

B.E.SEM-VII
ELECTRICAL & ELECTRONICS ENGG

CODE:701		SUBJECT:VLSI TECHNOLOGIES				
Teaching scheme		Examination Scheme				
Lect. Hrs.	Prac. Hrs	Theory Marks	Paper Hrs.	Oral/Prac.	T.W.	Total Marks
4	2	100	3	50	25	175
1.	Introduction: Historical Perspective, Overview of VLSI design Methodologies, VLSI Design Flow, Design Hierarchy, Concept of regularity, Modularity and Locality, VLSI Design Styles, Design Quality ,Packaging Technology, CAD Technology.					
2	Fabrication of MOSFETs: Introduction, Fabrication process Flow, The C-MOS n-well process, Layout Design Rules, Full-custom Mask Layout Design.					
3.	MOS Transistor: The MOS Structure, The MOS system under External Bias ,Structure and Operation of MOSFET,MOSFET V-I characteristics, MOSFET Scaling and small Geometry Effects ,MOSFET Capacitances.					
4.	MOS Inverters: Introduction ,Resistive Load Inverter, Inverter with n-type MOSFET Load ,CMOS Inverter, Delay-Time Definition ,Calculation of Delay Times, Inverter Design with delay constraints, Estimation of interconnect Parasitic , Calculation of interconnect delay, Switching power dis sipation of CMOS inverter.					
5	Combination of MOS logic circuits: Introduction ,MOS logic circuits with depletion NMOS loads , CMOS logic circuits, Complex logic circuits, CMOS transmission gates.					
6.	Dynamic logic circuits: Introduction , basic principles of pass transistor circuits, voltage boot strapping, synchronous dynamic circuits techniques, dynamic CMOS circuits techniques, high performance dynamic CMOS circuits,					
7.	Low power CMOS logic circuits : Introduction, overview of power consumption, low power design through voltage scaling, estimation and optimization of switching activity, reduction of switched capacitance, adiabatic logic circuits.					
8	Design for manufacturability: Introduction, process variation , basic concepts and definition, design of experiments and performance modeling parametric yield estimation , worst case analysis, performance variability minimization.					
9	Finite state machines: Moore and mealey machines synchronous controllers, timing consideration, Control using PLA/EPROM/CPLD and FPGA.					
10.	VHDL Programming.					

References Books:

- 1) CMOS digital Integrated circuits analysis and design (Third Edition)
By Sung. Mo. Kang & Yusuf lablebici
- 2) VHLD Primer by J. Bhasker.
- 3) VHDL by Douglas Perry

**B.E.SEM-VII
ELECTRICAL & ELECTRONICS ENGG**

CODE:702		SUBJECT:POWER SYSTEM ANALYSIS				
Teaching scheme		Examination Scheme				
Lect. Hrs.	Prac. Hrs	Theory Marks	Paper Hrs.	Oral/Prac.	T.W.	Total Marks
4	2	100	3	50	25	175
1.	Representation of power system components : Introduction ,single-phase solution of balanced three phase networks, the one line diagram and impedance or reactance diagram per unit system ,complex power, synchronous machine ,representation of loads.					
2.	Symmetrical fault analysis: Introduction, transient on a transmission line, short circuit of a synchronous machine (on no load), short circuit of a synchronous machine (on load), selection of circuit breaker, algorithm for short circuit studies, Z-BUS formulation.					
3.	Symmetrical component. Introduction, symmetrical component transformation, phase shift in star delta transformer, sequence impedance of transmission line, sequence impedance and sequence network of power system , sequence impedance and sequence network of synchronous machine, sequence impedance of transmission line and network of transformer, construction of sequence network of a power system.					
4.	Unsymmetrical fault analysis: Introduction, symmetrical component analysis of unsymmetrical faults, single line to ground (LG) fault, line-to-line (LL) fault, double line-to-ground (LLG) fault, open conductor fault bus impedance matrix method for analysis of unsymmetrical shunt fault.					
5.	Power system stability: Introduction, maximum steady state power, power angle diagram, steady state stability, transient steady stability ,the swing equation , equal area criterion, application of equal area , criterion critical clearing angle, factor affecting and methods of its improvement.					
6.	Load flow studies: Introduction, network model formulation, formation of Y-BUS by singular transformation, load flow problem, Gauss seidel method, Newton raphson method, decoupled load flow methods, control of voltage profile, resume.					
7.	Interconnected system: Introduction, parallel operation of alternator, condition necessary for successful parallel operation, synchronizing current, synchronizing power, synchronization torque ,effect of the increasing the excitation of one of the alternator, effect of the increasing the torque of prime mover of one of the alternator, effect of change of speed of one of the alternator, effect of unequal voltage, load sharing of two of the					

alternator, synchronous machine of infinite bus bar, economic loading of alternator, condition for economic loading of alternator running in parallel, interconnected station, load sharing, power limit of interconnectors, load dispatching.
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Reference Books:

- 1) Power system analysis and design by B R Gupta
- 2) Power system analysis and design by Nagrath and kothari.
- 3) Power system analysis and design by steeve nson
- 4) Power system analysis and design by C.L.wadhva.

