EE 292

ELECTRICAL TECHNOLOGY LAB
(For ECE)

Instruction	3	Periods per week
Duration of University Examination	3	Hours
University Examination	50	Marks
Sessional	25	Marks

List of Experiments:

1. Magnetization curve of a separately excited DC generator.
2. Load characteristics of a shunt generator.
3. Load characteristics of a series generator.
4. Performance characteristics of a DC shunt motor.
5. Load characteristics of a DC series motor.
6. Performance characteristics of a compound motor.
7. Speed control of DC motor.
8. O.C. and S.C. tests on single phase transformer.
9. Load test on single phase transformer.
10. Performance characteristics of a three phase induction motor.
11. Speed control methods of induction motors.
12. Regulation of alternator by O.C. and S.C. tests.
13. Measurement of three-phase power by Two Wattmeter method.

Note: At least 10 Experiments should be conducted in the semester

SCHEME OF INSTRUCTION & EXAMINATION
B.E. IIIrd YEAR
(ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-I

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L/T	D/P		Univ. Exam	Sessionals
		THEORY					
1.	EE 301	Power Systems - II	4	-	3	75	25
2.	EE 302	Electrical Machinery - II	4/1	-	3	75	25
3.	EE 303	Power Electronics	4/1	-	3	75	25
4.	EE 304	Digital Electronics and Logic Design	4	-	3	75	25
5.	EE 305	Linear Integrated Circuits	4	-	3	75	25
6.	EE 306	Linear Control Systems	4 /1	-	3	75	25
		PRACTICALS					
1.	EE 331	Electrical Machines Lab-I	-	3	3	50	25
2.	EE 332	Control Systems Lab	-	3	3	50	25
		Total	**24/3**	**6**	**24**	**550**	**200**

EE 301

POWER SYSTEMS - II

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Transmission Line theory: Short, medium, long lines- Line calculations, Tuned Lines-Power Circle Diagrams and their applications. Corona: Causes- Disruptive and Visual Critical Voltages, Power loss -minimization of Corona effects.

UNIT-II

Voltage Control: Phase Modifiers, Induction Regulators -Tap Changing Transformers, Series and Shunt Capacitance. Reactive Power Requirement Calculations. Static Var Compensators-Thyristor Controlled Reactors-Thyristor Switched Capacitors.

UNIT-III

Per Unit System of Representation: Use of per unit quantities in power systems, Advantages of per unit system. Symmetrical Three Phase transients in R-L series circuits- Short Circuit Currents - Reactance of Synchronous Machines- Symmetrical Fault Calculations. Short circuit capacity of a bus.

UNIT-IV

Unsymmetrical Faults: Symmetrical components of unsymmetrical phasors -Power in terms of symmetrical components -sequence impedance and sequence networks. Sequence networks of unloaded generators - Sequence impedances of circuit elements -Single line to ground, line-to-line and double line to ground faults on unloaded generator- Unsymmetrical faults of power systems.

UNIT-V

Transients in Power Systems: Causes of over voltages. Travelling Wave Theory -Wave equation -Open Circuited Line -The short circuited line junction of lines of different natural impedances- -Reflection and refraction Coefficients -Junction of Cable and overhead lines -Junction of three lines of different natural impedances -Bewley Lattice diagram.

Suggested Reading:

1. C.L. Wadhwa, *Electrical Power Systems,* Wiley Eastern Ltd., 4dtEdition, 2006.
2. John J. Grainger William D.Stevenson Jr. *Power System Analysis,* Tata McGraw Hill Edn. 2003
3. I.J. Nagrath & D.P.Kothari *Modern Power Systems Analysis,* TMH Edition, 2003.
4. A.Chakrabarti, M.L.Soni, P. V.Gupta, U.S.Bhatnagar, *A Text book on Power System,* Dhanpat Rai & Co (P) Ltd -1999.

EE 302

ELECTRICAL MACHINERY - II

Instruction	4/1	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Parallel operation of Single phase Transformer and load sharing. Insulation of Windings and terminals. Cooling arrangement in Transformers. Testing of Transformers -Routine Tests and Special tests -Measurement of Voltage ratio and check for voltage vector relationship. Measurement of No- load loss and current. Measurement of Insulation resistance. Maintenance of Transformers.

