GOVERNMENT COLLEGE OF ENGINEERING, AURANGABAD

(An Autonomous Institute of Government of Maharashtra)

Department of Electrical Engineering

Teaching and Evaluation Scheme

TE (Full-Time) in Electrical (Electronic & Power) Engineering

SEMESTER-I

(Implemented from 2014)

THEORY COURSES												
S. No.	**Course Code**	**Subject**	**Scheme of Teaching (Hrs/Week)**			**Total Credits**	**Scheme of Evaluation (Marks)**					
							Theory			**Term Work**	**Practical & Viva-voce**	**Total**
			L	**T**	**P**		**Test**	**TA**	**ESE**			
1	EE 341	Synchronous Machines	03			03	20	20	60			100
2	EE 342	Digital Electronics	03	01		04	20	20	60			100
3	EE 343	Power System Analysis	03			03	20	20	60			100
4	EE 344	Estimation, Testing and Maintenance	02			02	25	25				50
5	EE 345	Control Systems I	03	01		04	20	20	60			100
6	EE 346	Utilization of Electrical energy	02			02	25	25				50
LABORATORY COURSES												
1	EE 347	Lab Synchronous Machines			02	01				25	25	50
2	EE 348	Lab Digital Electronics			02	01				25	25	50
3	EE 349	Lab Power System Analysis			02	01				25		25
4	EE 350	Lab Estimation, Testing and Maintenance			02	01				25		25
5	EE 351	Lab Control Systems			02	01				25	25	50
6	EE 352	Mini Project			02	01				50		50
A]	**Total of Semester I**		**16**	**02**	**12**	**24**	**130**	**130**	**240**	**175**	**75**	**750**

SEMESTER-II

THEORY COURSES												
S. No.	**Course Code**	**Subject**	**Scheme of Teaching (Hrs/Week)**			**Total Credits**	**Scheme of Evaluation (Marks)**					
							Theory			**Term Work**	**Practical & Viva-voce**	**Total**
			L	**T**	**P**		**Test**	**TA**	**ESE**			
1	EE 353	Switchgear and Protection	03			03	20	20	60			100
2	EE 354	Control Systems II	03	01		04	20	20	60			100
3	EE 355	Linear Integrated Circuits and Applications	03			03	20	20	60			100
4	EE 356	Power Electronics	03	01		04	20	20	60			100
5	EE 357	Microprocessor and Interfacing Techniques	03			03	20	20	60			100
LABORATORY COURSES												
1	EE 358	Lab Switchgear and Protection			02	01				25		25
2	EE 359	Lab Simulation			02	01				50		50
3	EE 360	Lab Linear Integrated Circuits and Applications			02	01				25	25	50
4	EE 361	Lab Power Electronics			02	01				25	25	50
5	EE 362	Lab Microprocessors and Interfacing			02	01				25	25	50
6	EE 363	Seminar			02	02				25		25
		*Inplant Training										
B]	**Total of Semester II**		**15**	**02**	**12**	**24**	**100**	**100**	**300**	**175**	**75**	**750**
	Total of Semester (A+B)		**31**	**04**	**24**	**48**	**230**	**230**	**540**	**350**	**150**	**1500**

L-Lectures, T-Tutorials, P-Practicals, TA-Teacher Assessment, ESE-End-Semester Examination

External Examiner may be appointed from the same university or other university

***** Students will complete their inplant training in industries for maximum one month and minimum of two weeks during summer vacation. Students will have to prepare and submit the report after 6th semester.

EE341: Synchronous Machines

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Lectures	03Hrs/Week	Test	20 Marks
Total Credits	03	Teacher Assessment	20 Marks
		End-Semester Examination	60 Marks

Prerequisites:

EE 243 - Transformer &DC Machines
EE 251 - Asynchronous Machines
GE 241- Engineering Mathematics-III

Course Objectives:

The objectives of the course are to learn

1. Fundamentals of Synchronous Machines.
2. Characteristics, operation and applications of Synchronous Machines.
3. Mathematical analysis of operation of Synchronous Machine.
4. Design aspects of Synchronous Generator and Transformer.

Course Outcomes:

Students will be able to

1. Explain fundamentals of Synchronous Machine.
2. Analyze and solve numerical problems on operation of Synchronous Machine.
3. Design the Transformer and Synchronous Machine.
4. Write and present technical reports on Synchronous Machine and Transformer.

UNIT-1 Synchronous Motor:
Principle of operation, Phasor diagram, Methods of starting, Operation at constant power & fixed excitation, Equivalent circuit, Power developed, Effect of excitation, Hunting and methods of suppression, Effect of harmonics, Synchronous condenser.

UNIT-2 Synchronous Generator Part I:
Construction, Types, Applications, Winding factors, EMF equation, Armature reaction, Phasor diagram, Load characteristics, Voltage regulation by synchronous impedance method, MMF method, Zero power factor method, Two reaction theory, Slip test.

UNIT-3 Synchronous Generator Part II:
Parallel operation of Synchronous Generators, Methods of synchronization, Synchronization power, Synchronizing torque, Operation of Synchronous Generator on infinite bus bar, Effect of load on synchronization power, Effect of unequal voltage, Effect of change in excitation & steam supply, Operating charts for large generators, Short circuit ratio & its importance, Power angle characteristics, Efficiency & losses.

UNIT-4 Design of Synchronous Machine:
Types of construction, Types of Synchronous Machines, Prime movers for Synchronous Generators, Construction of Hydro and Turbo alternators, Output equation, Main dimensions, Short circuit ratio, Length of air gap, Armature design, Armature windings, Slot dimensions, Length of mean turn, Stator core, Elimination of harmonics, Design of rotor, Armature parameters, Magnetic circuit, Open circuit characteristic.

UNIT-5 Design of Transformers:
Types, Classification & specifications, Design of distribution & power transformer, Design of main imensions, Core section, Yoke section , Clearances, Insulation, Winding tank Design with & without ooling tubes.

TEXT AND REFERENCE BOOKS:

1. A. E. Fitzgerald & C. Kingsley & S. D. Umans , “Electric Machinery”, Tata McGraw Hill, New Delhi, 5th Edition.
2. I. J. Nagrath& D. P. Kothari, “Electric Machines”, Tata McGraw Hill, New Delhi, 2nd Edition.
3. A. K. Sawhney& A. Chakrabarti, “A Course in Electrical Machines Design”, Dhanpatrai& Co.
4. M. G. Say, “Performance and Design of A.C. Machines”, E.L.B.S. Publications.
5. A. S. Langsdorf, “Theory of Alternating Current Machinery”, Tata McGraw Hill Publications.
6. Dr P. S. Bhimbra, “Electric Machinery”, 5th edition, Khanna Publishers, Delhi.

