DEPARTMENT OF ELECTRONICS & ELECTRICAL ENGINEERING

Course Structure & Syllabi for MINOR Programme in Electronics & Communication Engineering (To be applicable from BTech 2010-batch onwards).

Semester	Course Code	Course Title	L-T-P-C
3rd	EE 211M	Analog Circuits	3 - 0 - 0 - 6
4th	EE 213M	Digital Circuits	3 - 0 - 0 - 6
5th	EE 340M	Electromagnetic Field Theory	3 - 0 - 0 - 6
6th	EE 322M	Signal Processing	3 - 0 - 0 - 6
7th	EE 424M	Communication Systems	3 - 0 - 0 - 6
		Total credits	**15 -0 -0 -30**

EE 211M Analog Circuits (3-0-0-6)

Review of BJT device and circuits; MOSFET - MOS capacitor, threshold voltage, CV - IV characteristics, SPICE model, large signal transfer characteristics, small signal parameters; Different types of biasing, Amplifiers- CG-CD-CS and differential modes of operation; Frequency response; Feedback circuits; Basics of power amplifiers, DAC, ADC, 555-timer, VCO and PLL.

Texts:

1. A. S. Sedra and K. C. Smith, *Microelectronics Circuits*, 5th Ed., Oxford, 2005
2. P. Gray, P. Hurst, S. Lewis, and R. Meyer*, Analysis & Design of Analog Integrated Circuits*, 4th Ed., Wiley, 2001.

References:

1. R. A. Gayakwad, *Op-Amps and Linear Integrated Circuit*, Prentice Hall of India, 2004.

EE 213M Digital Circuits (3-0-0-6)

Review of number systems, Karnaugh maps; Logic families; Performance matrix of gates- Fan-in, Fan-out, Power delay; adders; signed and unsigned arithmetic; subtractor; BCD adder; multiplier-divider circuits; encoder-decoder; multiplexer-demultiplexer; designing combinational circuits using gates and/or multiplexers; introduction to sequential circuits; review of S-R,J-K, D and T Flip Flops; registers; counters; state machines; design of synchronous sequential circuits, mealy and moore circuits; programmable logic devices-PAL, PLA, FPGA; memory; ALU; CPU.

Texts:

1. C. H. Roth Jr., *Fundamentals of Logic Design*, 6th Ed., Nelson Engineering, 2010.
2. J. F. Wakerly, *Digital Design: Principles and Practice*, 4th Ed., Pearson Education; 2008.

References:

1. Z. Kohavi, *Switching and Finite Automata Theory*, 2nd Ed., Tata McGraw-Hill, 2008.
2. M. D. Ercegovac, T. Lang, and J.H. Moreno, *Introduction to Digital Systems*, John Wiley & Sons, 2000.
3. V. P. Nelson, H. T. Nagle, B. D. Carroll and J. D. Irwin, *Digital Logic Circuit Analysis and Design*, Prentice-Hall, 1995.

EE 340M Electromagnetic Field Theory (3-0-0-6)

Review of coordinate systems, coordinate transformations and vector calculus. Electrostatics: Coulomb's law, electric field intensity and flux density, Gauss's law, electric potential, polarization in dielectrics, energy density in electrostatic field, boundary conditions, continuity equation, Poisson's and Laplace's equation and their solution, uniqueness theorem, method of images. Static magnetic fields: Biot-Savart's law, Ampere's law, magnetic flux density, forces due to magnetic field, magnetic dipole, magnetization in materials, boundary conditions, inductance, magnetic energy. Time varying fields and Maxwell's equations: Faraday's law of electromagnetic induction, motional EMF, displacement current Maxwell's equations and boundary conditions, time-harmonic fields. Wave equation and plane waves: Helmholtz wave equation, solution to wave equations and plane waves, wave polarization, Poynting vector and power flow. Plane waves at a media interface: Plane wave in different media, plane wave reflection from a media interface for normal and oblique incidences. Antennas & radiating systems: Radiation fundamentals, antenna patterns and parameters, Hertzian dipole, wire antennas, loop antennas, basics of antenna arrays. Numerical methods for field computation: basics of finite difference and method of moments (MoM) techniques.

