M.D. UNIVERSITY, ROHTAK
Scheme of studies & Examination
Bachelor of Technology (Electrical & Electronics Engg.)
SEMESTER V
'F ' Scheme Effective from 2011–2012

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
EE-311-F	Electrical Machines-II (EE, EEE)	3	1	-	4	50	100	-	150	3
EE-303-F	Electronic Measurement And Instrumentation (EE,EEE,ECE,IC)	3	1	-	4	50	100	-	150	3
EE-305-F	Analog Electronics Circuits (EE,EEE,ECE,IC)	3	1	-	4	50	100	-	150	3
EE-315-F	Power Systems-I (EE, EEE)	3	1	-	4	50	100	-	150	3
EE-317-F	Power Electronics (EE, EEE, Common with VI sem IC)	3	1	-	4	50	100	-	150	3
EE-309-F	Microprocessors And Interfacing (EE,EEE,ECE,IC)	3	1	-	4	50	100	-	150	3
EE-323-F	Electronic Measurement & Instrumentation Lab (EE,EEE,ECE,IC)	-	-	2	2	25	-	25	50	3
EE-321-F	Power Electronics Lab. (EE, EEE Common with VI sem , IC)	-	-	2	2	25	-	25	50	3
EE-319-F	Microprocessor & Interfacing Lab. (EE,EEE,ECE,IC)	-	-	2	2	25	-	25	50	3
EE-327-F	Electrical Machines-II LAB. (EE, EEE)	-	-	3	3	25	-	25	50	3
EE-333-F	Practical Training-I	-	-	2	2		-	-		-
	TOTAL	**18**	**6**	**11**	**35**	**400**	**600**	**100**	**1100**	

Note:

1) **Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.**
2) **Assessment of Practical Training-I, undergone at the end of IV semester, will be based on seminar, viva-voce, report and certificate of practical training obtained by the student from the industry. According to performance letter grades A, B, C, F are to be awarded. A student who is awarded 'F' grade is required to repeat Practical Training.**

EE-311-F **ELECTRICAL MACHINES - II**

L	T	P
3	1	-

Theory : 100 Marks
Class work : 50 Marks
Total : 150 Marks
Duration of Exam : 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

Poly-phase Induction Machine: Constructional features, production of rotating field, induction motor action, torque production, testing, development of equivalent circuit, performance characteristics, circle diagram, starting methods, methods of speed control - stator voltage control, stator resistance control, frequency control, rotor resistance control, slip power recovery control. double cage and deep bar motors. grid excited and self excited induction generators.

Section-B

Single phase Induction Motors: Double revolving field theory, cross field theory, different types of single phase induction motors, circuit model of single phase induction motor.

Section-C

Synchronous Generator: Principle, construction of cylindrical rotor and salient pole machines, winding, EMF equation, Armature reaction, testing, model of the machine, regulation -- synchronous reactance method, Rothert's mmf method, Potier triangle method. Output power equation, power angle curve, two reactance theory, slip test, transient and sub-transient reactances, synchronization, parallel operation.

Section-D

Synchronous Motor: Principles of synchronous motor, power angle curve, V-curve, starting, damper winding, synchronous condenser, applications.

TEXT BOOKS:

1. Electric Machines**:** I.J.Nagrath and D.P. Kothari, TMH, New Delhi.
2. Electric Machinery, Fitzgerald and Kingsley, MGH.
3. Electrical Machines, P.S. Bhimbra, Khanna Publishers Delhi

REF. BOOKS:

1. Theory of alternating current machinery: A.S. Langsdorf (TMH)
2. Generalized theory of Electrical Machines: P.S. Bhimbra(Khanna Pub.)

EE-303-F ELECTRONIC MEASUREMENT AND INSTRUMENTATION

L	T	P
3	1	-

Theory : 100 Marks
Class work : 50 Marks
Total : 150 Marks
Duration of Exam : 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

OSCILLOSCOPE:

Block diagram, study of various stages in brief, high frequency CRO considerations. Sampling and storage oscilloscope.

GENERATION & ANALYSIS OF WAVEFORMS:
Block diagram of pulse generators, signal generators, function generators wave analysers, distortion analysers, spectrum analyser, Harmonic analyser, introduction to power analyser.

Section-B

ELECTRONIC INSTRUMENTS:
Instruments for measurement of voltage, current & other circuit parameters, Q-meters, R.F. power measurements, introduction to digital meters.
FREQUENCY & TIME MEASUREMENT:
Study of decade counting Assembly(DCA), frequency measurements, period measurements, universal counter, introduction to digital meters.

Section-C

DISPLAY DEVICES:

Nixie tubes, LED's LCD's, discharge devices.
TRANSDUCERS:
Classification, Transducers of types: RLC photocell, thermocouples etc. basic schemes of measurement of displacement, velocity, acceleration, strain, pressure, liquid level & temperature.