UNIT-II

Poly-phase Transformer Connections ,Choice of Transformer Connections, Third harmonic voltages -Phase Conversion -3phase to 2-phase transformation -Scott connection. Constructional features of three-phase transformers, tertiary winding, parallel operation of transformer, Auto Transformer -Comparison with two winding transformers- Conversion of two winding transformer to auto transformer. Tap changer on transformers, No-load tap changer, On-load tap changer.

UNIT-III

Three-phase Induction Motor -Constructional features –Rotating Magnetic field theory —Principle of operation of squirrel cage and slip ring motors -Vector Diagram , Equivalent circuit -Expression for torque- Starting torque, Maximum torque -Slip/Torque characteristics - Performance characteristics -Equivalent circuits from test –Current loci circle diagram - Predetermination of characteristics of Induction Motors .

UNIT-IV

Starting methods of Induction motors .Modes of operation, torque and power limits of Induction motors-Speed control methods -Resistance Control, Voltage control, pole changing, Cascading, variable frequency

control- Slip power recovery schemes Kramer drive. Scherbius drive-Double cage Induction motors. Induction generator

UNIT-V

Unbalanced Operation: Voltage Unbalance -Unbalanced Operation of 3-phase Induction Motor -Per Phase Equivalent Circuits -Single Phasing-Unbalanced Operation of 3-Phase Transformers –Single phase load on Three phase transformers Single Phasing in 3 phase transformers- Delta / Star and Star/Delta transformers.

Suggested Reading:

1. I.J. Nagarath, D.P.Kothari, *Electrical Machines.* 4th Edition Tata McGraw Hill, 2010.
2. J.B. Gupta, *Theory and Performance of Electrical Machines,* S.K. Kataria. & Sons, 2003.
3. P.S. Bimbhra, *Generalised theory of Electrical Machines,* Khanna Publishers Fifth Edition 1995
4. M.G.Say, *The performance and Design of A.C. Machines*- Pitman, 1985.
5. Fitzerald A E and Kingzley, *Electrical Machines,* .3rd Edition.

EE 303

POWER ELECTRONICS

(Common to IE & EEE)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Power Semiconductor Diodes and Transistors: Types of power diodes-General purpose diodes -Fast recovery diodes -Their characteristics and applications. Bipolar Junction transistors, Power MOSFETs P-Channel, N- Channel. IGBTs -Basic structure and working, Steady state and switching characteristics-Comparison of BJT, MOSFET and IGBT -Their applications. ISCRs-Static and dynamic characteristics,Two transistor analogy.

UNIT-II

Turn on and turn off mechanism of BJT ,Power MOSFET, IGBTs .SCR trigger circuits-R, RC and UJT triggering circuits. Triggering circuits for Single phase bridge rectifier and Choppers. Driver Circuits for MOSFET, IGBT and BJT. The various commutation methods of SCRs. Protection of SCRs . GTO's - Basic structure, principle of operation, characterisics and applications.

UNIT-III

Principles of controlled rectification -Study of Single phase and three-phase half controlled and full controlled bridge rectifiers with R, RL, RLE loads. Effect of source inductances. Dual converters- circulating current mode and circulating current free mode-control strategies.

UNIT-IV

Classification of Choppers A, B, C, D and E, Switching mode regulators-Study of Buck, Boost and Buck-Boost regulators, Cuk regulators . Principle of operation of Single phase bridge type Cyclo converters and their applications. Single phase AC Voltage Controllers with R, and RL loads.

UNIT-V

Principle of operation of Single phase Inverters -Three phase bridge Inverters (180^0 and 120^0 modes)-voltage control of inverters-Single pulse width modulation- multiple pulse width modulation, sinusoidal pulse width modulation. Comparison of Voltage Source Inverters and Current source Inverters, Elementary Multilevel Inverters.

