# Engineering Physics

| SEMESTER - V | | | | | | |
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| **Sl. No.** | **Course Code** | **Course Name** | **L** | **T** | **P** | **C** |
| 1 | PH 201 | Electrodynamics | 2 | 1 | 0 | 6 |
| 2 | EE 202 | Introduction to Analog Circuits (Post midsem) | 3 | 0 | 0 | 3 |
| 3 | EE 320 | Fundamental of Digital Signal Processing | 2 | 0 | 2 | 6 |
| 4 | EE 212 | Devices and Circuits Laboratory | 0 | 0 | 3 | 3 |
| 5 | ME 203 | Fluid Mechanics | 2 | 1 | 0 | 6 |
| 6 | - | Institute Elective-1/RND Project-1 | 2 | 1 | 0 | 6 |
| | Fifth Semester Total Credits | | | | | 30 |
| | Third Year Total Credits | | | | | 64 |

# Engineering Physics

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| 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.<br><br>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.<br><br>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.<br><br>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.<br><br>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.<br><br>Waveguides, Resonant Cavities and Optical Fibers, Basics of Antennas. |
| 4 | **Texts/References** | **1.** D. J. Griffith: Introduction to Electrodynamics, 4th edition, Pearson, 2015.<br>**2.** J.D. Jackson: Classical Electrodynamics, Wiley student edition, 3rd edition, 2007.<br>**3.** Modern Electrodynamics, Andrew Zangwill, Cambridge University Press, 2012.<br>**4.** Foundations of Electromagnetic Theory, J. R. Reitz, F. J. Milford, and R. W. Christy, Addison-Wesley, 4th edition, 2008.<br>**5.** W K H Panofsky and M Philips: Classical Electricity and Magnetism Addison Wesley, 2nd edition, 1962.<br>**6.** W Greiner: Classical Electrodynamics, Springer, 1998.<br>**7.** Hayt, William H., Jr., and John A. Buck, "Engineering Electromagnetics", 7th ed. McGraw-Hill, 2006.<br>**8.** M.A. Heald and J.B. Marion, Classical Electromagnetic Radiation, Saunders, 1983. |

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| **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**<br>**1.** Introduction to feedback control – Integral control and proportional control<br>**2.** Linear circuits using Op-amps (amplifiers, arithmetic circuits, filters and oscillators)<br>**Part 2: Need for non-linearity for amplification.**<br>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.<br>**2.** J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988.<br>**3.** Ramakant Gayakwad, Op-amps and Linear Integrated Circuit, 4th edition, Pearson, 2000.<br>**4.** P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989.<br>**5.** Behzad Razavi, "Fundamentals of Microelectronics," John Wiley, 2013. |

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| 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)<br><br>**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)<br><br>**Elementary Fluid Dynamics:** Statics, stagnation pressure, Bernoulli Equation assumptions(4hr)<br><br>**Fluid Kinematics The velocity filed:** Eulerian and Largrangian flow descriptions, steady and deformation,<br><br>**Acceleration field:** material derivative, unsteady and convective effects.<br><br>**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.<br><br>**Conservation of momentum:** linear momentum and moment of momentum equation and their application., comparison of energy equation with Bernoulli's equation(6hr)<br><br>**Differential approach:** linear motion and angular motion with deformation,<br><br>**Conservation of mass:** differential form of continuity equation, stream function, Conservation of linear momentum, Inviscid flows, Irrotational flow(6hr)<br><br>**Viscous flow:** Stress relationships, NS Equations, Simple solutions for viscous flows(4hr) Dimensional analysis Buckingham's II-theorem, Dimensionless groups & their importance (3hr)<br><br>**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)<br><br>**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<br>**2.** F.M.White Fluid Mechanics, Seventh Edition, Tata McGraw Hill Education,2011,<br>**3.** Kundu, Pijush K., and Ira M.Cohen.Fluid Mechanic, Elsevier,2001 |