Assessment Methods:

Teacher assessment will be based on following (any two)–

1. Assignments 10 Marks
2. Objective type test 10 Marks
3. Modeling of synchronous machine using any electrical software 10 Marks
4. Technical/Industrial visit report 10 Marks

Designed By: Dr. N. R. Bhasme

EE342: Digital Electronics

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Lectures	03Hrs/Week	Test	20 Marks
Tutorials	01Hrs/Week	Teacher Assessment	20 Marks
Total Credits	04	End-Semester Examination	60 Marks

Prerequisites:

EE253 -Electronic Devices & Circuits

Course Objectives:

The objective of the subject is to

1. Provide the knowledge to understand common forms of number representation, logic gates and families, binary codes and Boolean algebra and to enable student to understand the logical operation of simple digital circuits.
2. Enable student to construct combinational logic circuits.
3. Design and develop sequential logic circuits.
4. Classify A/D converters and D/A converters.
5. Explain technology in the area of memory devices: ROM, RAM, PROM, PLD, FPGAs, etc.

Course Outcomes:

Students will be able to

1. Present digital codes, logical operations and number systems.
2. Set up combinational logic circuits like decoders, encoders, multiplexers, and de-multiplexers including arithmetic circuits and to perform lab work
3. Facilitate the construction of sequential logic circuits like flip-flops, registers, counters
4. Distinguish A/D converters and D/A converters.
5. Convince applications of memory devices.

UNIT-1 Fundamentals of Digital Electronics:

Review of number systems - binary, octal and hexadecimal number systems, Their conversions and arithmetic, 1's and 2's complements, Weighed and non-weighted codes, BCD codes, Excess-3 code, Gray code, Error correcting and detecting codes, Review of logic gates and logic families such as RTL, DTL, TTL, Schottky TTL, ECL, MOS, CMOS, I^2L etc, Boolean algebra.

UNIT-2 Combinational Logic Circuits:

Introduction to Karnaugh map, Minterms and Maxterms representation of logical functions, Sum of product and product of sum form minimization, Redundant terms, Quine- Mcklusky method for minimization, Design of combinational logic circuits, Design of half adder and subtractor, Design of full adder and subtractor, Binary parallel adder &subtractor, IC 7483, excess-3 adder, BCD to seven segment decoder, IC 7447.

UNIT-3 Sequential Logic Circuits:

Flip-Flops: R-S, D, J-K, T, Master slave flip-flops, Their conversion, Different flip-flop ICs.

Counters: Different types of counters, Design of divide by N asynchronous and synchronous counters, Design of BCD, Decade, Up-down counter, Ring and shift counters, Different counter ICs.

Shift Registers: Data-in and data-out modes, SISO, SIPO, PISO and PIPO modes, Left shift and right shift register, Universal shift register, IC 7495.

Multiplexer, Cascading of multiplexer, Demultiplexer, Cascading of demultiplexer, Different multiplexer and demultiplexer ICs.

UNIT-4 D/A and A/D Converters:
Digital to Analog converter (DAC)-weighted register method, R-2R ladder method, Analog to Digital Converter (ADC)- Parallel comparator method, Counter method, Successive approximation method, Counting A/D converter, Dual Slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion.

UNIT-5 Semiconductor Memory and Programmable Logic Devices:
Volatile and Non-Volatile Semiconductor Memory, RAM, ROM, PROM, EPROM, EEPROM, Program-mableLogic Devices, Programmable Logic Array, Complex Programmable logic Devices (CPLDs), I Programmable Gate array (FPGA).

TEXT AND REFERENCE BOOKS:

1. R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill Publications.
2. Malvino and Leach, "Digital Principles and Applications", McGraw Hill Publications.
3. Gothman, "Digital Electronics", Prentice Hall Publications.
4. Anand Kumar, "Fundamentals of Digital Circuits", Prentice-Hall India.

Assessment Methods:

Teacher assessment will be based on following topics mentioned in the syllabus. Any two of the following methods will be adopted:
1. Design and fabrication of logic circuits 10Marks
2. Multiple choice objective test on topics mentioned in syllabus10Marks
3. PPT Presentation on D/A and A/D converters and semiconductor memories 10Marks
4. Conducting Surprise test. 10 Marks

Designed By: Mr. S. S. Dhamse

EE343: Power System Analysis

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Lectures	03Hrs/Week	Test	20 Marks
Total Credits	03	Teacher Assessment	20 Marks
		End-Semester Examination	60 Marks

Prerequisites:

EE 246 - Generation Transmission & Distribution of Electrical Power

EE 257 - Numerical Computation Techniques

Course Objectives:

The objectives of the course are to

1. Provide the knowledge to understand line constants.
2. Analyse sending end voltage, receiving end voltage, transmission efficiency and regulation in case of transmission line.
3. Develop and solve the positive, negative and zero sequence network for a given system.
4. Recognise the common cause of faults in power system.
5. Formulate the power flow problems using load flow methods

Course Outcomes:

Students will be able to

1. Determine line constants for various conductor configurations.
2. Calculate Efficiency and regulation of transmission system.
3. Draw the sequence network for a given system.
4. Estimate Fault currents under different fault conditions.
5. Determine power flow for a given system.

UNIT-1 Line Constants:

Resistance of line, Influence of skin effect on resistance and proximity effect,Inductance of single phase two wire line, Flux linkage of one conductor of one group, Inductance of composite conductor line, G.M.R. and G.M.D.,Inductance of three phase line with equilateral spacing, Unsymmetrical spacing, Effect of transposition, Inductance of three phase double circuit cine, Capacitance of transmission line, Capacitance of a three-Phase transposed Line, Effect of earth on capacitance.

UNIT-2 Performance of Transmission Lines:

Representation and performance of short, Medium line- nominal T and nominal π method, Long transmission line–rigorous solution, Evaluation of ABCD constants interpretation of long line equations, Equivalent T and π representation, Ferranti effect, Power flow through transmission line.

UNIT-3 Representation of Power System Components:

Power in single-phase AC circuit, Complex power, Complex power balance, Power factor correction, Complex power flow, Balanced three phase circuits, Balanced three phase power, One line diagram, Impedance and reactance diagrams of a power system, Per unit system, Per unit representation of transformers, Synchronous Machines, Representation of loads.

