M.D. UNIVERSITY, ROHTAK

Scheme of studies & Examination

Bachelor of Engineering (Electrical Engg.)

SEMESTER V

Modified 'E ' Scheme Effective from 2007 –2008

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
EE-311-E	ELECTRICAL MACHINES-II (EE, EEE)	3	1	-	4	50	100	-	150	3
EE-303-E	ELECTRONIC MEASUREMENT AND INSTRUMENTATION (EL,EI, IC,EE, EEE, AEI)	3	1	-	4	50	100	-	150	3
EE-305-E	ANALONG ELECTRONICS CIRCUITS (EL, EE, EI, IC, EEE, AEI)	3	1	-	4	50	100	-	150	3
EE-315-E	POWER SYSTEMS-I (EE, EEE)	3	1	-	4	50	100	-	150	3
EE-317-E	POWER ELECTRONICS (EE, EEE Common with VI-sem EI, IC, AEI)	3	1	-	4	50	100	-	150	3
EE-313-E	MICROPROCESSOR (8085), INTERFACING & APPLICATIONS (EE, ONLY)	3	1	-	4	50	100	-	150	3
EE-323-E	ELECTRONIC MEASUREMENT & INSTRUMENTATION LAB (EL, EI, IC, EE, EEE, AEI)	-	-	2	2	25	-	25	50	3
EE-321-E	POWER ELECTRONICS LAB. (EE, EEE Common with VI sem EI, IC)	-	-	2	2	25	-	25	50	3
EE-319-E	MICROPROCESSOR (8085), INTERFACING & APPLICATIONS LAB. (EE ONLY)	-	-	2	2	25	-	25	50	3
EE-327-E	ELECTRICAL MACHINES-II LAB. (EE, EEE)	-	-	3	3	25	-	25	50	3
EE-333-E	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-E **ELECTRICAL MACHINES - II**

L	T	P
3	1	-

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

INDUCTION MACHINES

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.

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

SYNCHRONOUS MACHINES

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. 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.)

NOTE: 8 questions are to be set; 4 from each part. Students are to attempt 5 questions with at least 2 from each

EE-303-E **ELECTRONIC MEASUREMENT AND INSTRUMENTATION**

L T P			
3 1 0	CLASS WORK	:	50
	EXAM	:	100
	TOTAL	:	150
	DURATION OF EXAM	:	3 HRS

UNIT 1. OSCILLOSCOPE:
Block diagram, study of various stages in brief, high frequency CRO considerations. Sampling and storage oscilloscope.

UNIT 2. ELECTRONIC INSTRUMENTS:
Instruments for measurement of voltage, current & other circuit parameters, Q-meters, R.F. power measurements, introduction to digital meters.

UNIT 3. 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.

UNIT 4. FREQUENCY & TIME MEASUREMENT:
Study of decade counting Assembly(DCA), frequency measurements, period measurements, universal counter, introduction to digital meters.

UNIT 5. DISPLAY DEVICES:
Nixie tubes, LED's LCD's, discharge devices.

UNIT 6 TRANSDUCERS:
Classification, Transducers of types: RLC photocell, thermocouples etc. basic schemes of measurement of displacement, velocity, acceleration, strain, pressure, liquid level & temperature.

UNIT 7 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.

NOTE: Eight questions are to be set – at least one from each unit. Students have to attempt five questions in all.

EE-305-E **ANALOG ELECTRONIC CIRCUITS**

L T P			
3 1 0	CLASS WORK	:	50
	EXAM	:	100
	TOTAL	:	150
	DURATION OF EXAM	:	3 HRS

UNIT1. 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 .

UNIT2. 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.

UNIT3. OSCILLATORS:
Sinusoidal oscillators, Barkhausen criteria, R-C phase shift oscillator, generalform of oscillator circuit, wien-bridge oscillator, crystal oscillator.

UNIT4. 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.

UNIT5. 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) .

UNIT6. 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.

UNIT7. 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. Integrated Electronics: Milman Halkias, TMH.
2. Microelectronic Circuits : Sedra & Smith.

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

NOTE: Eight questions are to be set – at least one from each unit. Students have to attempt five questions.