B.E.SEM-VII
ELECTRICAL & ELECTRONICS ENGG

CODE:703		SUBJECT:POWER ELECTRONICS				
Teaching scheme		Examination Scheme				
Lect. Hrs.	Prac. Hrs	Theory Marks	Paper Hrs.	Oral/Prac.	T.W.	Total Marks
4	2	100	3	50	25	175
1.	Introduction: Emergence of power electronics engineering. PNP devices, thyristors, family members & their characteristics, power diodes, bipolar power transistor ,power MOSFETs, IGBTs ,static induction transistor, gate turn off thyristor ,MOS control thyristor , power integrated ICs, thyristor rating .					
2.	Thyristor turn off and turn on method: Thyristor as a controlling device , principle of operation, characteristics and two transistor analogy of SCR, SCR construction , gate characteristics, turn on method, dynamic turn on method, turn off mechanism, ratings, turn on and turn off losses, gate triggering circuit, pulse triggering, optical isolation, UJT relaxation oscillator, PUT, DIAC, TRIAC ,pedestal & ramp controlled triggering, phase triggering and integral cycle triggering.					
3.	Series and parallel connected SCRs: Requirement of series and parallel connection of thyristor, static and dynamic equalizing network, triggering method , derating factor ,string efficiency, precaution to be taken for SCRs in parallel.					
4.	Phase controlled converter: 1-phase half wave&full wave with R and R-L load, working of bridge converter, symmetrical and asymmetrical connection, half controlled and fully controlled bridge converter, effect of free wheeling diode, three phase half wave converter with R and R-L load continuous and discontinuous current operation, effect of free-wheeling diode, three phase converter, three half controlled & fully controlled bridge converter, dual converter.					
5.	Chopper: Chopper principle, duty ratio, chopper controlled method, current limit control, thyristor turn off method, chopper configuration, current and voltage wave form for continuous and discontinuous operation, step-up and step-down chopper, class A, class B, class C,class D, class E chopper, voltage commutated chopper, current commutated chopper, load commutated chopper, Jones chopper, Morgan's chopper,					
6.	Inverter: Inverter principle, classification of inverter, series and parallel inverter, types of inverter, Mc-Murry Bedford inverter, and voltage controlled of single phase inverter, voltage source inverter, current source inverter, cyclo-converter principle, single phase cyclo-converter.					

7.	AC voltage controllers : Method of AC voltage control, single phase AC voltage controllers, phase control and burst control methods.
8.	Application: UPS, zero voltage firing, speed control of D.C motors, Single phase induction motor using phase control.

References Books :

- 1) Power Electronics by M.H. Rashid.
- 2) Industrial Electronics and control by Biswanath Paul.
- 3) Thyristors and their applications by Ram Moorthy.
- 4) Power Electronics: Converters application and design by Ved Mohan.
- 5) Power Electronics: by P.C. Sen.
- 6) Power Electronics converter application and design by Ved Mohan.
- 7) Thyristoried power controller by Dube, Deradla and others.
- 8) Electronic Drives by De & Sen. (PHI)

B.E.SEM-VII
ELECTRICAL & ELECTRONICS ENGG

CODE:704		SUBJECT:ELECTRONICS SYSTEM DESIGN				
Teaching scheme		Examination Scheme				
Lect. Hrs.	Prac. Hrs	Theory Marks	Paper Hrs.	Oral/Prac.	T.W.	Total Marks
4	2	100	3	50	25	175
1.	Design of power supply. a) Unregulated- single phase and three phase with filter. b) Regulated – linear (fixed/variable)with protection, using discrete components & integrated circuits, constant voltage(cv) ,constant current(cc), programmable (cc-cv). c) Regulated – switched mode L coupled –step up/step down, fly back. Fly back converter –with one or more see. Forward converter-single end-pp-1/2 BR- full BR. d) Programmable-CV/CC.					
2.	Design of voltage amplifier using discrete component: Transistorized –BJT/FET, audio, video, IF, RF.					
3.	Power amplifier using discrete component : Transistorized –BJT/FET- audio.					
4.	Voltage amplifier using IC: D.C,A.C, peaking ,summing, scaling, averaging, instrumentation, differential, High Zin, integrator, differentiator.					
5.	Power amplifier –using IC LM 380 OR EQ.					
6.	Comparators and converters : Comparators Schmitt trigger, window detector, high speed, precision converter. V to F, F to V, I to V, V to I converter. Clipper, clamper, peak detector. Sample and hold ADC, DAC.					
7.	Pulse generator: Sq.wave generation ,triangular wave generation, saw tooth generation, VCO, Monostable, astable, timer 555 PLL 565.					
8.	Digital circuits: Combinational logic, programmable logic, sequential logic, algorithmic state machine, phase shifting network for single phase and three phase Power electronics circuits.					
9.	Magnetic components: power transformer-50 Hz single phase and three phase for rectifier and for inverters Filter chokes-(3-phase), pulse transformer –up to 30KHZ. Complete design calculations.					

