BACHELOR OF TECHNOLOGY

Electrical and Computer Science Engineering Department

Semester –IV

Course Scheme

Course Code	Course Name	Lecture hours	Tutorial hours	Practical hours	Credit
EE 192004	Linear Integrated Circuit Applications	3	0	0	3
EE 192005	Electrical Machines - I	3	0	3	4.5
EE 192006	Power System - I	3	1	0	4
EE 222001	Digital Systems	3	0	3	4.5
MA 192003	Probability and random Processes	3	1	0	4
	Total	**15**	**2**	**6**	**20**

I	Course Code	EE 192004			
II	Course Title	Linear Integrated Circuit Applications			
III	Credit Structure	L	T	P	C
		3	0	0	3
IV	Prerequisite (If any forthe student)				
V	Course Content	BJT Differential amplifier, Introduction to op-amps, ideal Characteristics, performance characteristics, input offset current, slew rate, input offset voltage, input bias current, Open and closed loop configurations, Offset and Frequency compensation. Exercise problems. Inverting and non-inverting amplifiers and their analysis, Applications: inverting and non- inverting summers, difference amplifier, differentiator and integrator, Voltage to current converter, Exercise problems. Instrumentation amplifier, Log and antilog amplifiers. Precision rectifier, Non-linear function generator, solving differential equations using analog computing blocks. Analog IC Multipliers and applications Comparators, regenerative comparators, input - output Characteristics, Astable and Monostable multivibrator, Triangular wave- generators, RC-phaseshift oscillator, Wein's bridge oscillator, Active Filters, Low pass, High pass, Band pass and Band Reject filters, Butterworth, Chebychev filters, Frequency Transformation. 555 Timer functional diagram, monostable and astable operation, applications. Voltage Regulator Series op amp regulator, Three terminal IC voltage regulator exercise problems. IC 723 general purpose regulator, Switching Regulator. PLL- basic block diagram and operation, capture range and lock range; applications of PLL IC 565, AM detection, FM detection and FSK demodulation. VCO IC 566, Weighted resistor DAC, R-2R and inverted R-2R DAC. IC DAC-08, Counter type ADC, successive approximation ADC, Flash ADC, dual slope ADC, conversion times of typical IC ADC			
VI	Text/References	1. G B Clayton, Operational Amplifiers, 5 th Edition, Elsevier science, 2003. 2. Sergio Franco, Design with Operational Amplifier and Analog Integrated Circuits, 3. 4 th Edition, TMH, 2011. 4. Roy Choudary D. and Shail B. Jain, Linear Integrated circuits, 4 th Edition, New Age International Publishers, 2010. Ramakant A.Gayakward, Op-Amps and Linear Integrated Circuits, 4 th Edition, PHI, 2010			

I	Course Code	EE 192005			
II	Course Title	Electrical Machines - I			
III	Credit Structure	**L**	**T**	**P**	**C**
		3	0	3	4.5
IV	Prerequisite (If any forthe student)				
V	Course Content	Magnetic materials, ac and dc magnetisation curves, introduction to permanent magnets and characteristics, principles of electromechanical energy conversion, mechanically commutated machine (DC Machine), working principle, construction, types of the winding, types of machines, circuit model, EMF equation, armature reaction and commutation, characteristics of generator, parallel operation of generator, speed-torque characteristics of motor, starting methods of motor, power stages, testing, BLDC motor, stepper motors, applications. Transformer as a magnetically coupled circuit, working principle, construction, circuit model, losses, efficiency, voltage regulation, inrush current, testing, connections, parallel operation, low frequency versus high frequency transformers, corresponding circuit models, tertiary windings, basics of induction motor, generation of magnetic field. BLDC motor, stepper motors, applications.			
VI	Text/References	1. A.E. Fitzgerald, C.Kingsley, S.D.Umans, Electrical Machinery, Tata McGraw Hill. Sixth Edition 2002 2. A. E. Clayton & N N Hancock, The Performance and Design of Direct Current Machines 1st Edition, CBS Publisher 3. P S Bhimbhra, Electrical Machinery (7th Edition), Khanna Publishers 4. D. P Kothari & I J Nagrath, ELECTRIC MACHINES, 4th Edition, McGraw Hill Education (India) Private Limited			

