Engineering Physics

SEMESTER - V						
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	PH301T	Electrodynamics	2	1	0	6
2	EE201T	Introduction to Analog Circuits (Post midsem)	3	0	0	3
3	EE302C	Fundamental of Digital Signal Processing	2	0	2	6
4	EE201L	Devices and Circuits Laboratory	0	0	3	3
5	ME203T	Fluid Mechanics	2	1	0	6
6	PH401L	Advanced Physics Laboratory	0	0	3	3
	Fifth Semester Total Credits					**27**

Engineering Physics

1	**Title of the course (L-T-P-C)**	**Electrodynamics (2-1-0-6)**
2	**Pre-requisite courses(s)**	Successful completion of PH102
3	**Course content**	Review of electrostatics and magnetostatics. Electrodynamics: Differential and integral forms of Maxwell's equations, Scalar and vector potentials, gauge transformations, Coulomb and Lorentz Gauge; Maxwell's equations in terms of potentials. Energy and momentum in electrodynamics. Electromagnetic waves: Electromagnetic waves in non-conducting media: Monochromatic plane waves in vacuum, propagation through linear media; Boundary conditions; Reflection and transmission at interfaces. Fresnel's laws; Electromagnetic waves in conductors: Modified wave equation, monochromatic plane waves in conducting media, Dispersion: Dispersion in non-conductors, free electrons in conductors and plasmas. Guided waves. Retarded potentials, Electric dipole radiation, magnetic dipole radiation. Radiation from a point charge: Lienard-Wiechart potentials, fields of a point charge in motion, power radiated by a point charge. Electrodynamics and Relativity: Review of special theory of relativity, Lorentz transformations, Minkowski four vectors, energy-momentum four vector, covariant formulation of mechanics; Transformation of electric and magnetic fields under Lorentz transformations, field tensor, invariants of electromagnetic field, Covariant formulation of electrodynamics, Lorentz force on a relativistic charged particle. Waveguides, Resonant Cavities and Optical Fibers, Basics of Antennas.
4	**Texts/References**	**1.** D. J. Griffith: Introduction to Electrodynamics, 4th edition, Pearson, 2015. **2.** J.D. Jackson: Classical Electrodynamics, Wiley student edition, 3rd edition, 2007. **3.** Modern Electrodynamics, Andrew Zangwill, Cambridge University Press, 2012. **4.** Foundations of Electromagnetic Theory, J. R. Reitz, F. J. Milford, and R. W. Christy, Addison-Wesley, 4th edition, 2008. **5.** W K H Panofsky and M Philips: Classical Electricity and Magnetism Addison Wesley, 2nd edition, 1962. **6.** W Greiner: Classical Electrodynamics, Springer, 1998. **7.** Hayt, William H., Jr., and John A. Buck, "Engineering Electromagnetics", 7th ed. McGraw-Hill, 2006. **8.** M.A. Heald and J.B. Marion, Classical Electromagnetic Radiation, Saunders, 1983.

1	**Title of the course (L-T-P-C)**	**Introduction to Analog Circuits (3-0-0-3)**
2	**Pre-requisite courses(s)**	Network theory, Electronic Devices
3	**Course content**	**Part 1: Linear circuits** **1.** Introduction to feedback control – Integral control and proportional control **2.** Linear circuits using Op-amps (amplifiers, arithmetic circuits, filters and oscillators) **Part 2: Need for non-linearity for amplification.** Single stage amplifiers, frequency response, Current mirror circuits, Differential amplifier.
4	**Texts/References**	**1.** J.V.Wait, L.P.Huelsman and GA Korn, Introduction to Operational Amplifier theory and applications, 2nd edition, McGraw Hill, New York, 1992. **2.** J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988. **3.** Ramakant Gayakwad, Op-amps and Linear Integrated Circuit, 4th edition, Pearson, 2000. **4.** P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989. **5.** Behzad Razavi, "Fundamentals of Microelectronics," John Wiley, 2013.