Section-D

INTRODUCTION TO SIGNAL CONDITIONING:
DC signal conditioning system, AC signal conditioning system, data acquisition and conversion system

TEXT BOOK:

1. A course in Electrical & Electronics Measurements & Instrumentation : A.K.Sawhney; Dhanpat Rai & Sons.

REFERENCE BOOKS.

1. Electronics Instrumentation & Measurement Techniques : Cooper; PHI.

EE-305-F **ANALOG ELECTRONIC CIRCUITS**

L	T	P
3	1	-

Theory : 100 Marks
Class work : 50 Marks
Total : 150 Marks
Duration of Exam : 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

SINGLE AND MULTISTAGE AMPLIFIERS:
Classification of amplifiers, distortion in amplifiers, frequency response of an amplifier, step response of an amplifier, pass-band of cascaded stages, RC-coupled amplifier, low frequency response of RC coupled stage, effect of an emitter bypass capacitor on low Frequency response, multistage CE amplifier .
FEEDBACK AMPLIFIERS :
Feedback concept, transfer gain with feedback, general characteristics of negative feedback amplifiers, input resistance, output resistance, voltage series feedback, current series feedback, current shunt feedback, voltage shunt feedback.

Section-B

OSCILLATORS:
Sinusoidal oscillators, Barkhausen criteria, R-C phase shift oscillator, generalform of oscillator circuit, wien-bridge oscillator, crystal oscillator.

Section-C

POWER AMPLIFIERS:
Class A, B, and C operations; Class A large signal amplifiers, higher order harmonic distortion, efficiency, transformer coupled power amplifier, class B amplifier : efficiency & distortion; class A and class B push-pull amplifiers; class C power amplifier.
OPERATIONAL AMPLIFIERS :
Ideal and practical operational amplifiers, inverting and non-inverting amplifier, differential amplifier, emitter coupled differential amplifier, transfer characteristics of a differential amplifier, offset error : voltage and current, common mode rejection ratio (CMRR) .

Section-D

LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS :
Scale changer, phase shifter, adder, voltage to current converter, current to voltage converter, DC voltage follower, Bridge amplifier, AC coupled amplifier, AC voltage follower, Integrator, differentiator.

NON-LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS :
Comparators, sample & hold circuits, Logarithmic amplifier, anti-log amplifier, logarithmic multiplier, waveform generators , Miller & Bootstrap sweep generators, regenerative comparator (Schmitt Trigger), multivibrators, ADC.

TEXT BOOK:
1. Agarwal - Foundations & Analog & digital electronics, Elsevier

2. Integrated Electronics: Milman Halkias, TMH.
3. Microelectronic Circuits : Sedra & Smith.

REFERENCE BOOKS:

1. Operational Amplifiers:Gaikwad
2. Electronic Circuit Analysis and Design (Second edition) : D.A.Neamen; TMH

EE-315-F **POWER SYSTEMS-I**

L	T	P
3	1	-

Theory : 100 Marks
Class work : 50 Marks
Total : 150 Marks
Duration of Exam : 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

REPRESENTATION OF POWER SYSTEM COMPONENTS: Introduction, Single-phase representation of balance three-phase network, The one-line diagram and the impedance or reactance diagram, Per unit (PU) system, Complex power, The steady state model of synchronous machine, Power transformer, Transmission of electric power, System protection, Representation of loads.

Section-B

LOAD FLOW STUDIES: Introduction, Network model formulation, Formation of YBUS by singular transformation, Load flow problem, Gauss-siedel method, Newton-Raphson method, Decoupled load flow studies, Comparison of load flow methods, Control of voltage profile.

Section-C

OPTIMAL SYSTEM OPERATION: Introduction, Optimal operation of generators on a bus bar, Optimal unit commitment (UC), Reliability considerations, Optimal generation scheduling, Optimal load flow solution, Optimal scheduling of hydrothermal system.

Section-D

AUTOMATIC GENERATION AND VOLTAGE CONTROL: Introduction, Load frequency control (single area case), Load frequency control and economic dispatch control, Two- area load frequency control, Optimal (two-area) load frequency control, Automatic voltage control.

TEXT BOOK:

Power System Engineering – DP Kothari, I J Nagrath, Tata McGraw Hill
Electrical Power system by C L Wadhwa
Power system Engineering by P. Kundur
Tleis - Power systems analysis using Fault tolerance systems,Elsevier
A Course in Electrical Power: Gupta, Soni & Bhatnagar (Dhanpat Rai & Sons).

REF. BOOKS:

1. Elements of power system analysis: W.D.Stevenson (MGH)
2. Electric Power: S.L.Uppal (Khanna Pub.)
3. Electrical power: J.B.Gupta (S.K.Kataria & Sons).
4. Power System Engineering: B. R. Gupta.