Network Equations:

Graph theory and its applications for formation of primitive networks and Z and Y matrices, Incidence matrices, Y-bus and Z-bus matrices.

UNIT-4 Symmetrical & Unsymmetrical Fault Analysis:

Transients on a transmission line, Short circuit of a synchronous machine on no load and on load, Short circuit current computation, Selection of circuit breakers, Z-bus formulation, algorithm of short

circuit studies, Fundamentals of symmetrical components, Sequence impedance and sequence networks of star connected loads, Transmission lines, Synchronous Machines and transformer, Sequence networks of a loaded generator, Single line to ground (L-G), Line to line (L-L), Double line to ground (L-L-G) faults, Unbalanced fault analysis of above faults using bus impedance matrix, Bus voltages and line currents during faults.

UNIT-5 Load Flow Studies:
Introduction, Network model formulation, Formation of Y-bus by singular transformation, Load flow problem, Iterative methods of load flow such as Gauss, Gauss-Seidel, Newton-Raphson method.

TEXT AND REFERENCE BOOKS:

1. C. L. Wadhawa , "Electrical Power System", John Wiley & Sons.
2. HadiSaadat, " Power System Analysis", Tata McGraw-Hill.
3. I.J. Nagrath&D.P.Kothari, "Modern Power System Analysis", Tata McGraw-Hill.
4. W.D. Stevenson and J.J. Grainger, "Power System Analysis", McGraw-Hill.
5. W.D. Stevenson, "Elements of Power System Analysis", McGraw-Hill.
6. W.D. Stagg & A.H. El-Abiad, "Computer Methods in Power System Analysis", McGraw-Hill.
7. ElgerdO.I., "Electrical Energy System Theory", McGraw-Hill.

Assessment Methods:

Teacher assessment will be based onfollowing :

1.	PPT Presentation.	05 Mark
2.	MCQ based on GATE questions.	10 Marks
3.	Quiz.	05 Marks

Designed By : Mrs. A. A. Bhole

EE344:Estimation Testingand Maintenance

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Lectures	02Hrs/Week	Test	25 Marks
Total Credits	02	Teacher Assessment	25 Marks

Prerequisites:

EE 243-Transformers &DC Machines

EE 251-Asynchronous Machines

Course Objectives:

The objectives of the course are to explain

1. Estimation technique of electrical system.
2. Estimation of wiring system.
3. Study of different illumination scheme.
4. Various methods for maintenance & testing of electrical equipment.
5. Safety rule & regulation for electrical equipment.

Course Outcomes:

Students will beable to

1. Estimation for wiring industrial, commercial, residential and various feeder.
2. Estimation the illumination scheme.
3. Prophase maintenance schedule of equipment.
4. Test electrical equipment as per IS.
5. Apply safety measure as per norms.

UNIT-1 Estimation:

Estimation for internal wiring of buildings (residential, commercial and small industry), Service lines, L.T. distribution and street light feeders, 11 kV feeders and sub stations, Estimation of electrical panel boards, Estimation of street light feeders using cables, Estimation & costing of substation, Service connection.

UNIT-2 Testing:

Testing of cables, Distribution transformer, Induction Motor, Synchronous Motor, DC Motor, Instrument transformer as per ISI standard, Testing of insulation.

UNIT-3 Maintenance of Electrical Equipments:

Routine, Preventive and breakdown maintenance, Main causes of failure of electrical equipments, Factors affecting maintenance schedule, Maintenance schedule for distribution transformer as per I.S. 1886, Maintenance schedule for power transformer as per I.S. 11028, Maintenance schedule for Induction Motor as per I.S. 900, Maintenance schedule for Synchronous Motor as per I.S. 4884, Maintenance schedule for storage battery, Maintenance schedule for switchgear and control equipments as per I.S. 3072.

UNIT-4 Indian Electricity Rules:

Safety precautions, Condition relating to survey and use of energy, Indian Electricity Rules 2003 for safety, Maintenance of equipment, Testing of equipment.

UNIT-5 Grounding:

Neutral grounding, Solid grounding, Resistance grounding, Reactance grounding, Earthing Transformer.

TEXT AND REFERENCE BOOKS:

1. J.B.Gupta, “Transmission and Distribution”, S.K.Kataria& sons New Delhi.
2. S.L.Uppal, “Electrical Wiring, Estimation & Costing”, Khanna publishers, New Delhi.
3. S.L.Uppal, “Electrical Power”, Khanna publication, New Delhi.
4. H.Partab, “Art and Science of Electrical Utilization”, Dhanpat Rai and sons New Delhi.
5. B.D.Arora, “Electrical, Wiring, Estimation and Costing”, New Heights New Delhi.
6. N. Alagappan S. Ekambaram, “Electrical Estimating and Costing”, Tata McGraw-Hill.
7. Frank J. Oliver, “Practical Relay Circuits”, D. B. Taraporewala sons Mumbai.
8. Relevant I.S. Codes Publishing company limited New Delhi.
9. H. Cotton, “The Transmission and Distribution of Electrical Energy”, The English Language Book Society.
10. M. G. Say,” The Performance and Design of Alternating Current Machines”, CBS Publishers & Distributors.

Assessment Methods:

Teacher assessment will be based onfollowing :

1.	Formative assessment based on Indian Electricity rules.	05Marks
2.	Electrical Estimation Design Problem.	10Marks
3.	PPT Presentation.	05 Marks

Designed By: Mr. P. S. Swami

EE345: Control System-I

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Lectures	03Hrs/Week	Test	20 Marks
Tutorials	01Hrs/Week	Teacher Assessment	20 Marks
Total Credits	04	End-Semester Examination	60 Marks

Prerequisites:

GE252 -Engineering Mathematics-IV

EE244 - Network Analysis

Course Objectives:

The objectives of the course are to

1. Explain mathematical model of linear time invariant systems.
2. Introduce basic control system components and their characteristics.
3. Introduce the design of sampled data system using discrete system analysis.
4. Specify control System performance in Frequency domain and time domain analysis.