<table>
<tr><td>I</td><td>Course Code</td><td colspan="4">EE 192006</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Power System - I</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>IV</td><td>Prerequisite (If any forthe student)</td><td colspan="4"></td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">Structure of power system: Generation, Transmission and Distribution of electrical power. Generation of Electrical Power: Introduction to conventional power generation. Schematic representation of steam-turbine driven AC power generating systems. Brief description of power plant components: Boilers, Super heaters, Turbines, Condensers, Chimney, Cooling towers. Specifications of synchronous generators and plant rating. Economic aspects: Load curve, Load duration and Integrated load duration curves-Load demand, Diversity, Capacity, Utilization and Plant use factors. Transmission of Electrical Power: Brief introduction to AC and DC transmission systems. AC Transmission line parameters: Types of conductors – ACSR, Bundled and Stranded conductors- Skin Effect- Calculation of inductance and capacitance for single phase and three phase, Single and double circuit lines, Concept of GMR & GMD, Symmetrical and asymmetrical conductor configuration with and without transposition. Effect of ground on Capacitance. Performance of AC transmission line: short, medium and long lines and their exact equivalent circuits- Nominal-T, Nominal-π. Regulation and Efficiency of transmission lines. Long transmission line-Rigorous solution. A, B, C, D parameters of transmission lines. Surge impedance and Surge impedance loading - Wavelengths and Velocity of propagation, Ferranti effect. Mechanical design of transmission lines: Overhead line insulators: Types of Insulators, String efficiency and methods for improvement. Phenomenon of corona, Factors affecting corona. Distribution of Electric power: Classification of distribution systems: DC and AC distribution systems, Underground and Overhead Distribution Systems. Design considerations of distribution feeders: Radial and loop, Primary feeders, Voltage levels, Feeder loading. Substations: Location of substations: Rating of distribution substation, Service area within the primary feeders. Benefits derived through optimal location of substations. Classification of substations: Air insulated substations - indoor and outdoor substations: Substation layout showing the location of all the substation equipment. Bus bar arrangements in the sub-stations: Single bus bar, Sectionalized single bus bar, Main and transfer bus bar.</td></tr>
</table>

VI	Text/References	1. A Text Book on Power System Engineering by M. L. Soni, P. V. Gupta, U. S. Bhatnagar and A. Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 1999. 2. Generation Distribution and Utilization of Electrical Power by C.L Wadhwa, New Age International (P) Ltd., 2005. 3. Power System Analysis by J. J. Grainger, W. D. Stevenson Jr., Tata Mc. Graw-hill, 2003. 4. Electrical Power Systems by C. L. Wadhwa, New Age International (p) Ltd. 5. Electrical Power Distribution Systems by Turan Gonen, Mc. Graw-hill, 198

I	Course Code	EE 222001			
II	Course Title	Digital Systems			
III	Credit Structure	L	T	P	C
		3	0	3	4.5
IV	Prerequisite (If any forthe student)				
V	Course Content	Number systems and Boolean algebra: Number systems, Codes, error detection and correction codes. Postulates and theorems. Logic functions, minimization of Boolean functions using algebraic, Karnaugh map and Quine – McClausky methods. Realization using logic gates, Combinational Functions, Realizing logical expressions using different logic gates and comparing their performance. Hardware aspects logic gates and combinational ICs: delays and hazards. Design of combinational circuits using combinational ICs: Combinational functions: code conversion, decoding, comparison, multiplexing, demultiplexing, addition, and subtraction. Analysis of Sequential Circuits Latches, Flip Flops – SR, JK D T, Flip flop characteristics, truth table, characteristic table, excitation tables, conversions, practical clocking aspects concerning flip-flops, timing and triggering considerations, edge triggering, Master Slave flip-flop. Design of Digital Systems Structure of sequential circuits: Moore and Melay machines. Analysis of sequential circuits: State tables, state diagrams and timing diagrams. State reduction. FSM and ASM. State diagrams and their features. Design flow: functional partitioning, timing relationships, state assignment, output racing. Examples of design of digital systems using PLDs, Realization of sequential functions using sequential MSIs: counting, shifting, sequence generation, and sequence detection Digital Logic Families, Characteristics - Fan Out, Propagation Delay, Power dissipation, DTL,RTL,TTL,CMOS Inverter, VTC of CMOS inverter, pull up and pull down, network, concept of delay, noise margin, latch up. Issues in digital IC design, custom design-semi custom and full custom, gate arrays (FPGA)			
VI	Text/References	1. J.F.Wakerly: Digital Design, Principles and Practices,4th Edition, Pearson Education, 2005 2. Tocci, R. J., Widmer, N. S., & Moss, G. L. Digital Systems: Principles and Applications. 10th Edition. Pearson,2010 3. Floyd, T. L. (2008). Digital Fundamentals. 10th Edition. Pearson Education India. 4. Taub, H., & Schilling, D. L. (1977). Digital integrated electronics. New York: McGraw-Hill. 5. Roth, J. C. H. Digital System Design using VHDL 6. Anand Kumar, Fundamentals of Digital Electronics 4h Edition, PHI			