5. Electric Power System: B.M.Weedy, John Wiley & Sons.
6. Transmission & Distribution of Electrical Engineering: H.Cotton.
7. Transmission & Distribution of Electrical Engineering: Westing House & Oxford Univ. Press, New Delhi.
8. Transmission & Distribution of Electrical Engineering: Westing House & Oxford Univ. Press, New Delhi.

EE-317-F **POWER ELECTRONICS**

L	T	P
3	1	-

Theory : 100 Marks
Class work : 50 Marks
Total : 150 Marks
Duration of Exam : 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

INTRODUCTION :
Role of power electronics, review of construction and characteristics of power diode, Shottky diode, power transistor, power MOSFET, SCR, DIAC, Triac, GTO, IGBT & SIT.
SCR:
Ratings and protections, series and parallel connections, R, RC and UJT firing circuit and other firing circuits based on ICs and microprocessors; pulse transformer and opto-coupler, commutation techniques.

Section-B

AC REGULATORS:
Types of regulator, equation of load current, calculation of extinction angle, output voltage equation, harmonics in load voltage and synchronous tap changer, three phase regulator.
CONVERTERS :
One, two, three, six and twelve pulse converters, fully and half controlled converters, load voltage waveforms, output voltage equation, continuous and discontinuous modes of operation, input power factor of converter, reactive power demand, effect of source inductance, introduction to four quadrant / dual converter, power factor improvement techniques, forced commutated converter, MOSFET and transistor based converters.

Section-C

INVERTERS :
Basic circuit, 120 degree mode and 180 degree mode conduction schemes, modified McMurray half bridge and full bridge inverters, McMurray -Bedford half bridge and bridge inverters, brief description of parallel and series inverters, current source inverter (CSI), transistor and MOSFET based inverters.
CHOPPERS :
Basic scheme, output voltage control techniques, one, two, and four quadrant choppers, step up chopper, voltage commutated chopper, current commutated chopper, MOSFET and transistor based choppers.

Section-D

CYCLOCONVERTERS :
Basic principle of frequency conversion, types of cycloconverter, non-circulating and circulating types of cycloconverters.
DRIVES:

Introduction to electric drives: DC drives – converter and chopper fed dc drives, ac drives - stator voltage control, V/f control, rotor resistance control, static Scherbius system and static Kramer systems.

TEXT BOOK:

1. Power Electronics: P.S Bhimra
2. Power Electronics : MH Rashid; PHI
3. Bose - Power electronics,Elsevier

REFERENCE BOOKS :

1. Rashid - Handbook of power electronics,Elsevier
2. Power Electronics : PC Sen; TMH
3. Power Electronics : HC Rai; Galgotia
4. Thyristorised Power Controllers : GK Dubey, PHI
5. Power Electronics and Introduction to Drives : A.K.Gupta and L.P.Singh;Dhanpat Rai

EE-309-F **MICROPROCESSORS AND INTERFACING**

L	T	P		
3	1	-	Theory	: 100 Marks
			Class work	: 50 Marks
			Total	: 150 Marks
			Duration of Exam	: 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section A

THE 8085 PROCESSOR :
Introduction to microprocessor, 8085 microprocessor : Architecture, instruction set, interrupt structure, and
Assembly language programming.

Section B

THE 8086 MICROPROCESSOR ARCHITECTURE :
Architecture, block diagram of 8086, details of sub-blocks such as EU, BIU; memory segmentation and physical address computations, program relocation, addressing modes, instruction formats, pin diagram and description of various signals

Section C

INSTRUCTION SET OF 8086 :
Instruction execution timing, assembler instruction format, data transfer instructions, arithmetic instructions,
branch instructions, looping instructions, NOP and HLT instructions, flag manipulation instructions, logical
instructions, shift and rotate instructions, directives and operators, programming examples.

Section D

INTERFACING DEVICE :

8255 Programmable peripheral interface, interfacing keyboard and seven
segment display, 8254 (8253) programmable interval timer, 8259A
programmable interrupt controller, Direct Memory Access and 8237 DMA controller.

TEXT BOOKS :
1. Microprocessor Architecture, Programming & Applications with 8085 : Ramesh S Gaonkar; Wiley Eastern Ltd.
2. The Intel Microprocessors 8086- Pentium processor : Brey; PHI

REFERENCE BOOKS:
1. Microprocessors and interfacing : Hall; TMH
2. The 8088 & 8086 Microprocessors-Programming, interfacing,Hardware & Applications :Triebel & Singh; PHI
3. Microcomputer systems: the 8086/8088 Family: architecture, Programming & Design : Yu-Chang Liu & Glenn A Gibson; PHI.
4. Advanced Microprocessors and Interfacing : Badri Ram; TMH

EE-323-F ELECTRONIC MEASUREMENT AND INSTRUMENTATION-LAB

L T P			
0 0 2	CLASS WORK	:	25 Marks
	EXAM	:	25 Marks
	TOTAL	:	50 Marks
	DURATION OF EXAM	:	3 HRS