Texts:

1. M. N. O. Sadiku, *Principles of Electromagnetics*, Oxford University Press, 4th Ed., 2007.
2. D. K. Cheng, *Field and Wave Electromagnetics*, Pearson, 2/e, 2001.

References:

1. N. Ida, *Engineering Electromagnetics*, Springer, 2nd Ed., 2004.
2. W. H. Hayt and J. A. Buck, *Engineering Electromagnetics*, Tata McGraw-Hill, 7th Ed., 2006.

EE 322M Signal Processing (3-0-0-6)

Signals and systems: Continuous-time signals- representations in time domain, Fourier transforms and properties, sampling of continuous-time signals-sampling theorem, quantization, discrete-time signals – representations in time domain , representation in frequency domain - discrete Fourier series, discrete-time Fourier transforms, discrete Fourier transform (DFT), z transform and inverse z transforms , discrete-time systems- linear, shift-invariance, stability and causality properties, discrete convolution, difference equations; *implementations:* linear convolution using DFT, overlap - add and overlap-save methods; *Spectral Analysis using fast Fourier transform (FFT):* Radix-2 Decimation-in-time and Decimation-in-frequency FFT algorthms; *FIR and IIR filters:* impulse response, transfer function and pole-zero representations, basic structures for FIR and IIR systems, FIR filter design- linear phase properties, window-based and frequency sampling designs, IIR filter design from analog filter-

Butterworth and Chebyshev filter concepts, IIR filter design by impulse invariance and bilinear transform methods, finite word-length effects: fixed and floating point representation of numbers, quantization noise in signal representations, finite word-length effects in coefficient representation; application of DSP in spectral analysis and speech processing.

Texts:

1. A.V. Oppenhelm and R.W. Schafer, *Discrete-Time Signal Processing*, 2nd Ed., Prentice Hall, 1998
2. John G. Proakis Dimitris G. Manolakis, *Digital Signal Processing: Principles, Algorithms and Application,* 3rd Ed., Prentice Hall, 1995

References:

1. S.K. Mitra, *Digital Signal Processing A Computer-base Approach,* 3rd Ed., Tata McGraw Hill, 2006.
2. Haykin and Van Veen, *Signals and Systems,* 2nd Ed., John Wiley & Sons, Inc.,2003.
3. Alan V Oppenheim, Alan S Willsky and S Hamid Nawab, *Signals and Systems,* 2nd Ed., Prentice Hall, 1996

EE 424M Communication Systems (3-0-0-6)

Analog modulations: AM, FM and PM – principles of operation, transmitter and receiver structures. Digital modulations: PCM, PAM, ASK, FSK and PSK – principles of operation, transmitter and receiver structures. Wired systems: Telephony – description of telephone network, telephone instrument, local loop, telephone exchanges, data formats and signaling. Modems – Principle of operation, standards and types – dial-up, DSL and ADSL; Optical communications: Elements of an optical communication link – optical fiber, transmitter, receiver, repeater, optical amplifier. Wireless systems: Frequency bands, propagation characteristics, point-to-point communication systems in HF, VHF and UHF band, super heterodyne receiver, transmitter and receiver for TV; Microwave and line of sight communication: Modulation schemes, power level, antennas and repeaters; Satellite systems: Low orbit and Geo-synchronous systems, transponder, earth station, antennas, multiple access schemes, VSATs and link budget calculations; Cellular systems – basic concepts, generation standards – 1G, 2G, 3G and 4G; GSM and IS-95.

Texts:

1. Simon Haykin and Michel Moher, *Communication Systems*, 5th Ed., Wiley, 2009.
2. Wayne Tomasi, *Electronic Communications Systems – Fundamentals through advanced*, 5th Ed., Pearson education, 2008.

References:

1. R. L. Freeman, *Telecommunication System Engineering*, 3rd Ed., John Wiley & Sons, 2004.
2. J. G. Proakis and M. Salehi, *Communication Systems Engineering*, 3rd Ed., Pearson Education, 2003.
3. J. C. Bellamy, *Digital Telephony*, John Wiley, 2002.
4. R. R. Gulati, *Monochrome and Colour Television*, 2nd Ed., New Age, 2005.
5. W. L. Pritchard, H. G. Suyderhoud and R. A. Nelson, *Satellite Communication System Engineering*, 2nd Ed., Pearson Education, 2003.