MA207

Course Objectives

To expose the students to the basics of real analysis and partial differential equations required for their subsequent course work.

Real Analysis and Partial Differential Equations (3 -1- 0) 4

Real number system. Sets, relations and functions. Properties of real numbers. Numerical sequences. Cauchy sequences. Bolzano-Weierstrass and Heine-Borel properties.

Functions of real variables. Limits, continuity and differentiability. Taylor's formula. Implicit and inverse function theorems. Extrema of functions.

Reimann integral. Mean value theorems. Differentiation under integral sign. Improper and multiple integrals. Change-of-variables formula.

Sequences and series of functions. Pointwise and uniform convergence. Power series and Taylor series.

Laplace and Helmholtz equations. Boundary and initial value problems. Solution by separation of variables and eigen function expansion.

Course Outcome

To understand the basics of Real analysis.

To apply the acquired knowledge in signals and Systems, Digital Signal Processing. etc.

References:

Guenther,R..B. & Lee,J.W., Partial Differential Equations of Mathematical Physics and Integral Equations, Prentice Hall.

Kreiszig,E., Advanced Engineering Mathematics,John Wiley.

Mattuck,A., Introduction to Analysis, Prentice-Hall.

EC201

Course Objective

To understand the fundamental characteristics of signals and systems.

To understand the concepts of vector space, inner product space and orthogonal series.

To understand signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide.

Development of the mathematical skills to solve problems involving convolution, filtering, modulation and sampling.

Signals and Systems (3 -1- 0) 4

Vector spaces. Inner Product spaces. Schwartz inequality. Hilbert spaces. Orthogonal expansions. Bessel's inequality and Parseval's relations.

Continuous -time signals, classifications. Periodic signals. Fourier series representation. Hilbert transform and its properties.

Laplace transform. Continous - time systems .LTI system analysis using Laplace and Fourier transforms.

Sampling and reconstruction of band limited signals. Low pass and band pass sampling theorems. Aliasing. Anti-aliasing filter.

Discrete time signals and systems .Z-transform and its properties. Analysis of LSI systems using Z - transform

Course Outcome

On successful completion of this course, all students will have developed knowledge and understanding of general signals and system properties (both in continuous and discrete domain), Time and transform domain representation of linear signals and systems.Orthogonal series, various transforms and its proprties, sampling. Analysis of systems (continuous and discrete) in time and transform domain.

On successful completion of this course, all students will have developed their ability to apply knowledge of mathematics to the analysis and design of electrical circuits, to identify, formulate, and solve engineering problems in the area of signals and systems, to use the techniques, skills, and engineering tools necessary for engineering practice.

References:

A.V.Oppenheim et al, Signals and Systems (2/e), Pearson 2003

S.S.Soliman & M.D.Srinath, Continuous and Discrete Signals and Systems,

Prentice- Hall, 1990

K.Huffman & R.Kunz, Linear Algebra, Prentice- Hall

EC203

Course Objective

To make the students capable of analyzing any given electrical network.

To make the students learn how to synthesize an electrical network from a given impedance/admittance function.

Network Theory (3 -1- 0) 4

Network concept. Elements and sources. Kirchoff's laws. Tellegen's theorem. Network equilibrium equations. Node and mesh method. Source superposition. Thevenin's and Norton's theorems.

First and second order networks. State equations. Transient response. Network functions. Determination of the natural frequencies and mode vectors from network functions.

Sinusoidal steady-state analysis. Maximum power-transfer theorem. Resonance. Equivalent and dual networks. Design of equalizers.

Two-port network parameters. Barlett's bisection theorem. Image and iterative parameters. Design of attenuators.

Two-terminal network synthesis. Reactance networks, separation property. Foster's reactance theorem. Synthesis of RL and RC networks.

Course Outcome

Students will be able to analyze the various electrical and electronic networks using the techniques they learn.

Students will be able to construct a circuit to suit the need.