LIST OF EXPERIMENTS:

1) Study blocks wise construction of a analog oscilloscope & Function generator.
2) Study blocks wise construction of a Multimeter & frequency counter.
3) Study Measurement of different components & parameters like Q of a coil etc using LCRQ meter.
4) Study of distortion factor meter and determination of the % distortion of the given oscillator
5) Determine output characteristics of a LVDT and Measure displacement using LVDT
6) Study characteristics of temperature transducer like Thermocouple, Thermistor & RTD with implementation of a small project using signal conditioning circuits like instrumentation amplifier.
7) Measurement of Strain using Strain Guage.
8) To study differential pressure transducer & signal conditioning of output signal.
9). Measurement of level using capacitive transducer..
10) Study of Distance measurement using ultrasonic transducer.

Note: Any Eight Experiments should performed from above list and two experiments can be suitably chosen on the contemporary topics

EE-321-F **POWER ELECTRONICS-LAB**

L T P			
0 0 2	CLASS WORK	:	25 Marks
	EXAM	:	25 Marks
	TOTAL	:	50 Marks
	DURATION OF EXAM	:	3 HRS

LIST OF EXPERIMENTS:

1. Static Characteristics of Power diode & Shottky diode and to study reverse recovery of Power Diode & Shottky diode.
2. Characteristics of IGBT & GTO
3. To study R, RC and UJT firing Circuit with Pulse transformer
4. To study of Firing Circuit based on ICs NE555, 7408 & 3140
5. To Study of Pulse transformer & optocoupler technique
6. To Study of SCR Communication Technique Class A-E.
7. Speed control of small motor using Single Phase Half wave & Full wave fully controlled Converter
8. Speed control of small motor using Single Phase Dual Converter (Continuous and discontinuous Control)
9. Study of Mc Murray - Bed ford Half & Full Bridge Inverter
10. To study Parallel Inverter to drive small AC Induction motor
11. Speed control of a small DC motor using MOSFET based Chopper with output voltage control technique
12. Speed control of small AC induction motor using Single Phase non circulating type bridge by frequency conversion.

EE-319-F MICROPROCESSOR & INTERFACING LAB.

L T P			
0 0 2	CLASS WORK	:	25 Marks
	EXAM	:	25 Marks
	TOTAL	:	50 Marks
	DURATION OF EXAM	:	3 HRS

List of Experiment

ANY TEN EXPERIMENTS SHOULD BE PERFORMED:

1. Write a program using 8085 for Hexadecimal addition & subtraction of two numbers.
2. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers
3. Write a program to perform multiplication and division of two 8 bit numbers using 8085
4. Write a program using 8086 for division of a defined double word (stored in a data segment) by another double Word division and verify.
5. Write a program using 8086 for finding the square root of a given number and verify.
6. Write a program using 8086 to copy 12 bytes of data from source to destination & verify.
7. Write a program to find maximum and minimum from series using 8086.
8. Write a program to initiate 8251 and to check the transmission and reception of character.
9. Write a program to interface ADC & DAC with 8085 & demonstrate generation of square wave.
10. Write a program to control the operation of stepper motor using 8085/8086 and 8255 PPI.
11 Write a program to interface 8X8 LED Matrix Display using 8085/8086 microprocessors and 8255 PPI.
12. Write a program to control the traffic light system using 8085/8086 and 8255 PPI.
13. Write a program to control simulated elevator 8085/8086 microprocessors and 8255 PPI.

EE-327-F **ELECTRICAL MACHINES-II LAB**

L T P			
0 0 2	CLASS WORK	:	25 Marks
	EXAM	:	25 Marks
	TOTAL	:	50 Marks
	DURATION OF EXAM	:	3 HRS

List of Experiments:

1. Study of the No Load and Block Rotor Test in a Three Phase Slip Ring Induction Motor & draw its circle diagram

2. To Study the Starting of Slip Ring Induction Motor by Rotor Resistance Starter.

3. To Study and Measure Direct and Quadrature Axis Reactance of a 3 phase alternator by Slip Test

4. To Study and Measure Positive, Negative and Zero Sequence Impedance of a Alternator

5. To Study and Measure Synchronous Impedance and Short circuit ratio of Synchronous Generator .

6. Study of Power (Load) sharing between two Three Phase alternators in parallel operation condition

7. Synchronization of two Three Phase Alternators, by

a) Synchroscope Method
b) Three dark lamp Method
c) Two bright one dark lamp Method

8. To plot V- Curve of synchronous motor.

9. To study and verify Load characteristics of Long Shunt & short shunt Commutatively Compound Generator using 3 phase induction motor as prime mover.

10. To perform O.C. test on synchronous generator. And determine the full load regulation of a three phase synchronous generator by synchronous impedance method

NOTE: At least 10 experiments are to be performed, with at least 7 from above list, remaining three may either be performed from above list or designed & set by concerned institution as per scope of syllabus.