Suggested Reading:

1. Singh.M.D and Khanchandani.K.B,-*Power Electronics,* Tata McGraw Hill, 2nd Edition, 2006.
2. Rashid.M.H. *Power Electronics Circuits Devices and Applications.* Prentice Hall of India, 2003
3. M.S.Jamil Asghar, *Power Electronics,* Prentice Hall of India, 2004
4. Bimbra.P.S, *Power Electronics,* Third Edition, Khanna Publishers, 1999
5. Mohan, Undeland, Robbins, *Power Electronics,* John Wiley, 1996.

EE 304

DIGITAL ELECTRONICS AND LOGIC DESIGN

(Common to IE & EEE)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Boolean Algebra and combinational logic AND,OR and NOT operations, Laws of Boolean Algebra, minimization of Boolean expressions, Truth tables and maps sum of products and product of sums -map method of reduction, incompletely specified functions multiple output minimization.

UNIT-II

Tabular minimization, Digital logic families and IC's, Characteristics of Digital IC's, Introduction to RTL, DTL, TTL, CMOS, ECL families, Details of TTL logic family -totem pole, open collector outputs. Wired AND operation, comparison of performance, TTL subfamilies, multiplexer and de-multiplexer, encoder and decoder, code converters, implementation of combinational logic using standard logic gates and multiplexers.

UNIT-III

Binary arithmetic and circuits -Half and Full adder- subtractor and Magnitude comparator, number complements-two's complement arithmetic, carry look ahead adder, decimal numbers and their codes, BCD and Excess-3 arithmetic.

UNIT-IV

Synchronous Sequential Circuits -Basic latch circuit -debouncing switch - SR., JK, D and T flip-flops-truth table and excitation table -ripple and synchronous counters up/down counter -general BCD counter- Counter decoding-shift registers, ring counters.

UNIT-V

Design of Digital Systems -Concept of state. State diagram-design of counters Sequence detector and generators -Design procedure, synthesis using D, JK, T flip-flops -applications of registers -concepts of programmable logic -PROM, PLA, PAL.

Suggested Reading:

1. Donald Pleach / Albert Paul Malvino / Goutam Saha *"Digital Principles and Applications"* McGraw- Hill, 2006.
2. Tocci & Widmer, *Digital Systems*-Pearson Education-Eigth Edition, 2003.
3. Morris Mano M.., *Digital Design*, Prentice Hall of India, Third Edition, 2002.
4. B. Somnadh Nair, *Digital Electronics and Logic Design*, Prentice Hall, India, 2002.
5. Floyd, *Digital Fundamentals*, 4th edition, Universal Book Stall, New Delhi, 1992.
6. J.P. Uyemura, *A First Course in Digital Systems Design*, Brooks/ Cole Publishing Co., (Available from Vikas Publishing House in India).

EE 305

LINEAR INTEGRATED CIRCUITS

(Common to IE & EEE)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Operational amplifiers -Characteristics, open loop voltage gain, output impedance, input impedance, common mode rejection ratio -Offset balancing techniques -Slew rate, Frequency response -Stability, frequency compensation of Op-amp, basic applications -inverter summer, analog integrator, differentiator, current to voltage converter, voltage to current converter, voltage follower, ac amplifier.

UNIT-II

Voltage limiter, clipper and clamper, precision rectifier-full wave and half wave, peak detector, comparator, zero crossing detector, Schmitt trigger, monostable, astable, bistable multiplier, divider, difference amplifier instrumentation amplifier circuits using Op-amps.

UNIT-III

Waveform generation using Op-amps- Sine, Square, Triangular and Quadrature oscillators, voltage controlled oscillator / multi vibrator, voltage to frequency converter, 555 timer functional diagram, operation as monostable and astable. phase locked loop, A/D and D/ A converters.

UNIT-IV

Series voltage regulator using Op-amp, shunt regulators using Op-amp, switching regulators using Op-amp, dual voltage regulator ,fixed voltage regulators, dual tracking regulators ,hybrid regulator. current sensing and current feedback protection.

UNIT-V

RC active filters, low pass, high pass band pass, band reject, notch, first order, second order transformation, state variable filter, switched capacitor filter, universal filter. Balanced modulator/ demodulator.