Course Outcomes:

Students will be able to

1. Derive the transfer function for single input single output system
2. Derive system input output relations using signal flow graph and block diagram reduction
3. Evaluate time domain response to known test signals
4. Apply R-H criterion to determine stability of LTI system
5. Specify design in the S-plane in terms of settling time, rise time and overshoot to step response
6. Construct bode and polar plots for various transfer functions
7. Sketch the root-locus to meet the desired transient response specification for systems order
8. Use various industrial controllers such as P,PI,PID

UNIT-1 Transfer Functions and Block Diagrams:

Basic components and classifications of general control systems, Physical –non physical, Linear, Nonlinear, Continuous-on off, Analog-digital, Open loop and closed-loop systems, Mathematical models of physical systems, Electrical analogy of non-electrical systems, Force-current and force-voltages analogies, Definition of transfer function, Block diagram representation of physical systems, Block diagram reduction techniques, Signal flow graphs and Mason's gain formula, Transfer function of electrical, Mechanical and electromechanical systems.

UNIT-2 Control System Components:

Error detectors: Potentiometers, Synchros and gyros, Optical rotary encoders, DC and AC servomotors, AC and DCtacho-generators.

UNIT-3 Time-Domain Analysis:

Standard test signals, Type and order of a system, Steady state error and definition of error time constant, Dynamic-error-coefficients, Transient response of second order systems, Time- domain specifications.

Stability Concepts:

Nature of system response from the location of roots in the s-plane of characteristic equation, Absolute and relative stability, Routh-Hurwitz criterion and its applications in special cases.

Root Locus:

Definition of root-locus, Rules for plotting root-loci, Root contours, Stability analysis using root locus, effect of addition of poles and zeros, Root locus for systems with transportation lag, Computer aided root locus.

UNIT-4 Frequency-Domain Analysis:
Frequency-domain specifications, Correlation between time-and frequency-domain responses, Polar plot, Bode plot, Determination of gain- and phase- margin from Bode plot, Effect of gain variation and addition of poles and zeros on Bode plot, Determinations of transfer function from the given Bode plot, Bode plot for all-pass and minimum –phase systems, Computer aided Bode plot, Nyquist stability criterion, Determination of absolute and relative stability by the application of Nyquist criterion, Effect of addition of poles & zeros on the shape of the Nyquist plot, Stability of linear control systems with time delay.

UNIT-5 Industrial Controllers:
PD, PI, PID controllers, tuning methods, pneumatic and hydraulic controllers, ISE, IATE.

TEXT AND REFERENCE BOOKS:

1. I.J. Nagrath& M Gopal, " Control System Engineering" New Age International.
2. Katsuhiko Ogata, " Modern Control Engineering", Prentice Hall.
3. Benjamin Kuo, "Automatic Control System", Prentice Hall.
4. John J. D'Azzo, C.H. Houpis, " Linear Control System Analysis and Design", McGraw Hill.
5. Xavier," Control system Engineering ", Chand Publication.
6. Norman Nice," Control System Engineering", John Wiley and Sons.

Assessment Methods:

Teacher assessment will be based on following :

1. Mini Project/ Model Assessment. 10 Marks
2. Finding solutions of various problems on control systems using MATLAB. 05Marks
3. PPT Presentation on various applications of control systems in Industries etc. 05Marks

Designed By :Dr. A. G. Thosar

EE346: Utilization of Electrical Energy

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Lectures	02Hrs/Week	Test	25Marks
Total Credits	02	Teacher Assessment	25 Marks

Prerequisites:

EE143 – Basic of Electrical Engineering

GE142 –Engineering Physics

Course Objectives:

The objectives of the course are to

1. Discuss various mode of transfer of heat.
2. Explain principles of electrical heating methods.
3. Illustrate various welding processes.
4. Illustrate electrolytic process.
5. Demonstrate principles of electric traction.

Course Outcomes:

Students will be able to

1. Explain laws of illumination.
2. Student will be able to choose appropriate method of electrical heating for Industrial application.
3. Distinguish between A.C. and D.C. Traction systems.

UNIT-1 Illumination:

Introduction, Definition, Laws of illumination, Polar curves, Photometry, Artificial sources of light, Incandescent lamps, Arc lamps, Discharge lamps, Lighting scheme, Street lighting, Factory lighting, Flood lighting.

UNIT-2 Electrical Heating & Welding:

Electrical Heating**:**

Introduction, Advantages, Modes of transfer of heat, Methods of electrical heating, Resistance heating, Induction heating, Dielectric heating, High frequency heating, Causes of feeler of heating elements.

Electric Welding:

Introduction, Advantages, Disadvantages of welding, Resistance welding, Electric arc welding, Choice of welding time, Submerge arc welding, Electron beam welding, Laser beam welding, Types of welding electrodes, Comparison between resistance & arc welding, Electrical welding equipment, Comparison between AC & DC welding.

UNIT-3 Electrolytic Process:

Introduction, Principle of electrolysis, Laws of electrolysis, Various terms related to electrolytic process, Application of electrolytic process, Power supply for electrolysis process.

UNIT-4 Electrical Traction I :

Introduction, Heavy of existing electrical traction system in India, System of traction, System of track electrification, Comparison between DC & AC traction, Special features of traction motors, Different type of traction motor, Braking, Overhead & auxiliary equipment.

UNIT-5 Electrical Traction II **:**

Introduction, Types of services, Speed time & speed distance curves for different services, Definition-crest speed, Average speed, Schedule time, Dead weight, Accelerating weight, Adhesive weight,

Coefficient of adhesion. Factors affecting schedule speed of train, Traction efforts, and specific energy conservation.

TEXT AND REFERENCE BOOKS:

1. C. L. Wadhawa, “Generation, distribution and utilization of electrical energy”, New age international limited.
2. R. K. Rajput, “Utilization of electrical power”, Laxmi Publication Ltd.
3. S. Sivanagaraju. , “Generation and Utilization of Electrical Energy”, Pearson publication Ltd.

Assessment Methods:

Teacher assessment will be based on following:

1. Surprise test. 05Marks
2. Writing visit report on heating welding and traction system 10 Marks
3. Solving design examples based on various illumination, heating and welding and traction system. 05 Marks

Designed By: Dr. A. G. Thosar &
Mr. S. M. Shinde

EE347: Lab Synchronous Machines

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Practical	02Hrs/Week	Term Work	25 Marks
Total Credits	01	Practical/Oral	25Marks

Term Work:

Term work shall consist of minimum eight experiments from the following:

1. Perform an Experiment for Determination of regulation of a three phase Synchronous Generator by direct loading.
2. Perform an Experiment for Determination of regulation of a three phase Synchronous Generatorby synchronous impedance method and MMF method.
3. Perform an Experiment for Determination of regulation of a three phase by ZPF method Synchronous Generator.
4. Perform an Experiment for Determination of direct and quadrature axis synchronous reactance by slip test.
5. Perform an Experiment for Synchronization ofSynchronous Generatorwith infinite busbar by lamp method or synchroscope.
6. Study of parallel operation of two Synchronous Generator.
7. Study of starting and reversal of Synchronous Motor.
8. Perform an Experiment for Plotting of V and inverted V curves of synchronous motor.
9. Study of Synchronous Generatorused in different power stations.
10. Modeling and simulation of Synchronous Machines using software such as MATLAB, MAGNET, ANSYS or any other electrical software (maximum 2 experiments).