EE-333-F **PRACTICAL TRAINING – I**

L T P
- - 2

At the end of fourth semester each student would undergo six weeks practical training in an industry/Professional organization/research laboratory with the prior approval of the Director Principal/Principal of the concerned college and submit a written typed report along with a certificate from the organization. The record will be evaluated by a board of examiners to be appointed by the Director- Principal/Principal of the concerned college during V Sem. who will award one of the following grades:

Excellent	:	A
Good	:	B
Satisfactory	:	C
Non – Satisfactory	:	F

A student who has been awarded 'F' grade will be required to repeat practical training even after eighth semester.

M.D UNIVERSITY,ROHTAK
SCHEME OF STUDIES AND EXAMINATION
B.Tech. III YEAR (ELECTRICAL & ELECTRONICS ENGINEERING)
SEMESTER - VI
Modified 'F' Scheme effective from 2011-12

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
EE-312-F	Power Systems –II (EE, EEE)	3	1	-	4	50	100	-	150	3
EE-314-F	Computer Added Electric Machines Design (EE, EEE)	3	1	-	4	50	10 0	-	150	3
EE-306-F	VLSI Design	3	1	-	4	50	100	-	150	3
EE-304-F	Control systems engg. (EE, EEE,ECE)	3	1	-	4	50	100	-	150	3
EE-318-F	Electric Power Generation (EE, EEE)	3	1	-	4	50	100	-	150	3
EE-344-F	Transmission Lines And Networks	3	1	-	4	50	100	-	150	3
EE-324-F	Control system engg. Lab (EE, EEE,ECE)	-	-	2	2	25	-	25	50	3
EE-330-F	VLSI Design Lab	-	-	2	2	25	-	25	50	3
EE-326-F	Computer Added Electric Machines Design Lab (EE, EEE)	-	-	2	2	25	-	25	50	3
EE-328-F	Power Systems Lab (EE, EEE)	-	-	2	2	25	-	25	50	3
GPEE-302-F	General Proficiency	-	-	-	-	50	-	-	50	3
	TOTAL	**18**	**6**	**8**	**32**	**450**	**600**	**100**	**1150**	

1. **Each student has to undergo practical training of 6 weeks during summer vacation and its evaluation shall be carried out in the VII semester.**
2. **Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.**

EE-312-F **POWER SYTEMS - II**

L	T	P
3	1	-

Theory : 100 Marks
Class work : 50 Marks
Total : 150 Marks
Duration of Exam : 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

SYMMETRICAL FAULT ANALYSIS: Transients on a transmission line, short circuit of synchronous machine at no load and on full load.

SYMMETRICAL COMPONENTS: Symmetrical component transformation, phase shift in star-delta transformation, sequence impedances.
UNSYMMETRICAL FAULT ANALYSIS: Single line to ground fault, line to line fault, double line to ground fault, open conductor fault.

Section-B

CIRCUIT BREAKERS: Theory of arc interruption, circuit breaker, circuit breaker ratings, restriking voltage transients, current chopping, duties of switch gear, automatic switch, air circuit breaker, bulk oil, minimum oil, air blast, SF6 CB, vacuum and DC circuit breakers.
APPARATUS PROTECTION: Transformer, generator, motor and bus zone protection.

Section-C

PROTECTIVE RELAYS: Nature and causes of faults, consequences, zone of protection, essential qualities, primary and backup protections, relay classification, principal types of electromagnetic relays, i.e. attracted armature, induction disc, induction cup types.
RELAY APPLICATION AND CHARACTERISTICS: Over -current, instantaneous over current, IDMT, directional and differential relays, distance relays, plain impedance, mho, reactance, offset mho type, transmission line & feeder protection, introduction, over current, distance, pilot wire and carrier current protection, neutral grounding.

Section-D

STATIC & DIGITAL RELAYS: Classification of static relays, amplitude and phase comparators, block-spike and block-average comparators , rectifier type relays. Introduction to digital relay: basic principles. Application of microprocessors and computers - recent Trends. Travelling wave relay, relaying schemes based on microwave and optical fiber link.

TEXT BOOKS:

1. Power System protection and switchgear –B.Ram, D.N.Vishvakarma : TMH.
2. Switchgear and protection - S.S.Rao : Khanna Pub.

REF. BOOKS:

1. Protective Relays -Their Theory and Practice Vol.I & II: W.Van Warrington.
2. Advanced power system analysis and dynamics: L.P.Singh, Wiley Eastern N.Delhi.
3. Digital Protection : Protective relay from Electro Mechanical to Microprocessor-L.P.Singh,Wiley Eastern.
4. Power System Protection and Switchgear -B.Ravinder Nath and M.Chander, Wiley Eastern,N.Delhi.
5. A course in Electrical Power - Soni, Gupta and Bhatnagar - Dhanpat Rai & Sons.
6. Power System Engg: I.J. Nagrath and D.P. Kothari(TMH).
7. Power System Engineering: V. K. Mehta.

