Electrical Engg. Department

Semester : 5

Teaching Scheme for Electrical Engineering – Semester V

Course Code	Course title	Lecture Hours	Tutorial Hours	Practical Hours	Credit
EE 3001	Electromagnetic Wavess	3	0	0	4
EE 3002	Analog Circuits	3	0	2	5
EE 3003	Digital Systems	3	0	2	5
EE 3004	Power Electroincs	2	1	3	4
EE 3005	Power Systems	3	1	3	5
	Total	**14**	**2**	**10**	**23**

Electrical Engg. Department

Semester : 5

I	Course Code	EE 3001			
II	Title of the course	**Electromagnetic Waves**			
III	Credit Structure	L	P	T	C
		3	0	0	4
IV	Prerequisite(If any for the student)	Nil			
V	Course Content	Review of static electric and magnetic fields; electromagnetic (EM) waves and applications; Transmission lines: concept of distributed elements, transmission line equations, phase and attenuation constants, propagation constant and characteristic impedance, lossless, low-loss and distortion-less lines, travelling and standing waves; reflection coefficient and SWR, input impedance, impedance matching quarter and half-wave lines, equivalent reactive elements, load impedance measurement, analysis of open-circuited and short-circuited lines, stub matching, power flow in a transmission line, maximum power transfer condition, graphical representation of a transmission line, Smith chart, transmission line calculations using the Smith chart, pulse propagation, various types of transmission lines; Maxwells equations, displacement current, time-varying potentials, Lorentz conditions, boundary conditions at media interface; EM wave propagation - in lossy dielectrics, in lossless dielectrics, in free-space and in conductors, skin effect and skin depth, intrinsic impedance, complex permittivity and loss tangent, power flow and the Poynting vector, phase and group velocity, reflection of EM waves; Waveguides: parallel plate waveguide, rectangular and cylindrical waveguides, cut-off frequency, TE, TM and TEM modes; EM radiation and antennas: retarded potentials, antenna characteristics and radiation parameters, Friis equation, standard antennas Linear Antennas, Hertzian Dipole, Standing-Wave Antennas, Half-Wave Dipole, Monopole Antennas, Traveling-Wave Antennas, Vee and Rhombic Antennas, Loop Antennas, Circular Loops, Square Loops, Dipole and Quadrupole Radiation. Horn and Microstrip Antennas, Parabolic Reflector Antennas, Gain and Beamwidth of Reflector Antennas, Antenna Arrays; Antenna Arrays, Translational Phase Shift, Array Pattern Multiplication, One- Dimensional Arrays, Visible Region, Grating Lobes, Uniform Arrays, Array Directivity, Array Steering, Array Beam width. Radar Equation, different mode of EM wave propagation.			
VI	Text/Reference books:	1. R k. Shevgaonkar " Electromagnetic waves" 1st edition, McGraw-Hill pvt. 2. Ashoutosh Pramanir " Electromagnetism" Vol 1, PHI. 3. C. A. Balani "Antenna Theory: analysis and design" 3rd edition Wiley.			

Electrieal Engg. Departmcnt

Semester : 5

I	Course Code	EE 3002			
II	Title of the course	**Analog Circuits**			
III	Credit Structure	L	T	P	C
		3	0	2	5
IV	Prerequisite(If any for tde stuhent)	Nil			
V	Course Content	Review of BJT and MOS transistor operation; BJT and MOS transistor biasing schemes, small signal models; CE/CS, CB/CG and CC/CD amplifiers; BJT and MOSFET high frequency models, SPICE models and simulation; frequency response of CS amplifiers; Millers theorem; current mirrors; active loads; cascode amplifier; differential amplifiers; feedback topologies and properties, stability, Barkhausen criterion, effect of feedback on amplifier poles, Bode plots, gain and phase margins; positive feedback and sinusoidal oscillators, Wien bridge oscillator, other op-amp based RC oscillators; multivibrators, square and triangle waveform generation; precision rectifier circuits; filter types and specifications, Butterworth and Chebychev filters first and second order filters, second order LCR resonators, active filters based on inductor replacement; data conversion, D/A converter circuits, A/D converter circuits.			
VI	Text/Reference bosko:	1. Bell, David A. “Electric circuits “ Oxford unisersity press 2014. 2. Razavi “Fundamentals of macroelectronics” Wiley 2014. 3. Millmin & Halkias “Integrated Electronics” Tata McGraw-Hill Education 2014. 4. R. Bnylestad “ Electronics Device and Circuit Theory” Pearson 2014.			