Designed By: Dr. N. R. Bhasme

EE348: Lab Digital Electronics

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Practical	02Hrs/Week	Term work	25 Marks
Total Credits	01	Practical/Oral	25 Marks

Term Work:

Term work shall consist of minimum eight experiments from the following:

1. To verify truth table and identify IC numbers of basic logic gates.
2. To build basic logic gates using universal gates.
3. Verification of De Morgan's theorems.
4. Design and implementation of any two combinational logic circuits based on examples such as to find majority of one's, to find numbers exactly divisible by 3 or 4 etc.
5. To design arithmetic circuits such as half and full adder, half and full Subtractor.
6. To verify truth table of different flip-flop ICs.
7. Design of mod-2, mod-5, mod-7 or 8 or 9, mod-10 and reverse mod-10 counter using IC 7490.
8. Design of mod n synchronous counter.
9. Study of multiplexer and function realization using data selector ICs.
10. Study of De-multiplexer and function realization using data selector ICs.
11. Study of A/D converters (any one type).
12. Study of D/A converters (any one type).

Designed By: Mr. S. S Dhamse

EE349: Lab Power System Analysis

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Practical	02Hrs/Week	Term Work	25 Marks
Total Credits	01	Total Marks	25 Marks

Term Work:

Term work shall consist of minimum eight experiments from the following:

1. To build the bus admittance matrix for a given power system network.
2. To determine power flow for given power system network using Gauss-Seidelmethod.
3. To determine power flow for given power system network using Newton-Raphson method.
4. To determine power flow for given power system network using Fast-Decoupled method.
5. To form the bus impedance matrix by building algorithm method.
6. To determine fault current, bus voltage and line currents for a bolted fault for given power system network.
7. To determine fault current, bus voltage and line currents for line-to ground unbalanced fault for given power system network.
8. To determine fault current, bus voltage and line currents for line-to line unbalanced fault for given power system network.
9. To determine fault current, bus voltage and line currents for double line-to ground unbalanced fault for given power system network.

Designed By: Mrs. A. A. Bhole

EE350:Lab Estimation, Testing and Maintenance

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Practical	02Hrs/Week	Term Work	25Marks
Total Credits	01		

Term Work:

Term work shall consist of minimum two experiments from the following:

1. Electrification of an area supplied by a distribution substation.
2. Electrical installation for H.T. industrial consumes.
3. Electrical installation for multi storied residential apartments/flats.

The term work shall also include record of minimum four experiments out of following

1. Perform an Experiment for Measurement of earth resistance.
2. Perform an Experiment for Cable fault location.
3. To study Acidity, flash point test on transformer oil.
4. Study of cable jointing.
5. Study of different types of sources of light and to find intensity of light of Fluorescent Lamp, HP mercury vapour lamp, HP sodium vapour lamp & Compact Fluorescent lamp (CFL)
6. To perform experiment to determine Dielectric strength transformer oil.
7. Perform an Experiment for Back to back test on transformer.
8. To Perform experiment for measurement of insulation resistance of cable.

Designed By :Mr. P.S. Swami

EE351: Lab Control Systems I

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Practical	02Hrs/Week	Term work	25 Marks
Total Credits	01	Practical/Oral	25 Marks

Term Work:

Term-work shall consist of minimum eight experiments from the following:

1. Use of potentiometers as error detectors.
2. Use of Synchros as error detector.
3. Time domain analysis of a second order system.
4. Computer aided plotting of root-locus.
5. Computer aided plotting of Nyquist- and Bode- plots.
6. Study of a continuous- time and/or digital position control system.
7. Study of Regulator system.
8. Computer aided design of a linear control system.
9. Torque speed characteristic of AC servo motor.
10. To study the performance characteristics of a DC speed motor control system.
11. To study the time response of a variety of simulated linear systems and to correlate the studies with theoretical results.

Designed By : Dr. A.G. Thosar

EE352: Mini Projects

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Practical	02Hrs/Week	Term work	50Marks
Total Credits	01		

Term Work:

Mini Project will be implemented as below-

1. Group size should be restricted to maximum four students.
2. Mini project will be a working model.
3. The mini project will be assessed by a panel of three examiners appointed by HOD.

The examiners may be from the different departments or from the Electrical Department of the institute.

EE353: Switchgear & Protection

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Lectures	03Hrs/Week	Test	20 Marks
Total Credits	03	Teacher Assessment	20 Marks
		End-Semester Examination	60 Marks

Prerequisites:

EE246 - Generation Transmission & Distribution of Electric Power
EE343 - Power System Analysis
EE 341- Synchronous Machine

Course Objectives:

The objectives of the course areto

1. Impart knowledge related to the function of switchgear in power system and the function of different types of circuit breaker.
2. Demonstrate the relay time grading scheme, current grading Scheme for relay operation.
3. Explain the application of carrier current protection to transmission line.
4. Deliver knowledge related to system protection against transients & surges.
5. To know about the recent technology in protection.

Course Outcomes:

Students will be able to

1. Draw constructional diagram of various switchgear.
2. Illustrate various protection schemes.
3. Explain Arc Interruption phenomenon.
4. Recognise application of appropriate relay.
5. Student can able to implement recent technology for protection of power system equipment.

UNIT-1 Introduction:
Substation equipments, Fault clearing process, Different types of switchgears.

UNIT-2 Principle of Circuit Interruption:
Arc phenomenon, A.C. & D.C. circuit breaking, Arc interruption theories, Transient recovery voltage, Re-striking voltage, Factors affecting TRV, Rate of rise of restriking voltage, Resistance switching, Damping of TRV, Current chopping, Capacitive current breaking, Auto reclosing.

UNIT-3 Circuit Breakers:
Construction, Working principle, Application & comparison of different types of circuit Breakers such as Air break, Air blast, Minimum oil circuit breaker, SF6 & Vacuum Circuit breakers, H.V.D.C. Circuit breakers, Circuit breaker ratings.