EE-314-F COMPUTER ADDED ELECTRIC MACHINES DESIGN

L	T	P		
3	1	-	Theory	: 100 Marks
			Class work	: 50 Marks
			Total	: 150 Marks
			Duration of Exam	: 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

GENERAL: General features and limitations of electrical machine design. Types of enclosures, heat dissipation, temperature rise heating and cooling cycles and ratings of machine machines. Cooling media used.

BASIC DESIGN PRINCIPLES: Output equation and output coefficient, Specific electric and magnetic loading. Effect of size and ventilation.

Section-B

MAGNETIC CIRCUITS: MMF calculation for airgun and iron parts of electrical machines, gap contraction coefficient. Real and apparent flux densities. Estimation of magnet current of transformers and rotating machines, no load current of transformers and induction motors. Leakage flux and reactance calculations for transformers and rotating machines, Design of field magnet.

Section-C

DETAILED DESIGN: Design of transformer, D.C. machines induction motor and synchronous machine and their performance calculations.

Section-D

COMPUTER AIDED DESIGN: Computerization of design Procedures. Development of Computer program and performance prediction. Optimization techniques and their applications to design Problems.

TEXT BOOKS:

1. A course in Electrical Machine Design by A.K. Sawhney, Khanna Pub.

REFERENCE BOOKS:

1. Theory, performance and Design of alternating current machines by MG Say, ELBS, 15th Ed. 1986.
2. Theory, Performance and Design of Direct Current machines by A.E. Clayton, 3rd Ed. 1967.
Optimization Techniques, S.S. Rao

EE-306-F **VLSI DESIGN**

L	T	P		
3	1	-	Theory	: 100 Marks
			Class work	: 50 Marks
			Total	: 150 Marks
			Duration of Exam	: 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory
and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common
question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions
out of 9 questions.

Section-A

BASIC MOS TRANSISTOR : Enhancement mode & Depletion mode – Fabrication (NMOS, PMOS, CMOS, BiCMOS) Technology – NMOS transistor current equation – Second order effects – MOS Transistor Model.

Section-B

NMOS & CMOS INVERTER AND GATES : NMOS & CMOS inverter – Determination of pull up / pull down ratios – Stick diagram – Lamda based rules – Super buffers – BiCMOS & steering logic.

Section-C

SUB SYSTEM DESIGN & LAYOUT: Structured design of combinational circuits – Dynamic CMOS & clocking – Tally circuits – (NAND-NAND, NOR-NOR and AOI logic) – EXOR structure – Multiplexer structures – Barrel shifter.

Section-D

DESIGN OF COMBINATIONAL ELEMENTS & REGULAR ARRAY LOGIC : NMOS PLA – Programmable Logic Devices - Finite State Machine PLA – Introduction to FPGA**.**

VHDL PROGRAMMING: RTL Design – Combinational logic – Types – Operators – Packages – Sequential circuit – Sub-programs – Test benches. (Examples: address, counters, flipflops, FSM, Multiplexers / De-multiplexers).

TEXT BOOKS

1. D.A.Pucknell, K.Eshraghian, 'Basic VLSI Design', 3rd Edition, Prentice Hall of India, New Delhi, 2003.
2. Introduction to Digital Integrated Circuits : Rabaey,Chandrakasan & Nikolic.
3. Principles of CMOS VLSI Design : Neil H.E. Weste and Kamran Eshraghian; Pearson.

REFERENCE BOOKS

1. N.H.Weste, 'Principles of CMOS VLSI Design', Pearson Education, India, 2002
2. VLSI Technology: S.M. Sze; McGraw-Hill.

EE-304-F **CONTROL SYSTEM ENGINEERING**

L	T	P
3	1	-

Theory : 100 Marks
Class work : 50 Marks
Total : 150 Marks
Duration of Exam : 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

INTRODUCTORY CONCEPTS :System/Plant model, types of models, illustrative examples of plants and their inputs and outputs, controller servomechanism, regulating system, linear time-invariant (LTI) system, time-varying system, causal system, open loop control system, closed loop control system, illustrative examples of open-loop and feedback control systems, continuous time and sampled data control systems. Effects of feedback on sensitivity (to parameter variations),stability, external disturbance (noise), overall gain etc. Introductory remarks about non-linear control systems.

Section-B

MATHEMATICAL MODELLING : Concept of transfer function, relationship between transfer function and impulse response, order of a system, blockdiagram algebra, signal flow graphs : Mason's gain formula & its application, characteristic equation, derivation of transfer functions of electrical and electromechanical systems. Transfer functions of cascaded and non-loading cascaded elements. Introduction to state variable analysis and design.

