

ENGINEERING PHYSICS Syllabus 2018 onwards

[Common to ECE, EIE, Mechatronics, EEE, CSE and IT]

Credits: 4

Hrs/week – Lecture-4, Tutorial-1

UNIT I – WAVE OPTICS [12 hrs]

Huygens' principle, superposition of waves – Theory of interference of light -Young's double slit experiment. Thin films- Newton's rings, Michelson interferometer-Anti reflection coating. Fresnel and Fraunhofer diffraction– diffraction due to 'n' slits- plane transmission grating. Rayleigh criterion for limit of resolution - resolving power of grating

UNIT -II - QUANTUM PHYSICS [12 hrs]

Black body radiation-Planck's law – Energy distribution function, Wave – particle duality-de Broglie matter waves – Concept of wave function and its physical significance – Heisenberg's Uncertainty Principle – Schrodinger's wave equation – Time independent and Time dependent equations – Particle in a one dimensional rigid box – tunneling (Qualitative) – Scanning tunneling microscope.

UNIT III – PHOTONICS [12hrs]

Einstein's theory of matter radiation interaction and A and B coefficients; Properties of laser-spontaneous and stimulated emission, amplification of light by population inversion, different types of lasers: solid-state laser(Neodymium), gas lasers (CO₂), applications –IR Thermography. Optical fibre- principle [TIR]-types-material, mode, refractive index-Fibre loss-Expression for acceptance angle and numerical aperture. Application-Communication.

UNIT IV - SEMICONDUCTOR DEVICES AND APPLICATIONS [12 hrs]

Introduction to P-N junction Diode and V-I characteristics, Zener diode and its characteristics, Introduction to BJT, its input-output and transfer characteristics, SCR characteristics, FET, MOSFET and CMOS characteristics. Basic logic gates - NAND, NOR as Universal building block.

UNIT V – NEW ENGINEERING MATERIALS [12 hrs]

Dielectric materials: Definition – Dielectric Breakdown – Dielectric loss – Internal field – Clausius Mossotti relation.

Superconducting materials: Introduction – Properties- Meissner effect – Type I & Type II superconductors – BCS theory-Applications.

Nanomaterials: Introduction – Synthesis of nano materials – Top down and Bottom up approach- Ball milling- PVD method- Applications.

Smart materials: Shape memory alloys-Biomaterials (properties and applications)

TEXT BOOKS

1. Optics by Subramaniam N & BrijLal, S Chand & Co. Pvt. Ltd., New Delhi, [unit 1]
2. Modern Physics by R Murugesan, Kiruthiga, Sivaprasath S Chand [all units]
3. Quantum Mechanics by Sathyaprakash, Pragati Prakashan, Meerut. [unit 2]
4. Applied Engineering Physics – Rajendran & Marikani (Tata McGraw Hill) [unit 3,5] 2009
5. Engineering Physics – Bhattacharya, Bhaskaran – Oxford Publications [unit 2,3,5] 2012
6. Engineering Physics I & II – G.Senthilkumar, VRB publications [unit 2,3] 2012
7. Applied Physics for Engineers – K.Venkatramanan, R.Raja, M.Sundarrajan(Scitech) [3,5] 2014
8. Principles of Electronics by V.K.Mehta, (S.Chand) [unit 5]

REFERENCE BOOKS

1. Fundamentals of Optics by Jenkins A Francis and White E Harvey, McGraw Hill Inc., New Delhi,
2. Quantum Mechanics by V. Devanathan, Narosa, Chennai.
3. Engineering Physics by M.N.Avadhanulu, S.Chand& Company Ltd.
4. Concepts of Modern Physics by Arthur Beisser, McGraw Hill, 7th edition.
5. Optics by R.Agarwal, S.Chand publishers.
6. Basic Electronics by B.L.Theraja, S.Chand publishers.
7. Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J. Walker, John Wiley and Sons, New York.

APPLIED PHYSICS FOR ENGINEERS - I

[Common to MECHANICAL, CIVIL AND CIVIL & STRUCTURAL ENGG.]