References:

W.H.Hayt & J.E.Kemmerly, Engineering Circuit Analysis (6/e), McGraw-Hill

N.Balamanian, Electrical Circuits, McGraw-Hill

T.S.Huang & R.R.Parker, Network Theory, Addison-Wesley, 1971.

EC205

Course Objective

To expose the students to the rudiments of Electromagnetic theory essential for subsequent courses on microwave engineering, antennas and wireless communication.

Engineering Electromagnetics (3- 0 - 0) 3

Electrostatics. Coulomb's law. Gauss's law and applications. Electrostatic potential. Poisson's and Laplace equations. Method of images.

Electrostatic fields in matter. Dielectrics and dielectric polarization. Capacitors with dielectric substrates. Force and energy in dielectric systems.

Magnetostatics.Magnetic fields of steady currents. Biot-Savart's and Ampere's laws. Magnetic vector potential. Magnetic properties of matter.

Electrodynamics.Flux rule for motional emf. Faraday's law. Self and mutual inductances. Maxwell's equations. Poynting theorem.

Electromagnetic wave propagation. Uniform plane waves Wave polarization. Reflection and refraction. Propagation in an ionized medium. Effect of a biasing magnetic field. Faraday rotation.

Course Outcome

The course begins with the most elementary material, develops underlying concepts needed for sequential topics and progresses to more advanced methods.

Students can understand the concepts of electricity, magnetism, Maxwell's equations and waves. This will be useful for understanding the courses like transmission lines and waveguides, antennas, microwave electronics and wireless communication.

References:

D.J.Griffiths, Introduction to Electrodynamics (3/e), PHI

R.E.Collin, Foundations for Microwave Engineering (2/e) Mc Graw –Hill, 2002.

R.E.Collin, Antennas and Radiowave Propagation, Mc Graw-Hill, 1985.

EC207

Course Objective

To make the students understand the fundamentals of electronic devices.

To train them to apply these devices in mostly used and important applications.

Semiconductor Physics and Devices (3 – 0 - 0) 3

Semiconductor materials, crystal growth, film formation, lithography, etching and doping. conductivity, charge densities, E-K relation, Fermilevel, continuity equation, Hall effect and its applications.

P-N junction diodes, biasing, V-I characteristics, capacitances. Diode model. Various types of diodes.

BJT, modes of operation, BJT models, BJT switch, breakdown mechanisms, Photo devices.

MOSFET, operation, V-I characteristics, MOSFET as amplifier and switch, capacitance, equivalent model. CMOS circuits. BiCMOS circuits. CCDs.

Power devices, operation and characteristics. Thyristor family. Power diodes. Power transistors. GTOs and IGBTs.Display devices, Operation of LCDs,ACTFELs, plasma and field emission displays.

Course Outcome

To understand the applications and characteristics of various electronic devices.

To apply the knowledge to understand various circuits.

To design various applications based on the various Devices.

References:

S.M.Sze, Semiconductors Devices, Physics and Technology, (2/e), Wiley, 2002

A.S.Sedra & K.C.Smith, Microelectronic Circuits (5/e), Oxford, 2004

L.Macdonald & A.C.Lowe, Display Systems, Wiley, 2003

EC209

Digital Circuits and Systems (3 - 0 - 0) 3

Review of number systems. Binary and BCD arithmetic. Binary codes. Error detection and correcting codes.

Boolean laws. Logic operations. Boolean functions-simplifications. Combinational circuits.Programmable logic arrays.

Flip flops. Types of Flip flops. Synchronous and asynchronous circuit analysis and design. Semiconductor memories.

Asynchronous Circuit Analysis and Design. State reduction and state assignment. Hazards.

CMOS and ECL family of logic circuits.

References:

S.Brown & Z.Vranesic, Fundamentals of Digital Logic with VHDL Design, McGraw-Hill, 2000.

A.S.Sedra & K.C.Smith, Microelectronic Circuits (5/e), Oxford, 2004.

EC211

Devices and Networks Laboratory 0 - 0 - 3 – 1

EC213

Digital Electronics Laboratory 0 - 0 - 3 – 1