Suggested Reading:

1. D.Roy Choudhury, *Linear Integrated Circuits,* Shail B.Jain, 3rd Edition, New Age International(P) Ltd., 2007.
2. Malvino Albert Paul, *Electronic Principles,* 7th Edition, Tata McGraw Hill, 2006
3. Coughlin and Driscoll, *Operational Amplifiers and Linear integrated Circuits,* 6th Edition, Prentice hall of India 2003.
4. David A. Bell, *Operational Amplifiers and Linear IC s,* PHI, 2003.
5. Gayakwad R.A. *Op-Amps and Linear Integrated Circuits,* 4th Edition, Prentice Hall of India, 2002.
6. S. Franco, *"Design with Operational Amplifiers and Analog Integrated Circuits",* McGraw Hill Inc., 2002 (Available from Tata McGraw Hill in India).

EE 306

LINEAR CONTROL SYSTEMS

(Common to IE & EEE)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Open and Closed loop Systems, Continuous time and discrete time control systems. Control system components, Error sensing devices, Potentiometers. Synchros, AC-DC servo motors-Block diagram representation, Transfer function and impulse response, Signal flow graphs.

UNIT-II

Time Response: Types of Input, Transient response of second order system for step input. Time domain specifications - Types of system- static error coefficients, Error Series-Routh-Hurwitz criterion of stability. Root Locus Technique- Typical systems analyzed by root locus technique-Effect of location of roots on system response PID Controller.

UNIT-III

Frequency Response Plots: Bode Plots, Frequency domain specifications. : Mp, ω_p for a second order system, Nyquist criterion for a stability, relative stability, gain and phase margin, Compensation: Cascade Compensation using Bode plots.

UNIT-IV

State Space Representation: Concept of State, State Variable, State Models of linear time invariant systems. Derivation for state models from transfer functions and differential equations. State Transition matrix- Solution of State equations by time domain method. Observability and Controllability.

UNIT-V

Discrete Control Analysis: Introduction to signals and systems, The Z-transformation, digital control, advantages and disadvantages. Digital control system architecture. The discrete transfer function. Sample data system. Transfer function of sample data systems- Z-plane specifications of control system design.Z-domain stability.

Suggested Reading:

1. I.J.Nagrath, M.Gopal, *Control System Engineering*, New Age International (P) Limited Publishers, 5th Edition, 2007.
2. J.F.Franklin and J.D.Powell, *Digital Control of Dynamic Systems*, Addison Wesley, 1980.
3. M.Gopal, *Control Systems Principles and Design*, Tata McGraw Hill, 2nd Edition, 2003.
4. K.Ogata, *Modern Control Systems*, 3rd Edition.PHI, 2000.
5. B.C. Kuo, *Automatic Control Systems*, 8th edition, Prentice Hall, New Delhi, 2002.
6. Shinners S.M., *Modern Control Engineering*, Prentice Hall, New Jersey, 1995.
7. D'azzo and Houpis, *Linear Control System Analysis and Design*, 4th edition, Singapore, 1995.

EE 331

ELECTRICAL MACHINES LAB - I

Instruction	3	Periods per week
Duration of University Examination	3	Hours
University Examination	50	Marks
Sessional	25	Marks

List of Experiments:

1. Magnetization characteristics and the speed Vs voltage curve of separately and self excited D.C. generator
2. Load characteristics of separately excited and Shunt Generators
3. Load characteristics of Compound generator
4. Performance characteristics of Series Motor
5. Performance characteristics of D.C. shunt motor
6. Performance characteristics of Compound motor
7. Separation of iron and friction losses and estimation of parameters in D.C. machines.
8. (a) Speed control of D.C. shunt motor by shunt field control and armature resistance control (b) Swinbum's Test
9. Separation of core losses in a Single Phase transformer
10. Open circuit and short circuit tests on a Single Phase transformer
11. Sumpner's test on two identical transformers
12. Estimation of efficiency of DC Machine by Hopkinson test.

Note : Atleast 10 experiments should be conducted in the Semester.