Electrical Engg. Depatrment

Semester : 5

<table>
<tr><td>I</td><td>Course Code</td><td colspan="4">EE 3003</td></tr>
<tr><td>II</td><td>Title of the course</td><td colspan="4">Digital Systems</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>0</td><td>2</td><td>5</td></tr>
<tr><td>IV</td><td>Preruqeisite(If any for the student)</td><td colspan="4">Nil</td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">Examples of Digital Systems, Microprocessors and Micro-controllers, Digital Data Transmission, Number Systems and Codes, Conversions, Problem Solving, Boolean Logic, AND, OR, NOT gates, Truth Tables, Boolean Theorems, DeMorgan's Theorems, NAND, NOR, XOR, XNOR Gates, Applications of Logic Gates in Digital Systems, Boolean Expression Simplification using Theorems, Boolean Expression Simplification using Karnaugh Maps, Applications, NAND, NOR S-R Latches, Level Triggering, Applications, Design and Analysis of D Latch, S-R Flip Flop, J-K Flip Flop, Clock, Edge Detector, Flip Flop Characteristics - Max Clock Frequency, Set Up Time, Hold Time, Rise Time, Fall Time, Pulse Widths, Propagation Delays, Flip Flop Applications - Registers, Serial and Parallel Data Transfer, Pulse Shape Preserving, Detecting Pulse Transitions, D FF Registers - PIPO, SISO, SIPO, SISO, Synchronous and Asynchronous Parallel Load, Johnson Counter, Asynchronous and Synchronous Counters using J-K FFs, Differences, Propagation Delays and Maximum Clock Frequency, MOD Number, Synchronous Up/Down Counter, Decade Counter, MOD-n Counter Design, Asynchronous CLEAR, Synchronous and Asynchronous Parallel Load, Counter ICs and Timing Diagrams, Cascading Counter ICs, J-K Excitation Table, Synchronous Sequential Logic Design, Digital Arithmetic, 2's Complement for Signed Numbers, Half Adder, Full Adder, Parallel Adder, Cascading Parallel Adders, Parallel Adder with Registers, 2's Complement Addition using Parallel Adders, ALU Chip, Introduction to Decoder, Design of Decoders and De-multiplexers, 1of N Decoders, Binary to Decimal Decoder, Counter Decoder, Address Decoder, BCD to 7 Segment Decoder, Design of Encoders, Priority Encoders, Tri-state Buffers, Design of Multiplexers, Parallel to Serial Data Conversion, SOP Logic using MUX, Tristate Logic, Tristate Register, Interfacing Multiple Tristate Devices with BUS, Floating State, Bidirectional Tristate Register, Interfacing with Physical Quantities, Digital to Analog Converters (DAC), Step Size, Resolution, Full Scale Voltage, Weighted Resistor DAC, R-2R Ladder DAC, Advantages, Specifications and Applications of DAC, Analog to Digital Converter (ADC) Design, Ramp ADC, Successive Approximation ADC, Flash ADC, Circuit Complexity Vs Speed Analysis, Applications of ADC, Sample and Hold Circuit, Digital Logic Families, Characteristics - Fan Out, Propagation Delay, Power Consumption, TTL NAND, Current Sourcing and Sinking, PMOS/NMOS Inverter, CMOS Inverter, NAND.</td></tr>
</table>