UNIT-4 L.T. Switchgears:
Characteristics & applications of other circuit breaking devices such as Miniature air circuit breakers, Moulded case circuit breakers, Different contactors, Rewirable& H.R.C. fuses, Earth leakage breakers.

UNIT-5 Protective Relaying:
Need for protective relaying in power systems, Protective zones, Primary and backup protection, Desirable qualities of protective relaying, Definitions of terms used in relaying, Principle of operation & characteristics of induction type, Impedence, Reactance MHO relay, Buccolz, Negative Phase Sequence, Harmonic restraint relays, Induction relay settings, Principle of over current, Graded time lag, Directional, Biased differential, Reverse power, Earth fault relays, Introduction to digital &

numerical relays, Basic component of static relay, Block diagram of static over current and distance relay, Block diagram of numerical relay, Advantage and disadvantages.

UNIT-6 Protection:

Types of faults & Protection schemes for alternators, Transformers, Bus bars, Transmission lines, Feeders, Protection of transmission lines against overvoltage's, Lightning arresters, Arcing grounds, Power system neutral earthing.

TEXT AND REFERENCE BOOKS:

1. C. Russul Mason, "Art & Science of Protective Relaying ", John Wiley & Sons
2. Sunil S. Rao, "Switchgear Protection & Power Systems", Khanna Publishers, Fifth edition
3. Y. G. Paithankar& S. R. Bhide , "Fundamentals of Power Systems Protection", Prentice Hall of India
4. Madhav Rao, "Solid state protective relaying", Tata McGraw Hill

Assessment Methods:

Teacher assessment will be based on following:

1.	Multiple Choice Questions	05 Marks
2.	Quiz.	05 Marks
3.	Surprise test.	10Marks

Designed By :Mr. P. S. Swami

EE354:Control Systems II

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Lectures	03Hrs/Week	Test	20 Marks
Tutorials	01Hrs/Week	Teacher Assessment	20 Marks
Total Credits	04	End-Semester Examination	60 Marks

Prerequisites:

EE 345 - Control Systems-I

GE 252- Engineering Mathematics IV

Course Objectives:

The objectives of the course are to

1. Explain Control system design by frequency response.
2. Introduce Digital control system and estimate stability by using Jury criterion.
3. Explain design of non linear control system using describing function concepts and phase plane techniques.
4. Introduce optimal design concept, Intelligent Controllers like Fuzzy logic controller.

Course Outcomes:

Students will be able to

1. Find the controllability and observability for a given system
2. Realize the desired performance by using pole placement and observer design.
3. Check the stability of system using Jury's Stability criteria
4. Map the system from 'S' domain to 'Z' domain
5. Design nonlinear control system using describing functions and phase plane techniques
6. Formulate optimal control problem and fuzzy logic control

UNIT-1 Control System Design By Frequency Response:
Lag compensation, Lead compensation, Lag-Lead compensation
State Variable Analysis and Design:
State space representation of continuous and discrete systems solving the time –invariant state equation, State transition matrix, Eigen values and Eigen vectors, Controllability and observability criteria for time invariant systems, Pole placement using state variable feedback, Design of state observers.

UNIT-2 Digital Control Systems:
Introduction to discrete time systems, The Z transform and the inverse Z transform, Pulse transfer function, Time response of sampled data systems, Stability using Jury criterion, Bilinear transformation, Frequency response root locus.

UNIT-3 Non Linear Control Systems:
Characteristics of nonlinear systems, Linearizing techniques, Design of non linear control system using describing function concepts and phase plane techniques, Liapunov's stability criterion.

UNIT-4 Introduction to Optimal Control:
Introduction to Process Control, Feed forward, Ratio, Cascade DDC, Supervisory.

UNIT-5 Programmable Logic Controllers:
Introduction to PLC, Constructional features, Working principle and applications.
Intelligent Controllers such as: Fuzzy logic controller.

TEXT AND REFERENCE BOOKS:

1. I.J. Nagrath& M Gopal, “Control Systems Engineering", New Age Publishers Fourth Edition.
2. Benjamin Kuo, “Digital Control system”, Oxford.
3. K. Ogata, “Modern Control System”“, Prentice Hall.
4. Lee Stoline,”Applied Non –Linear System”, Prentice Hall.
5. M. Gopal,”Digital Control Systems”, New Age Publishers Fourth Edition.
6. J. Stephanpoulis,”Chemical Process Control: An Introduction to theory and Practice”, Prentice Hall.
7. Norman Nice, “Control System Engineering”, New Age Publishers.

Assessment Methods:

Teacher assessment will be based on following:

1. Assignment 10 Marks
2. MCQ 10 Marks

Designed By: Dr. A.G. Thosar

EE355: Linear Integrated Circuits and Applications

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Lectures	03Hrs/Week	Test	20 Marks
Total Credits	03	Teacher Assessment	20 Marks
		End-Semester Examination	60 Marks

Prerequisites:

EE 244- Network Analysis

EE 253 - Electronic Devices and Circuits

Course Objectives:

The objective of the subject is to

1. State the basic building blocks of operational amplifiers and its parameters.
2. Demonstrate linear and non-linear applications of op-amp.
3. Apply basic knowledge to simulate inductance using op-amp and other practical applications.
4. Design active filters and to design multi vibrators using timer.
5. Explain application of op-amp in signal generators; and Phase Locked Loops.

Course Outcomes:

Students will be able to

1. Tell basics of operational amplifiers and to tabulate its parameters.
2. Discuss linear and non-linear applications of an op-amp.
3. Illustrate application of op-amp in inductance simulation, medical electronics, in solar cell energy measurement etc.
4. Find circuit components R and C to construct active filters and multi vibrators.
5. Verify output of op-amp as signal generators i.e. triangular, saw-tooth etc.

UNIT-1 Op-Amp Fundamentals:

The operational amplifier, Block diagram representation and analysis of a typical Op-amp, Ideal op-amp, Open loop Op-amp configurations, Negative feedback, Non – ideal closed loop characteristics, Input bias and offset current, Input offset error compensation, Frequency response, Slew rate limiting, Input and output impedance, Operation limits, compensated and uncompensated op-amps, Compensation techniques.

UNIT-2 Linear and Non-linear Op-Amp Circuits:

I to V and V to I converters, Current amplifiers, Difference amplifiers, Instrumentation amplifiers, Transducer bridge amplifier and applications, Voltage comparators, Monolithic voltage comparator, Voltage comparator applications, Schmitt trigger and its application, Precision rectifiers, Limiters, Analog switches, Peak detectors, Sample and hold circuits, Integrator and differentiator, Log/antilog amplifiers, Practical log/antilog circuits, Analog multipliers.