EE 332

CONTROL SYSTEMS LAB

(Common to IE & EEE)

Instruction	3	Periods per week
Duration of University Examination	3	Hours
University Examination	50	Marks
Sessional	25	Marks

List of Experiments:

1. Characteristics of D.C. and A.C. Servo motors.
2. Characteristics of Synchro Pair.
3. Frequency response of compensating networks.
4. Step response of second order system.
5. D.C.Positon Control System.
6. A.C.position Control System.
7. Closed loop P, PI and PID Controller.
8. Step response and Frequency response of a given plant.
9. Design of lag and lead compensation for the given plant.
10. ON/OFF Temperature Control systems.
11. Temperature control system.
12. Level Control system

Note : Atleast 10 experiments should be conducted in the Semester.

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IIIrd YEAR
(ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER - II

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L/T	D/P		Univ. Exam	Sessionals
		THEORY					
1.	EE 351	Digital Signal Processing	4	-	3	75	25
2.	EE 352	Electrical Machinery - III	4/1	-	3	75	25
3.	EE 353	Switchgear and Protection	4	-	3	75	25
4.	EE 354	Microprocessor and Microcontrollers	4	-	3	75	25
5.	CM 371	Managerial Economics and Accountancy	4	-	3	75	25
		PRACTICALS					
1.	EE 381	Electrical Machines Lab-II	-	3	3	50	25
2.	EE 382	Power Electronics Lab	-	3	3	50	25
3.	EE 383	Integrated Circuits Lab	-	3	3	50	25
4.	EE 384	Industrial Visit	-	-	-	-	*Gr
		Total	**20/1**	**9**	**24**	**525**	**200**

Excellent / Very Good / Good / Satisfactory / Unsatisfactory

EE 351

DIGITAL SIGNAL PROCESSING

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Introduction to Digital Signal Processing: Classification of Signals & Systems. Linear shift invariant systems, stability and causality, Sampling of Continuous signals -Signal Reconstruction, quantizing & encoding, linear constant co-efficient difference equations, properties of discrete system-linearity.

UNIT-II

Fourier Analysis: Distinguishing Fourier transform of discrete singular & discrete Fourier transform, Discrete Fourier series, Phase and amplitude spectra, Properties of Discrete Fourier Transform, Linear Convolution of sequence using DFT, Frequency domain representation of discrete time system DTFT and DFT , Computation of DFT. Fast Fourier transform: Radix- 2 decimation in time and decimation in frequency FFT algorithms, Inverse FFT.

UNIT-III

Z- Transform: Application of Z- Transforms for solution of difference equations of digital filters system function -stability criterion, Realization of filters -direct, canonic. Cascade and parallel form, linear phase realization.

UNIT-IV

IIR Filters: Design of Butterworth Chebyshev filters, IIR filter design by impulse invariant bilinear transformation, impulse invariance method, step invariance method

UNIT-V

FIR Filters: Characteristics of FIR Digital Filters. Frequency response, comparison of FIR, IIR filters -Window techniques, Design of these filters,

using -Rectangular, Hamming, Bartlet, Kaiser windows, Architecture and features of TMS 320F/2047 and ADSP signal processing chips, Applications of DSP.

Suggested Reading:

1. P. VenkataRamani, M.Bhaskar, *"Digital Signal Processor: Architecture, Programming & Application "*, TataMcGrawHill-2004
2. Avatar Singh, S.Srinivasan, *"Digital Signal Processing"*, Thomson Publication, 2004.
3. Lafley, *"DSP Processing. fundamentals. architecture & feature"*. S Chand Publishers & Co. 2000
4. Jackson L.B. *"Digital Filters and Signal Processing"*. Second edition, Kluwer Academic Publishers. 1989
5. Oppenheim A V, and Schafer R. W. *"Digital Signal Processin"*, Prentice Hall Inc. 1975.

EE 352

ELECTRICAL MACHINERY - III

Instruction	4/1	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Synchronous Machines: Constructional Details, Types of windings – Winding factors -e.m.f. equation -Fractional pitch and fractional slot windings -Suppression of harmonics and tooth ripple -Armature reaction and reactance -Synchronous impedance.

UNIT-II

Synchronous Generator: Voltage Regulation -Phasor diagram of alternator with non-salient poles -O.C. and S.C characteristics – Synchronous impedance, Ampere turn, ZPF methods for finding regulation –Principle of two reaction theory and its application for the salient pole synchronous machine analysis -Synchronism and parallel operation.