10.	Annunciators and simple controllers : Annunciator –multiple input both analog and digital. Controller –ON/OFF/proportional using power transistor .Triac and Thyristors and power control devices.
11.	Mechanical and thermal design: Circuit design: <ol style="list-style-type: none"> 1) I/O Specification. 2) Circuit diagram –complete with values. 3) Calculations-brief 4) Bill of materials with cost estimate. 5) For system design..... All above and PCB layout ,artwork, Drawing –front panel layout, chassis layout , Wiring chart/dia gram.
12.	PRACTICAL WORK: One assignment –small fabrication ,testing with design value(expected values) and actual value for performance,V,I,P level achieved and Waveform performance parameters.
13.	Active filter: Butter worth -1 st , 2 nd and higher order low pass filter, high pass filter, band pass filter, band reject filter.

Reference Books: (Electronics system design)

- 1) Power supplies – B.S. Sonde (New Age.).
- 2)
- 3) Operation amplifier and linear IC s- Coughlin & Driscoll (PHI).
- 4) Electronics device and circuits – Boylestead (PHI).
- 5) Electronics circuit analysis & design – Neamen (TMH).
- 6) Introduction to system design using ICs –B.S. Sonde (New Age.).
- 7) Engineering Circuit analysis – Hayt,Kemmerly, Durbin (TMH)

**B.E.SEM-VII
ELECTRICAL & ELECTRONICS ENGG**

CODE:705		SUBJECT: SWITCH GEAR & PROTECTION.				
Teaching scheme		Examination Scheme				
Lect. Hrs.	Prac. Hrs.	Theory Marks	Paper Hrs.	Oral/Prac.	T.W.	Total Marks
4	2	100	3	50	25	175
Switchgear:						
1.	Theory of circuit interruption: Physics of arc phenomena, property of arc, arc interruption theories.					
2.	Circuit constant in relation to circuit breaking : Circuit breaker rating, circuit constants and circuit conditions, restricting voltage, transient characteristic of restricting voltage, expression for R.R.R.V., factor affecting the restricting voltage characteristics, current chopping interruption of small inductive currents, capacitor switching.					
3.	Theory and practice of conventional circuit breaker: Automatic switching, air break circuit breaker, oil circuit breaker, single and multibreak construction, performance of circuit breaker, minimum oil circuit breaker, air blast circuit breaker, interruption method, voltage distribution in oil circuit breaker with arc control device, modification of circuit breaker, circuit breaker duty by shunt resistors, comparative merits of different type of conventional circuit breaker, auto reclosures and fuses.					
4.	Recent development in circuit breaker: Modern trends, vacuum circuit breaker, SF ₆ circuit breaker and D.C. circuit breakers.					
5.	Testing of circuit breaker: High voltage testing, S.C testing of circuit breaker, direct testing and indirect testing of C.B.					
Protection						
1.	Introduction: Requirements of protective systems, primary back up and auxiliary protection, essential requirements of protective system, basic terminology, method of discrimination.					
2.	Operating principles and construction feature of electromagnetic relay: Classification of relay, principle, types of electromagnetic relay, theory of induction relay torque – various type of induction relay.					
3.	Relay application and characteristic: General equation for electromagnetic relay, over current relay, instantaneous over current relay, plug setting, and time multiplier setting in induction disc relay, directional relay, differential relay, distance relays etc. , application.					
4.	Apparatus protection scheme: Generator protection, transformer protection, feeder protection, bus zone protection, carrier protection.					

5.	Testing and maintenance of protective gear: Classification of relay testing, general method of testing protective gear, current transformer test and potential transformer test.
6.	Static relay: General principle of static relays, their application and future prospectus.

- Laboratory work shall be based on the above theory.
- The student should be taken to power stations and substations show actual equipments used in field and their operation and performance.

Reference Books :

- 1) Power system protection and switchgear by B. Ravindranath &M. Chandar.
- 2) Switch gear and protection by S.S. Rao.
- 3) Art and science of protective relaying. by Masson.