UNIT-3 Applications of Op-Amp:

Simulation of inductance using operational amplifier, Special op-amp circuit for capacitance multiplier, Phase detector, Phase shifter, Solar cell energy measurement, Op-Amp electronic thermometers, Op-Amp in medical electronics monitoring system.

UNIT-4 Active Filters:

Classification, Transfer function, Butter worth filters, Low pass, High pass, Band pass, Band stop, Notch and all pass.

Timer:

C 555, Functional block diagram, Applications of IC 555 such as monostable and astablemultivibrator.

UNIT-5 Signal Generators:

Sine wave generators, Free running multivibrator, Triangular wave generators, Saw tooth wave generators, V/F and F/V converters.

Phase-Locked Loops :

Introduction, Basic principles, Phase Detector/comparator, Voltage controlled Oscillator, PLL Applications.

TEXT AND REFERENCE BOOKS:

1. R. A. Gaikwad,"Op-amps and Linear Integrated Circuits Technology", PHI Publications
2. K. R. Botkar, "Integrated Circuits", Khanna Publications.
3. D. Roy Chaudhari, "Linear Integrated Circuits", New Age International Publishers.
4. G. B. Clayton, "Operational Amplifiers", Butterworth & Co. Publications.
5. S. Franco, "Design with Operational Amplifiers and Analog ICs", Tata McGraw-Hall.

Assessment Methods:

Teacher assessment will be based on following:

1. Multiple Choice Objective. 05Marks
2. PPT presentation. 05Marks
3. Surprise test. 10 Marks

Designed By : Mr. S. S. Dhamse

EE356: Power Electronics

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Lectures	03Hrs/Week	Test	20 Marks
Tutorials	01Hrs/Week	Teacher Assessment	20 Marks
Total Credits	04	End-Semester Examination	60 Marks

Prerequisites:

EE253 - Electronic devices and circuits
EE224 - Network Analysis
GE241 - Engineering Mathematics-III

Course Objectives:

The objective of the subject is to

1. Describe power semiconductor devices in Thyristor family.
2. Present triggering methods, commutation methods etc. of Thyristor.
3. Classify controlled rectifiers and dual converters.
4. Demonstrate DC-DC converters and their control techniques.
5. Describe single and three phase inverter

Course Outcomes:

Students will be able to

1. Present structure, characteristics, and applications etc. of power semiconductor devices.
2. Tell different triggering methods, commutation methods etc. of Thyristor.
3. Analyze single and three phase converters with different types of load and their control techniques.
4. Discuss types, operation and control techniques of choppers.
5. Enumerate single and three phase inverter and its control techniques like PWM

UNIT-1 Power Semiconductor Devices:
Structure, Principle of operation, V/I characteristics of power semiconductor devices such as SCR, TRIAC, DIAC, GTO, Power Transistor, Power MOSFET, IGBT.

UNIT-2 Performance of Thyristor:
Triggering methods, Turn on-turn off characteristics of SCR, Types of commutation, Ratings, protection, Series & parallel operation, Gate Drive IC's

UNIT-3 AC-DC Converters:
Single phase converters with different types of load, Three phase half and full wave converters, Performance parameters, Use of freewheeling diode, Effect of source inductance, Dual converters in circulating & non-circulating current modes.

UNIT-4 DC-DC Converters:
Operation of chopper, Types of choppers, Various commutation methods, CLC and TRC techniques, PWM and FM techniques.

UNIT-5 DC-AC Converters:
Series and parallel inverters, Single phase centre tapped and bridge inverter with R, RL load, Three phase bridge inverters, PWM techniques-Single, Multiple and Sinusoidal PWM, PWM inverter, Current source inverters.

TEXT AND REFERENCE BOOKS:

1. M.H. Rashid, “Power Electronics”, Third Edition, Prentice-Hall of India Pvt. Ltd. 2005.
2. Mohan, Undeland, Robbins, Power Electronics”, Second Edition, John Willey & Sons, 1995.
3. B. K. Bose, “Modern Power Electronics and AC Drives”, Prentice-Hall of India Pvt. Ltd. 2006.
4. C. W. Lander, “Power Electronics”, Tata McGraw-Hill Publications India 1993.
5. P.C. Sen, “Power Electronics”,Tata McGraw-Hill Publications India.
6. G. K. Dubey, S. R. Doradla, A. Joshi, M. K. Sinha, “Thyristorised Power Controllers”,Wiley Eastern Ltd. 1987.
7. M.Ramamoorthy, ”An Introduction to Thyristors& Their Applications”, East-West Press Pvt. Ltd., New Delhi.

Assessment Methods:

Teacher assessment will be based on following:

1. Multiple Choice Objective. 05Marks
2. PPT presentation. 05Marks
3. Surprise test. 10Marks

Designed By :Mr. S. S. Dhamse

EE357: Microprocessors and Interfacing Techniques

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Lectures	03Hrs/Week	Test	20 Marks
Total Credits	03	Teacher Assessment	20 Marks
		End-Semester Examination	60 Marks

Prerequisites:

EE342-Digital Electronics

Course Educational Objective:

The objectives of the course are to

1. Develop an in-depth understanding of the operation of microprocessor, assembly language programming & interfacing techniques.
2. Study different peripheral devices and their interfacing to 8085.

Course Outcomes:

Students will be able to

1. Identify the basic element and functions of microprocessor.
2. Describe the architecture of microprocessor and its peripheral devices.
3. Demonstrate fundamental understanding on the operation between the Microprocessor and its interfacing devices.
4. Use 8085 microprocessor and its peripherals in applications.

UNIT-1 Evolution of Computers:
Intel 8085 Microprocessor Architecture, Addressing modes, Timing diagrams, Classification of Instructions, Instruction Set.

UNIT-2 Programming 8085:
Assembly Language Programs Based on Arithmetic (8/16/32 Bit) Logical, Branch and Machine Control Group of Instructions, Programs for Counting Time Delays, Stack operation, Programs Illustrating the use of Stacks and Subroutines.

UNIT-3 Interrupts and Data Transfer:
Interrupt Structure of 8085, Programs Illustrating the use of Hardware interrupts, Various Hardware and Software Interrupts, Types of data Transfer, Synchronous and Asynchronous Data Transfer, Interrupt Driven Data Transfer, Data Transfer by polling, Parallel Data Transfer.