UNIT-III

Synchronous Motor: Theory of operation- Vector diagram –Variation of current and p.f. with excitation -Hunting and its prevention –Current and power diagram Predetermination of performance –Methods of Starting and Synchronizing. Synchronizing Power. Synchronous Condenser.

UNIT-IV

Transient Stability Studies of Synchronous Machines: Elementary ideas of transient behavior of an Alternator -Three phase short circuit of an Alternator -Elementary ideas of the stability of synchronous machine connected to infinite Bus. Special Machines -Permanent Magnet Motors, Switched Reluctance Motors, Hysteresis Motors.

UNIT-V

Two phase servo motor characteristics- Single phase motors- Theory and operation of single phase motors-Shaded pole, Split phase and capacitor motors -Compensated and uncompensated series and repulsion motors. Linear Induction motors.

Suggested Reading:

1. I.J.Nagrath & D.P. Kothari, *Electrical Machines,* Tata McGraw IIill, 2004, 3rd ede.
2. S.K.Bhattacharya, *Electrical Machines,* Tata McGraw Hill, 2002.
3. P.S.Bhimbhra, *Generalized Theory of Electrical Machines,* Fifth Edition, Khanna Publishers, 1995,
4. M.G Say, *The Performance and Degin of A.C Machine,* Pitman Publications, 1985.

EE 353

SWITCHGEAR AND PROTECTION

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Introduction to protective relays, Need for protection, Backup protection, Zones of protection, Definitions of relay pickup, Dropout and reset values, Classification of relays, Operating principles and construction of electromagnetic and induction relays, Over current, Over voltage and power relays, Directional features, Universal relay torque equation. Over current protection for radial feeders and ring mains, Protection of parallel lines, Relay settings for over Current relays, Earth fault and phase fault protection.

UNIT-II

Static phase and Amplitude comparators, Characteristics of Dual input comparators, Distance protection, 3-step Distance relays, Characteristics Distance relays on the R-X diagram, Sampling comparator, static over current relay, Microprocessor based over current relaying.

UNIT-III

Transformer and generator protection, Different relays, Percentage differential relays, Protection of generator and transformer using percentage differential relays, Split phase, Inter turn protection, Overheating, Loss of excitation, Protection of generators, Protection of transformers against magnetizing inrush, Bucholz relay, Protection of earthing transformers, Generator transformer unit protection.

UNIT-IV

Circuit breakers, Need for circuit breakers, Arc Properties, Principles of arc quenching. Theories, Recovery and restricing voltages, Definitions in circuit breakers, Rated symmetrical and asymmetrical breaking current, Rated making current, Rated capacity, Voltage and Frequency of circuit

breakers, Auto reclosure, Duty cycle, Current chopping, Resistance switching, Derivations of RRRV, Maximum RRRV etc., Circuit breaker calculations, Types of circuit breakers, Oil, Poor oil, Air, Air blast, SF6 and Vacuum circuit breakers, Testing of circuit breakers.

UNIT-V

Over voltage protection, Protection of transmission lines against direct lightening strokes, Ground wires, Protection angle, Protection zones, Height of ground wire, Conductor clearances. Conductor heights, Tower footing resistance and its effects, Equipment protection assuming rod gaps, Arcing horns, Different types of lightening arrestors, Their construction, Surge absorbers, Peterson coil, Insulation co-ordination.

Suggested Reading:

1. C.L. Wadhwa, *Electrical Power System,* Wiley Eastern Ltd., 2nd Edition, 2003
2. Badriram and Viswakarma, *Power System Protection and Switchgear,* Tata McGraw Hill, 2004.
3. Sunil S. Rao, *Switchgear and Protection,* Khanna Publications, 2000.

EE 354

MICROPROCESSORS AND MICROCONTROLLERS

(Common to EEE & IE)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Microprocessor Architecture of 8086- Segmented memory, Addressing modes, Instruction set, Minimum and maximum mode operations.

UNIT-II

Assembly language programming, Assembler directive, simple programs using Assembler, stings, procedures, Macros, Timing.