1	**Title of the course (L-T-P-C)**	**Fluid Mechanics (3-0-0-6)**
2	**Pre-requisite courses(s)**	**Nill**
3	**Course content**	**Introduction:** Scope, definition of fluid as continuum, fluid properties. (2hr) **Fluid Statics:** Pressure at a point, basic equation for pressure field, pressure variation **(fluid at rest):** standard atmosphere, Measurement of pressure manometer, Hydrostatics force on a plane and curve surface, Buoyancy, flotation and stability, pressure variation in a fluid with rigid body motion linear motion, rigid body rotation(4hr) **Elementary Fluid Dynamics:** Statics, stagnation pressure, Bernoulli Equation assumptions(4hr) **Fluid Kinematics The velocity filed:** Eulerian and Largrangian flow descriptions, steady and deformation, **Acceleration field:** material derivative, unsteady and convective effects. **Control volume and system representation:** Reynolds' Transport Theorem, physical interpretation, steady, unsteady effects, moving control volume, potential function(6Hr) Integral approach Conservation of mass derivation of continuity, fixed, non-deforming control volume, moving non-deforming control volume, deforming control volume. **Conservation of momentum:** linear momentum and moment of momentum equation and their application., comparison of energy equation with Bernoulli's equation(6hr) **Differential approach:** linear motion and angular motion with deformation, **Conservation of mass:** differential form of continuity equation, stream function, Conservation of linear momentum, Inviscid flows, Irrotational flow(6hr) **Viscous flow:** Stress relationships, NS Equations, Simple solutions for viscous flows(4hr) Dimensional analysis Buckingham's II-theorem, Dimensionless groups & their importance (3hr) **Viscous Flow in Pipes:** General characteristics of pipe flow, fully developed laminar and turbulent flow, turbulent shear stress, turbulent velocity profile, Pipe Flow rate measurement. (4hr) **Boundary layer:** Boundary layer characteristics boundary layer structure and thickness on a plate, Blasius boundary layer, momentum integral boundary layer equation for a flat plate(4hr)
4	**Texts/References**	**1.** Yunus A. Cengel, John M. Cimbala, Fluid Mechanics, Tata McGraw Hill Education,2011 **2.** F.M.White Fluid Mechanics, Seventh Edition, Tata McGraw Hill Education,2011, **3.** Kundu, Pijush K., and Ira M.Cohen.Fluid Mechanic, Elsevier,2001

1	**Title of the course** (L-T-P-C)	**Fundamentals of Digital Signal Processing** (2-0-2-6)
2	**Pre-requisite courses(s)**	Signals and Systems (EE 210)
3	**Course content**	**Lecture:** Review of basic signal processing, and sampling, introduction to DSP, Z transform, DFT, FFT, Implementation of discrete time systems, and Introduction to digital filters. **Laboratory:** Overview of DSP kit, generation of waveform, convolution and correlation, DFT and FFT, design of digital filters
4	**Texts/References**	**1.** Proakis and Manolokis, "Digital Signal Processing," 4thedition, Prentice Hall, 2006. **2.** S K Mitra, "Digital Signal Processing," McGraw Hill, Inc., 4thedition, 2017. **3.** Alan V Oppenheim, "Digital Signal Processing," Prentice Hall,1975.

1	**Title of the course** (L-T-P-C)	**Devices and circuits Lab** **(0-0-3-3)**
2	**Pre-requisite courses(s)**	--
3	**Course content**	This lab will reinforce concepts thought in Electronic devices and analog circuits. It will have experiments on Device characterization and circuits design and characterization. The following is the tentative list of experiments for this lab: **1.** LED and Photodiode characterization **2.** BJT biasing and CE amplifier **3.** Solar cell characterization **4.** Diode Temperature characteristics **5.** NMOS characterization and CS amplifier **6.** MOS differential amplifier **7.** basic opamp circuits **8.** Active filters **9.** Multivibrators **10.** Audio amplifiers
4	**Texts/References**	**1.** J.V.Wait, L.P.Huelsman and GA Korn, Introduction to Operational Amplifier theory and applications, 2nd edition, McGraw Hill, New York, 1992. **2.** J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988. **3.** Behzad Razavi, Fundamentals of microelectronics, Wiley Publications **4.** A.S.Sedra and K.C. Smith,Microelectronic Circuits, Saunder's College Publishing, Edition IV, 2017. **5.** Ramakant Gayakwad, Op-amps and Linear Integrated Circuit, 4th edition, Pearson, 2000.