EE-315-E POWER SYSTEMS-I

L	T	P
3	1	-

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

1. INTRODUCTION: Structure of a power system, indoor and outdoor substations, equipment for substations, layout, auxiliary supply.
2. DISTRIBUTION SYSTEMS: Radial, ring mains and network distribution system, comparison of various types of ac and dc systems.
3. TRANSMISSION LINES: Calculation of line parameters, Ferranti effect, proximity effect.
4. PERFORMANCE OF LINES: models of short, medium and long transmission lines, performance of transmission lines, circle diagram, capacity of synchronous condenser, tuned lines, voltage control.
5. MECHANICAL DESIGN: Sag and stress calculations, effect of ice and wind, dampers.
6. INSULATORS: Types, insulating materials, voltage distribution over insulator string, equalizer ring.
7. CABLES: Types of LV and HV cables, grading of cables, capacitance, ratings.
8. CORONA: Phenomenon, critical voltage, power loss, reduction in losses, radio-interference, HVDC transmission – types of links, advantages and limitations.

TEXT BOOKS: 1. Power System Engg: I.J.Nagrath and D.P.Kothari (TMH)
2. 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.

NOTE: 8 questions are to be set –one from each unit. Students have to attempt any 5 questions.

EE-317-E **POWER ELECTRONICS**

L T P			
3 1 0	CLASS WORK	:	50
	EXAM	:	100
	TOTAL	:	150
	DURATION OF EXAM	:	3 HRS

UNIT1. 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.

UNIT2. 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.

UNIT3. 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.

UNIT4. 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.

UNIT5. 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.

UNIT6. 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.

UNIT7. CYCLOCONVERTERS :
Basic principle of frequency conversion, types of cycloconverter, non-circulating and circulating types of cycloconverters.

UNIT8. 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 : MH Rashid; PHI

REFERENCE BOOKS :
1. Power Electronics : PC Sen; TMH
2. Power Electronics : HC Rai; Galgotia
3. Thyristorised Power Controllers : GK Dubey, PHI
4. Power Electronics and Introduction to Drives : A.K.Gupta and L.P.Singh;Dhanpat Rai
5. Power Electronics: P.S Bhimra.

NOTE : Eight questions are to be set –one from each unit. Students have to attempt any five questions.

EE-313-E MICROPROCESSOR (8085), INTERFACING & APPLICATIONS

L	T	P		
3	1	-	Theory	: 100 marks
			Class Work	: 50 marks
			Total	: 150 marks
			Duration of Exam.	: 3 Hrs.

1. Introduction: Overview; History of microprocessors.
2. The 8085 Processor: Architecture, Addressing modes, instruction set, Timing diagrams & simple examples, including loops & nested loops, interrupts.
3. The 8255 PPI chip: Architecture, control words, modes & simple examples.
4. Introduction to other chips: Introduction to DMA process & its controller chip 8257, & a few other chip such as programmable interrupt controller, programmable interval timer.
5. Interfacing & application of 8085 Microprocessor: Interfacing issues, Interfacing ADC & DAC, Interfacing memory, Microprocessor-based voltage, current, frequency, power measurement schemes.

TEXT BOOKS:

1. Ramesh S. Gaonkar, “Microprocessor Architecture, Programming & Applications with 8085/8086 A”, Wiley Eastern Ltd.

REF. BOOKS:

1. B.Ram, “Fundamentals of Microprocessors & Microcomputers”, Dhanpat Rai & Sons, Delhi.
2. Michael Andrews, “Programming Microprocessor Interfaces for control & instrumentation”, Prentice Hall Inc., Engle Wood Clifs, New Jersey.
3. S.I. Ahson, “Microprocessors with Application in Process Control”, TMH, New Delhi.

Note: 8 question are to be set, at least one question from each unit. Students have to attempt any 5 questions.

EE-323-E ELECTRONIC MEASUREMENT AND INSTRUMENTATION-LAB

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

LIST OF EXPERIMENTS:

1. Measurement of displacement using LVDT.
2. Measurement of distance using LDR.
3. Measurement of temperature using R.T.D.
4. Measurement of temperature using Thermocouple.
5. Measurement of pressure using Strain Guage.
6. Measurement of pressure using Piezo-Electric Pick up.
7. Measurement of distance using Capacitive Pick up.
8. Measurement of distance using Inductive Pick up.
9. Measurement of speed of DC Motor using Magnetic Pick up.
10. Measurement of speed of DC Motor using Photo Electric Pick up.