UNIT-III

Memory and I/O interfacing, A/D and D/A interfacing, 8255(PPI) , Programmable interval Timer(8253), Keyboard and display interface, interrupts of 8086.

UNIT-IV

Microcontrollers-8051 microcontrollers, Architecture, I/O ports, Connecting external memory, Instruction set, Assembly language programming.

UNIT-V

Interrupts, serial I/O, Timers, Counters, Applications of microcontrollers-interfacing LEDs, Seven Segment display, keyboard interfacing.

Suggested Reading:

1. Douglas. V. Hall - *Microprocessors and Interfacing* - Tata McGraw Hill- Revised 2nd edition, 2006
2. Krishna Kant – *"Microprocessors and Microcontrollers-Architecture, programming and system design 8085, 8086, 8051, 8096",* Prentice-Hall india-2007
3. Kenneth. J. Ayala –*"The 8051 Microcontrollers Architecture, programming and Applications",* Thomson publishers, 2nd edition.
4. Walter A. Triebel & Avtar Singh- *The 8088 & 8086 Microprocessor-* Fourth edition, Pearson.
5. Myke Predko, *"Programming and Customizing the 8051 micro controller",* Tata-McGraw Hill, 3rd reprint 2002.

CM 371

MANAGERIAL ECONOMICS AND ACCOUNTANCY

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Meaning and Nature of Managerial Economics: Managerial Economics its usefulness to Engineers, Fundamental Concepts of Managerial Economics, Scarcity, Marginalism, Equi-marginalism, Opportunity costs, Discounting, Time Perspective, Risk and Uncertainty, Profits, Case study method.

UNIT-II

Consumer Behaviour: Law of Demand, Determinants, Kinds; Elasticity of Demand (Price, Income and Cross-Elasticity); Demand Forecasting, Law of Supply, Concept of Equilibrium. (Theory questions and small numerical problems can be asked).

UNIT-III

Theory of Production and Markets: Production Function, Law of Variable Proportion, ISO quants, Economics of Scale, Cost of Production (Types and their measurement), Concept of Opportunity Cost, Concept of Revenue, Cost-Output relationship, Break-Even Analysis, Price – Output determination under Perfect Competition and Monopoly (theory and problems can be asked).

UNIT-IV

Capital Management: Its significance, determination and estimation of fixed and working capital requirements, sources of capital, Introduction to capital budgeting, methods of payback and discounted cash flow methods with problems. (Theory questions are numerical problems on estimating working capital requirements and evaluation of capital budgeting opportunities can be asked).

UNIT-V

Book-keeping: Principles and significance of double entry book keeping, Journal, Subsidiary books, Ledger accounts Trial Balance, concept and preparation of Final Accounts with simple adjustments, Analysis and interpretation of Financial Statements through Ratios.

(Theory questions and numerical problems on preparation of final accounts, cash book, petty cash book, bank reconciliation statement, calculation of some ratios).

Suggested Reading:

1. Mehta P.L., "*Managerial Economics - Analysis, Problems and Cases*", Sulthan Chand & Son's Educational publishers, 2011.
2. Maheswari S.N. "*Introduction to Accountancy*", Vikas Publishing House, 2005.
3. Panday I.M. "*Financial Management*", Vikas Publishing House, 2009.

EE 381

ELECTRICAL MACHINES LAB - II

Instruction	3	Periods per week
Duration of University Examination	3	Hours
University Examination	50	Marks
Sessional	25	Marks

LIST OF EXPERIMENTS:

1. Three phase to Two phase conversion (Scott connection).
2. Heat run test on Three phase transformer.
3. No-load test blocked rotor test and load test on 3-phase Induction motor.
4. Speed control of Three phase Induction motor by any three of the Following.
   a. Cascade connection
   b. Rotor impedance control
   c. Pole changing
   d. Rotor slip recovery -Kramer drive
   e. V/f control.
5. Retardation Test, Dynamic Braking of DC Shunt Motors.