UNIT-4 Memory Design:
Memory Organization and Interfacing memory to Processor, Fully nested and Partial decoding logic, Chip Capacity, Memory Module, Address Space, related Problems.

UNIT-5 Interfacing of Peripheral Devices:
Necessity of interfacing peripheral devices, Interfacing of 8255 PPI, Different modes, Timing diagrams and programming, Interfacing of 8253, Different modes, Comparison between 8253 and 8254, Related programs, Interfacing of 8257, Data transfer in Burst mode, Master, Slave configuration, Related programs, Interfacing of 8259, Initialization and Operational command words and its programming, Interfacing 8279 with 8085, Various Commands words Interfacing of ADC/DAC 0808/0809 to 8085, Specifications of ADC/DAC Microprocessor Applications- Measurement of voltage, Frequency, Stepper motor control, DC motor speed control.

TEXT AND REFERENCE BOOKS:

1. B Ram, “Fundamentals of Microprocessors and Microcomputers”, Dhanpat Rai and Sons, New Delhi, ivthEdition.
2. R.A.Gaonkar, “Microprocessor Architecture Programming and Applications with 8085”,Penram International Publishing(India), ivthEdition.
3. Douglas Hall, “Microprocessor and Interfacing”, Tata mcgrawHill.
4. Intel Microprocessor and Microcomputer Handbook.
5. Joseph J. Carr, “Microprocessor Interfacing and Applications”, Blue Ridge Summit Publisher.

Assessment Methods:

Teacher assessment will be based on following:

1. Mini projects. 10 Marks
2. PPT presentation. 05Marks
3. Assignment based on programming of microprocessor for different applications. 05Marks

Designed By : Mrs. S. S. Kulkarni

EE358: Lab Switchgear and Protection

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Practical	02Hrs/Week	Term work	25 Marks
Total Credits	01		

Term Work:

Term work shall consist of minimum eight experiments from the following:

1. Study of Biased& Unbiased differential protection of transformer.
2. Study of Distanceprotection of transmission line.
3. Study of Differential protection of alternator.
4. To plot Characteristics of over current relay.
5. Study & use of relay testing kit.
6. Study of vacuum circuit breaker.
7. To plot Characteristics of rewirable HRC fuse.
8. Study of Numerical Relay.
9. Study of air circuit breaker.
10. Study of static relay.
11. Study of MCB.
12. To Produce Visit report on protection schemes in substation.

Designed By :Mr. P.S. Swami

EE359:Lab Simulation

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Practical	02Hrs/Week	Term work	50 Marks
Total Credits	01		

Term Work:

Student will perform simulation exercises based on the subjects learned using MATLAB or any other software available in the lab. Following list is indicative only:

1. To simulate the 1-phase fully Controlled rectifier circuit with R & RL load and obtain the corresponding waveforms using MATLAB/SIMULINK
2. To simulate the 3-phase fully Controlled rectifier circuit with R & RL load and obtain the corresponding waveforms using MATLAB/SIMULINK
3. To simulate the DC motor speed control using armature control
4. To simulate the DC motor speed control using field current control
5. To simulate at least one semiconductor device
6. MATLAB program for state space analysis to transfer function, transfer function to state space analysis, controllability, observability, digonalisation of the system

Designed By: Mr.S.S.Dhamse

EE360: Lab Linear Integrated Circuits and Applications

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Practical	02Hrs/Week	Term work	25 Marks
Total Credits	01	Practical/Oral	25 Marks

Term Work:

Term work shall consist of minimum eightexperiments from the following:

1. Inverting amplifier using IC 741 and its frequency response.
2. Non-inverting amplifier using IC 741 and its frequency response.
3. Summing amplifier- to build summing amplifier in inverting and non-inverting mode.
4. Measurement of Op-Amp parameters: Input offset voltage, input bias current. Input offset current, PSRR and CMRR.
5. Measurement of slew rate of Op-Amp.
6. Study of comparator -To build different types of comparators and observe the waveforms on CRO.
7. Voltage limiter- to build Voltage limiter and to observe the output waveforms.
8. Differentiating circuits using op-amp- to build and to observe the output waveforms for various values of R and C.
9. Integrating circuits using Op-Amp - to build and to observe the output waveforms for various values of R and C.
10. Timer- to build astable&monostablemultivibrator and to observe the output waveforms using IC 555.
11. Precision rectifiers to build precision rectifiers and to observe the output waveforms.

Designed By :Mr. S. S. Dhamse

EE361: Lab Power Electronics

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Practical	02Hrs/Week	Term work	25 Marks
Total Credits	01	Practical/Oral	25 Marks

Term Work:

Term work shall consist of minimum eight experiments from the following:
(Software based simulation can be used for some experiments)

1. Static Characteristics of SCR, IGBT, MOSFET.
2. Transient Characteristics of SCR/MOSFET.
3. Construction of SCR using two transistor.
4. R, R-C, UJT Triggering Methods of SCR.
5. Forced Commutation methods of SCR.
6. Single phase half wave and full wave Converter with R, RL loads.
7. Single phase half and fully controlled converter with R, RL loads.
8. Three phase converter with different types of load.
9. Series/ parallel Inverters.
10. SCR D.C. Choppers.
11. Study of D. C. Power Supplies/ A. C. Power Supplies.
12. Study of SCR/IGBT based Industrial applications.

Designed By : Mr. S. S. Dhamse

EE362:Lab Microprocessors and Interfacing Techniques

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Practical	02Hrs/Week	Term work	25 Marks
Total Credits	01	Practical/Oral	25 Marks

Term Work:

Term work shall consist of minimum eight programs from the following:

1. Study of 8085 Trainer kit.
2. Execution of simple programs based on data transfer instructions/ on arithmetic and logical instructions.
3. Execution of programs based on 16 bit data.
4. Execution of programs using any hardware interrupts of 8085 .
5. Execution of programs using SID/SOD.
6. Study of different modes such as input, output, BSR mode of 8255.
7. Study of different modes of 8253.
8. Data transfer using 8257 DMA controller.
9. Interfacing of ADC0808/DAC08 to 8085.
10. Interfacing of 8259 interrupt controller.
11. Interfacing of 8279 keyboard controller.
12. Interfacing of stepper motor to 8085.

Designed By: Mrs. S. S. Kulkarni

EE363:Seminar

(Compulsory)

Teaching Scheme:		**Evaluation Scheme:**	
Practical	02Hrs/Week	Term work	25Marks
Total Credits	02		

Students will present the seminar on relevant topics.