NOTE : 1. At least ten experiments have to be performed in the semester.
2. At least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus of EE-303-C.

EE-321-E **POWER ELECTRONICS-LAB**

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

LIST OF EXPERIMENTS:

1. Study of characteristics of diode, thyristor and triac.
2. Study of characteristics of transistor and MOSFET.
3. Study of R and R-C firing circuits.
4. Study of UJT firing circuit.
5. Study of complementary voltage commutation using a lamp flasher.
6. Study of complementary voltage commutation using ring counter.
7. Study of thyristorised d-c circuit breaker.
8. Study of a.c. phase control.
9. Study of full wave converter.
10. Study of dc chopper.
11. Study of series inverter.
12. Study of bridge inverter.
13. Study of single phase cycloconverter.

NOTE : At least ten experiments have to be performed in the semester. At least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus of EE-308-C.

EE-319-E MICROPROCESSOR (8085), INTERFACING & APPLICATIONS LAB.

L	T	P
-	-	2

Practical : 25 marks
Class Work : 25 marks
Total : 50 marks
Duration of Exam. : 3 Hrs.

1. Study architecture of 8085 & familiarization with its hardware, commands & operation of Microprocessor kit.
2. Write a well-documented program for:
   a. addition of two 8-bit numbers (provision for carry)
   b. addition of two 8-bit numbers.
3. Write a well-documented program for:
   a. subtraction of two 8-bit numbers (display of borrow)
   b. subtraction of two 16-bit numbers (display of borrow)
4. Write a well documented program for:
   Multiplication of two 8-bit numbers by repeated addition method. Check for minimum number of addition and also test for typical data.
5. Write a well-documented program for:
   Multiplication of two 8-bit numbers by bit rotation method.
6. Write a well-documented program for: Division of two 8-bit numbers by repeated subtraction method. Test for typical data.
7. Write a well-documented program for Dividing two 8-bit numbers by bit rotation method. Test for typical data.
8. Write a well-documented program for:
   a. Finding a largest number from an array.
   b. Finding a smallest number from an array.
9. Write a well-documented program for arranging an array of numbers in descending order.
10. Write a well-documented program for arranging an array of numbers in ascending order.
11. Write a well-documented program for finding square of a number using Look-up table.
12. Identification of input & output pins of port 8255, for various control words.
13. To measure an electrical quantity using microprocessor & 8255.
14. Write a program to interface a 2-digit number using seven-segment LEDs. Use 8085 microprocessor and 8255 PPI chip.
15. Write a program to control the operation of stepper motor using 8085 microprocessor & 8255 PPI chip.

Note: At least 10 experiments are to be performed with at least 7 from above list, remaining 3 may either be performed from the above list or designed and set by concerned institution as per the scope of syllabus.

EE-327-E ELECTRICAL MACHINES-II LAB

L	T	P
-	-	3

Practical : 25 Marks
Class work : 25 Marks
Total : 50 Marks
Duration of Exam : 3 Hours

List of Experiments:

1. To perform the open circuit test and block rotor test on 3 phase induction motor and draw the circle diagram.
2. Speed control of induction motor by rotor resistance control.
3. To conduct the load test to determine the performance characteristics of the I.M..
4. To compute the torque v/s speed characteristics for various stator voltages.
5. To perform the open circuit test and block rotor test on single-phase induction motor and determine equivalent circuit parameters.
6. To perform load test on a universal motor and determine the performance with dc/ac supply voltage.
7. Voltage Vs load Characteristics of 3 phase synchronous generator. And draw input vs. Output power.
8. To perform O.C. test on synchronous generator. And determine the full load regulation of a three phase synchronous generator by synchronous impedance method
9. Determination of direct axis and quadrature axis reactances of synchronous machines.
10. To plot V- Curve of synchronous motor.
11. To study the parallel operation of synchronous generators.
12. Determination of sequence impedances of synchronous machine for various stator voltages.

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-E **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.