6. Performance characteristics of Single phase Induction motor.
7. Voltage regulation of Alternator by
   a. Synchronous impedance method
   b. Ampere-turn method.
   c. Z.P.F. Method.
8. Regulation of Alternator by slip test.
9. Determination of V curves and inverted V curves of synchronous motor.
10. Power angle characteristics of a synchronous motor.
11. Load characteristics of Induction Generator.
12. P.F Improvement of Induction motor using capacitors.

Note : Atleast 10 experiments should be conducted in the Semester.

WITH EFFECT FROM THE ACADEMIC YEAR 2012 - 2013

EE 382

POWER ELECTRONICS LAB

Instruction	3	Periods per week
Duration of University Examination	3	Hours
University Examination	50	Marks
Sessional	25	Marks

List of Experiments:

1. S.C.R, BJT MOSFET and IGBT Characteristics.
2. Gate Triggering circuits for SCR.BJT,MOSFET and IGBT using R,RC, UJT and IC's
3. Single Phase step down cyclo-converter with R and RL loads
4. A.C Voltage controllers with R and RL loads
5. Study of forced commutation techniques.
6. Two quadrant D.C.drive.
7. Bridge rectifiers-half control and full control with R and RL loads.
8. Simulation of Single Phase Full converter and Semi converter

9. Simulation of Single Phase and three phase Inverter
10. Buck and Boost choppers
11. Study of 1 KVA UPS and SMPS for variable voltage with constant load, Constant voltage with variable load.
12. V/f Control of AC drive.
13. Single phase inverter with R & RL load.

Note : Atleast 10 experiments should be conducted in the Semester.

WITH EFFECT FROM THE ACADEMIC YEAR 2012 - 2013

EE 383

INTEGRATED CIRCUITS LAB

(Common to IE & EEE)

Instruction	3	Periods per week
Duration of University Examination	3	Hours
University Examination	50	Marks
Sessional	25	Marks

LIST OF EXPERIMENTS:

1. Generation of triangular, sine and square wave using IC's.
2. PLL (Phase locked loop).
3. Design of a stable multivibrator using 555 timer.
4. Active filters.
5. Instrumentation amplifier —Sample and hold circuit.
6. Design of integrator and differentiator using Op-Amp.
7. Multiplexer —application for logic realization and parallel to serial Conversions.
8. Synchronous counters.
9. Asynchronous counters.
10. Clippers and clampers using Op-Amps.
11. Monostable operation using IC's.

12. Boot-strap sweep circuit using Op-Amp.
13. Half adder, full adder and subtractor and realization of combinational logic.
14. A/D converters.
15. D/ A converters.

Note : Atleast 10 experiments should be conducted in the Semester.

WITH EFFECT FROM THE ACADEMIC YEAR 2012 - 2013

EE 384

INDUSTRIAL VISIT / STUDY

Atleast 3 days in Semester — 3 x 8 = 24 hours
Sessional — Grade*

Students are expected to visit at least two industries during the semester and submit a detailed technical report on the study -visits to the Department. The Department should evaluate the reports through a Committee consisting of Head of the Department and two more faculty members to award the Grades.

****Excellent /Very Good/Good /Satisfactory /Unsatisfactory.***

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WITH EFFECT FROM THE ACADEMIC YEAR 2013 - 2014

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IV - YEAR
(ELECTRICAL & ELECTRONICS ENGINEERING)

SEMESTER - I

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1.	EE 401	Power System Operation and Control.	4	-	3	75	25
2.	EE 402	Electric Drives and Static Control.	4	-	3	75	25
3.	EE 403	Electrical Machine Design.	4	-	3	75	25
4.		ELECTIVE - I	4	-	3	75	25
		PRACTICALS					
1.	EE 431	Electrical Simulation Lab.	-	3	3	50	25
2.	EE 432	Microprocessors and Microcontrollers Lab	-	3	3	50	25
3.	EE 433	Power Systems Lab	-	3	3	50	25
4.	EE 434	Project Seminar	-	3	3	-	25
		Total	**16**	**12**	**24**	**450**	**200**

ELECTIVE – I

EE 411 High Voltage DC Transmission
EE 412 High Voltage Engg.
EE 413 Power Quality
EE 414 Nuclear Energy
ME 411 Entrepreneurship
CS 403 Information Security
CS 467 Embedded Systems