Section-C

TIME DOMAIN ANALYSIS : Typical test signals, time response of first order systems to various standard inputs, time response of 2nd order system to step input, relationship between location of roots of characteristics equation, w and wn, time domain specifications of a general and an under-damped 2nd order system, steady state error and error constants, dominant closed loop poles, concept of stability, pole zero configuration and stability, necessary and sufficient conditions for stability Hurwitz stability criterion Routh stability criterion and relative stability. Root locus concept, development of root loci for various systems, stability considerations..

Section-D

FREQUENCY DOMAIN ANALYSIS , COMPENSATION & CONTROL COMPONENT :Relationship between frequency response and time-response for 2nd order system, polar, Nyquist, Bode plots, stability, Gain-margin and Phase Margin, relative stability, frequency response specifications.

Necessity of compensation, compensation networks, application of lag and lead compensation, basic modes of

feedback control, proportional, integral and derivative controllers, illustrative examples.
Synchros, AC and DC techo-generators, servomotors, stepper motors, & their applications, magnetic amplifier.

TEXT BOOK :

1. . Control Systems :Anuj Jain & Naveen mehra vayu education
2.Control Systems - Principles & Design : Madan Gopal; Tata Mc Graw Hill.
3. Control System Engineering : I.J.Nagrath & M.Gopal; New Age

REFERENCE BOOKS :

1. Automatic Control Systems : B.C.Kuo, PHI.
2. Modern Control Engg : K.Ogata; PHI.

EE-318-F ELECTRICAL POWER GENERATION

L	T	P		
3	1	-	Theory	: 100 Marks
			Class work	: 50 Marks
			Total	: 150 Marks
			Duration of Exam	: 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section-A

INTRODUCTION: Energy sources, their availability, Recent trends in Power Generation, Interconnected Generation of Power Plants.

Section-B

POWER GENERATION PLANNING: Load forecasting, load curves, load duration curve, Base load and Peak load Power Plants, connected Load, maximum demand, demand factor, Group diversity factor, load factor, significance of load factor, plant factor, capacity factor, selection of unit size, No. of Units, reserves, cost of power generation, Depreciation, tariff.

Section-C

CONVENTIONAL ENERGY SOURCES: Selection of site, capacity calculations, classification, Schematic diagram and working of Thermal Power Stations, Hydro Electric Plant, Nuclear Power Plant and Diesel Power Stations.
NON-CONVENTIONAL ENERGY SOURCES: Wind, Solar, Tidal, Ocean, and Geothermal sources of Energy, fuel cell, Magneto Hydro Dynamic (MHD) system.

Section-D

ELECTRIC ENERGY CONSERVATION & MANAGEMENT: Energy management, Energy Audit, Energy Efficient Motors, Co-generation.

TEXT BOOKS:
1. Electric Power Generation, B.R.Gupta
2. Power Generation, Operation and Control, Wood and Wollenberg, John Wiley & Sons,1984.

REF. BOOKS:
1. A Course in Electric Power System, Soni, Gupta, Bhatnagar, Dhanpat Rai & Sons
2. Power System Engineering, Nagrath & Kothari, Tata Mc-Graw Hill, New Delhi
3. Power Plant Engg: G.D. Rai
4. Electric Power: S.L. Uppal (Khanna Publishing)

EE-344-F TRANSMISSION LINES AND NETWORKS

L	T	P		
3	1	-	Theory	: 100 Marks
			Class work	: 50 Marks
			Total	: 150 Marks
			Duration of Exam	: 3 Hours

NOTE: For setting up the question paper, Question No. 1 will be set up from all the four sections which will be compulsory and of short answer type. Two questions will be set from each of the four sections. The students have to attempt first common question, which is compulsory, and one question from each of the four sections. Thus students will have to attempt 5 questions out of 9 questions.

Section A

INTRODUCTION

Fundamental quantities; Primary Constants of Transmission line; loop Inductance; Shunt Capacitance; loop Resistance; Skin effect; Transmission line equations; characteristic Impedance; Propagation Constant; Computation of Primary and Secondary Constants.

OPEN, SHORT AND TERMINATED LINES

Reflected and incident waves; standing waves in open and short-circuited lines; Input Impedance of open and short-circuited lines; Transmission lines as circuit Elements; Input Impedance of terminated lines; Reflection Co-efficient; Standing wave Ratio; Reflection loss due to mismatching; Efficiency.

Section B

POWER LINES

Transmission of Electrical Energy; Overhead transmission lines; Characteristics of low frequency transmission lines, Effect of length; calculation of Inductance, Capacitance; circle diagram, Receiving-end power diagrams, sending-end power diagram;

Section C

TRANSMISSION LINES MEASUREMENTS

The Measurement of standing wave Ratio, Wavelength, Impedance, Power and Reflection Co-efficient; Special Impedance Measuring methods; Measurement of standing waves in wave guides; Measurement of Insertion loss.