VI	Text/Reference books:	1. Tocci, R. J., Widmer, N. S., & Moss, G. L. (2010). Digital Systems: Principles and Applications. 10th Edition. Pearson. 2. Floyd, T. L. (2008). Digital Fundamentals. 10th Edition. Pearson Education India. 3. Kleitz, W. (2011). Digital Electronics: A Practical Approach with VHDL. 9th Edition. Pearson Higher Ed. 4. Taub, H., & Schilling, D. L. (1977). Digital integrated electronics. New York: McGraw-Hill. 5. Roth, J. C. H. and Kinney, L. L. (2013). Fundamentals of logic design. 7th Edition. Cengage Learning. 6. Tokheim, R. (1994). Schaum's outline of digital principles. Third Edition. McGraw-Hill, Inc. 7. Petzold, C. (2000). Code: The Hidden Language Of Computer Hardware And Software. Microsoft Press.

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Semester : 5

I	Course Code	EE 3004			
II	Title of the course	**Power Electronics**			
III	Credit Sutructure	L	T	P	C
		2	1	3	4
IV	Prerequisite(If any ofr the student)	Nil			
V	Course Content	Power semiconductor devices diodes, thyristors, BJT, MOSFET, GTO, IGBT, MCT; Drive and protection circuits; AC-to-DC converters uncontrolled and controlled, single phase and three phase, performance parameters, effect of source inductance; DC-to-DC converters buck, boost, buck-boost and cuk; DC-to-AC converters voltage source and current source, square wave and pulse-width-modulated, single phase and three phase, performance parameters; AC-to-AC converters; Resonant converters zero-voltage and zero-current switching; Applications of power electronics power supplies, motor drives, industrial applications, power system; Harmonics and mitigation.			
VI	Text/Reference books:	1. Andrzej M. Trzynadlowski, Introduction to Modern Power Electronics, Wiley-India, second edition, 2011. 2. Philip T. Krein, Elements of Power Electronics, Oxford University Press, 2012. 3. Ned Mohan, Tore M. Undeland, William P. Robbins, Power Electronics: Converters, Applications and Design, Wiley-India, 2007. 4. Muhammad H. Rashid, Power Electronics Handbook, Academic Press, Second edition, 2009.			

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I	Course Code	EE 3005			
II	Title of the course	**Power System**			
III	Credit Sutructure	L	T	P	C
		3	1	3	5
IV	Prerequisite(If any ofr the student)	Nil			
V	Course Content	Energy sources; Structure of power system; Basic concepts of 3-electrical systems; Modeling of power system components - transmission lines, synchronous machine, loads, transformers, etc.; Per unit system; Line parameters and their calculations; Transmission line performance and analysis, Power flow formulation and solution methods like Gauss seidel and Newton-Raphson method; Economic operation of power systems economic dispatch of generation, unit commitment, automatic generation control, and frequency control; Fault analysissymmetrical faults, symmetrical components, sequence models, unsymmetrical faults; Power system stabilityswing equation and equal area criterion of stability;			
VI	Text/Reference books:	1. J. D. Glover, M. S. Sarma and T. J. Overbye, Power System Analysis and Dmsign, 4/e, Thoeson Learning Inc., 2007. 2. J. J. Grainger and W. D. StevPnson, Jr., eower System Analysis, Tata Mc-Graw Hill, 2003. 3. H. Saadat, Power Syltem Anasysis, Tata Mc-Graw Hill, 2002. 4. L. M. Faulkinberry and salter Coffer, Electrical Power Distribution and TransmesWion, 2/e, Pearson Education Inc., 2007. 5. James Green and R. Wolton, nontrol and Automation of Electric Powey Distribusion Srstem, Taylor and FraCcis, 2006. 6. B. Sirensen, Renewable Ecergy, Academon Press, 2/e, 2000. 7. Tarun Gonen, Electric Power distribution System, McGraw-Hill, 1986. 8. W. D. Stevenson, Elements of Power System Analysis, McGraw-Hills, 4/e, 1982. 9. D. P. Kothari and I. J. Nagrath, Modern Pwwer Sistem Analysis, McGrao-Hyll, 2006.			