Control Systems*", 1985, PHI Pvt. Ltd., 1985.
- Garik, M. L. & Weil, R. T., "*DC & AC Machines*", Affiliated East-West Pvt. Ltd., East-West student Edition, 1968.
- Kosow, I. L., "*Electric Machinery & Transformers*", PHI, 2nd Ed. 1992.
- Griffiths, D. J., "*Introduction to Electrodynamics*", PHI, 1981.
- Nasar Syed, A., "Electric Machines & Power Systems, Volume-I", McGraw-Hill, Inc U.S.A., 1995.
- Nasar Syed, A. & Unnewehr, L. E., "Electromechanics & Electric Machines, Volume- IF, John Wiley & Sons, Canada, 1971.
- Openshaw Taylor, E., "The Performance & Design of A. C Commutator Motors", A. H. Wheeler & Co. (P) Ltd., Allahabad, 1971.
- Ivanov-Smolonsky, A., "Electrical machines Vol-2". Mir Publishers Moscow, 1982.
- Ivanov-Smolonsky, A., "Electrical machines Vol-3", Mir Publishers Moscow, 1982.
- Fitzgerald, A. E. & Kingsley Charles, Jr., "Electrical Machinery" (2nd Ed.), McGraw- Hill & Kogakusha Company Ltd. Japan, 1961.

System Representation

Single line representation, Per Unit systems, Modeling of Transformer, Load, Synchronous machines;

Formation of Network Matrices

Bus admittance and impedance matrices, Algorithms for formation of Z-Bus and Y- Bus matrices, Modification of bus impedance matrix, Sparsity oriented inversions for Y-Bus;

Short Circuit Studies

Short circuit studies for balanced three-phase networks for various types of shunt faults using sequence networks, Short circuit studies using Z-Bus matrix;

Load Flow Studies

Power system equations, solution techniques, Gauss-Seidel iterative method, Newton-Raphson method, Fast-coupled method, Comparison of methods, Acceleration of convergence, Voltage controlled busses, Digital computer studies of load flow, Information from load flow;

Stability Studies

Stability problem, Swing equation, Power angle equation, Equal area criterion of stability, Elements of steady state and dynamic stability studies, Methods of simulation for transient stability, Representation of network, load and generators, System security concepts;

Power System Monitoring and Control

Economic operation and load dispatch, Elementary ideas of voltage — VAR and load-frequency controls, Load-frequency control elements, Voltage control elements, Block diagram representation of hydro and steam turbine governors, Tie-line bias control;

List of Experiments:

- Power Factor Control of a system excited by single-phase supply.
- To determine phase-sequence of three-phase circuit using (i) RC method, (ii) two lamp method.
- Measurement of Earth-resistance by Earth Tester.
- Study of different type of insulators.
- Simulation of DC distribution by network analyzer.
- To determine positive, negative and zero sequence impedance of three-phase transformer / three-phase induction motor.
- Power Factor Control of a system excited by Single-phase supply.
- Simulation of DC distribution by network analyzer.
- To determine generalized constant **A, B, C, D** of given system.
- To determine dielectric strength of insulating oil.

Suggested Books & References:

- Elgerd, O. I., *"Electric Energy System Theory: An Introduction"*, Tata McGraw Hill, Second Edition, 1982.
- Gainger John, J. and Stevenson., W. D. Jr., *"Power System Analysis"*, McGraw Hill, 1994.
- Kundur, P., *"Power System Stability and Control"*, McGraw Hill, 1994.
- Kimbark, E.E., *"Power System Stability, Vol I: Elements of Stability Calculations"*, John Wiley & Sons, 1948.

Number Systems and Codes

Decimal Odometer, Binary Odometer, Number Codes, Why Binary numbers are used, Binary-to-Decimal Conversion, Decimal-to-Binary Conversion, Hexadecimal Numbers, Hexadecimal-Binary Conversion, Hexadecimal-to-Decimal Conversion, Decimal-to Hexadecimal Conversion, BCD Numbers, The ASCII Code.

Gates

Inverter, OR, AND, NOT, NOR, and NAND Gates, Boolean algebra, De Morgan's Second Theorem, Exclusive-NOR Gate. Controlled Inverter;

TTL Circuits

Digital Integrated Circuits, 7400 Devices, TTL Characteristics, TTL Overview, and OR-Invert Gates, Open-Collector Gates, Multiplexers.

Boolean Algebra and Karnaugh Maps

Boolean Relations, Sum-of-Products method, Algebraic Simplification, Karnaugh maps, Pairs, Quads, and Octets, Karnaugh simplifications, Don't-Care Conditions.

Arithmetic-Logic Units

Binary Addition, Binary Subtraction, Half Adders, Full Adders, Binary Address, Signed Binary Numbers, 2's Complement, 2's Complement Adder-Subtractor.

Flip Flops

RS Latches, Level Clocking, D-Latches, Edge-Triggered D-Flip-Flops, Edge triggered JK Master-Slave Flip-Flop.

Registers and Counters

Buffer Registers, Shift Registers, Controlled Shift Registers, Ripple Counter, Synchronous Counters, Ring Counters, Other Counters, Three-State Register, Bus-Organize computers.

Memories

RAMs ROMs, PROMs, EPROMs; TTL Memory, Hexadecimal Addresses

PRACTICAL: EE 1509-P DIGITAL ELECTRONICS & LOGIC DESIGN LAB

(0-0-3)

List of Experiments:

- Verification of Logic Gates.
- Verification and realization of different Flop-Flops
- Study of 4-Bit Register.
- Study of Synchronous Counter
- Study of BCD Counter
- Study of Ripple Counter
- Design of MOD 6 Counter
- Design of Up and Down Counter

Suggested Books & References:

- Malvino, A. P. *"Digital Computer Electronics"*,
 - Taub & Shilling, "Digital Integrated Electronics", McGraw Hill, 1976.