Section D

EQUALIZERS AND FILTERS

Classification of Equalizers; Inverse Impedance and inverse Network; full series Equalizer, full shunt Equalizer and Bridge – T Equalizer; Lattice Equalizer; Characteristics of Equalizers; Equalizer for Transmission for Digital Data; Active Filters, First order and second order Butterworth filter; universal active filters.

ATTENUATORS:

Symmetrical Attenuators, Symmetrical T-Attenuator, Π-Attenuator, Bridged T-Attenuator, Lattice Attenuators; A Symmetrical T-Attenuator, L-Attenuator, Π-Attenuator; Minimum loss Attenuator, Attenuator for variable load; Balanced and unbalanced Attenuators; Ladder Attenuators.

TEXT BOOKS:

Transmission Lines and Networks by UMESH SINHA, Satya Prakashan.

EE-324-F **CONTROL SYSTEM LAB**

L T P			
0 0 2	CLASS WORK	:	25
	EXAM	:	25
	TOTAL	:	50
	DURATION OF EXAM	:	3 HRS

LIST OF EXPERIMENTS:

1. To study speed Torque characteristics of
   a) A.C. servo motor
   b) DC servo motor .
2. (a) To demonstrate simple motor driven closed loop DC position control system.
   (b) To study and demonstrate simple closed loop speed control system.
3. To study the lead, lag, lead-lag compensators and to draw their magnitude and phase plots .
4. To study a stepper motor & to execute microprocessor or computer-based control of the same by changing
   number of steps, direction of rotation & speed.
5. To implement a PID controller for temperature control of a pilot plant.
6. To study behavior of 1 order,2 order type 0,type 1 system.
7. To study control action of light control device.
8. To study water level control using a industrial PLC.
9. To study motion control of a conveyor belt using a industrial PLC

MATLAB BASED (ANY FOUR EXPT.)

10. Introduction to MATLAB (Control System Toolbox), Implement at least any
    - Different Toolboxes in MATLAB, Introduction to Control Systems Toolbox.
    - Determine transpose, inverse values of given matrix.
    - Plot the pole-zero configuration in s-plane for the given transfer function.
    - Plot unit step response of given transfer function and find peak overshoot, peak time.
    - Plot unit step response and to find rise time and delay time.
    - Plot locus of given transfer function, locate closed loop poles for different values of k.
    - Plot root locus of given transfer function and to find out S, Wd, Wn at given root & to discuss stability.
    - Plot bode plot of given transfer function and find gain and phase margins
    - Plot the Nyquist plot for given transfer function and to discuss closed loop stability, gain and phase margin.

EE-330-F **VLSI DESIGN LAB**

L T P			
0 0 2	CLASS WORK	:	25
	EXAM	:	25
	TOTAL	:	50
	DURATION OF EXAM	:	3 HRS

Combinational & Sequential Design Exercises using FPGA (Spartan 3) & CPLD

1) Design of Half-Adder, Full Adder, Half Subtractor, Full Subtractor
2) Design a parity generator
3) Design a 4 Bit comparator
4) Design a RS & JK Flip flop
5) Design a 4: 1 Multiplexer
6) Design a 4 Bit Up / Down Counter with Loadable Count
7) Design a 3: 8 decoder
8) Design a 8 bit shift register
9) Design a arithmetic unit
10) Implement ADC & DAC interface with FPGA
11) Implement a serial communication interface with FPGA
12) Implement a Telephone keypad interface with FPGA
13) Implement a VGA interface with FPGA
14) Implement a PS2 keypad interface with FPGA
15) Implement a 4 digit seven segment display

EE-326-F CONVENTIONAL AND CAD OF ELECTRIC MACHINES -LAB

L T P
0 0 2

Class Work	: 25 marks
Exam	: 25 marks
Total	: 50 marks
Duration of exam.	: 3 hours

This will pertain the syllabus of theory Paper CONVENTIONAL AND CAD OF ELECTRIC MACHINES.

EE-328-F POWER SYSTEMS LAB

L	T	P
-	-	2

Practical	: 25 marks
Class work	: 25 marks
Total	: 50 marks
Duration of exam.	: 3 hours

1. To draw the operating characteristcs of IDMT relay.
2. To study the performance of Earth fault relay.
3. To study the performance of a over voltage relay.
4. To study the performance of under voltage relay.
5. Testing of breakdown strength of a transformer oil.
6. To study flash point test of transformer oil.
7. To find ABCD ,Hybrid & Image parameters of a model of transmission line.
8. To study performance of a transmission line under no load condition & under load at different power factors.
9. To observe the Ferranti effect in a model of transmission line.
10. To study performance characteristics of typical DC distribution system in radial & ring main configuration..
11. To study characteristics of MCB & HRC Fuse.
12. To study radial feeder performance when a) fed at one end b) fed at both ends.