Credits: 4

Hrs/week – Lecture-4, Tutorial-1

UNIT I – PROPERTIES OF MATTER [12 hrs]

Stress – Strain – Hooke's law – Elastic Behavior of Material – Young's modulus by cantilever depression – Non-uniform bending – Uniform bending- Application -I-shaped girders. Torsional Pendulum – Couple per unit twist of a wire-Time period-Application- Determination of Rigidity Modulus.

UNIT II – TECHNICAL ACOUSTICS [12hrs]

Acoustics of buildings – Reverberation- Weber Fechner law- Factors affecting acoustics of a building and remedies –Sabine's formula for reverberation time- Absorption coefficient.
Ultrasonic waves - Properties - Generation – Piezoelectric method – Detection- Kundt's tube- Application of Ultrasonics in industries – NDT.

UNIT III – PHOTONICS [12hrs]

Einstein's theory of matter radiation interaction and A and B coefficients; Properties of laser-spontaneous and stimulated emission, amplification of light by population inversion, different types of lasers: solid-state laser(Neodymium), gas lasers (CO₂), applications –IR Thermography.
Optical fibre- principle [TIR]-types-material, mode, refractive index- Fibre loss-Expression for acceptance angle and numerical aperture. Application- Communication.

UNIT -IV - QUANTUM PHYSICS [12 hrs]

Black body radiation-Planck's law – Energy distribution function, Wave – particle duality-de Broglie matter waves – Concept of wave function and its physical significance – Heisenberg's Uncertainty Principle – Schrodinger's wave equation – Time independent and Time dependent equations – Particle in a one dimensional rigid box – tunneling (Qualitative) – Scanning tunneling microscope

UNIT5– ENGINEERING MATERIALS [12 hrs]

Dielectric materials- Definition – Dielectric Breakdown – Dielectric loss – Internal field – Claussius Mossotti relation.

Superconducting materials -Introduction – Properties-Meissner effect – Type I & Type II superconductors – BCS theory-Applications.

Nanomaterials- Introduction – Synthesis of nano materials – Top down and Bottom up approach- Ball milling- PVD method- Applications.

Smart materials- Shape memory alloys-Biomaterials (properties and applications)

TEXT BOOKS

1. Applied Physics for Engineers – K.Venkatramanan, R.Raja, M.Sundarrajan (Scitech) (2014)
2. Applied Engineering Physics – Rajendran&Marikani(Tata McGraw Hill) (2009)
3. Modern Physics by R Murugesan, Kiruthiga, Sivaprasath S Chand (2010)
4. Quantum Mechanics by Sathyaprakash, Pragati Prakashan, Meerut. [unit 4]
5. Engineering Physics – Bhattacharya, Bhaskaran – Oxford Publications(2012)
7. Engineering Physics I & II – G.Senthilkumar, VRB publications (2012)

REFERENCE BOOKS

1. Engineering Physics - M.N.Avadhanulu, S.Chand & Company Ltd.
2. Concepts of Modern Physics by Arthur Beisser, McGraw Hill, 7th edition.
3. Introduction to Solid state Physics – C.Kittel, Wiley Student Edition
4. Modern Physics - R.Murugesan, S.Chand& Company Ltd.
5. Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J. Walker, (Wiley)
6. Quantum Mechanics by V. Devanathan, Narosa, Chennai, 2005.
7. Quantum Mechanics by V K Thangappan, Wiley Eastern

APPLIED PHYSICS FOR ENGINEERS – II

[for semester III, for Mechanical engineering only]

Credits: 4

Hrs/week – Lecture-4, Tutorial-1

UNIT I – SIMPLE HARMONIC MOTION [12 hrs]

Simple Harmonic Motion-Wave equation – Time Period – Amplitude and frequency. Two Simple Harmonic waves moving parallel to each other – Two Simple Harmonic waves moving perpendicular to each other– Lissajous figures – Kinetic energy of a vibrating particle – Total energy of a particle executing simple harmonic motion.

UNIT II – OPTICS [12 hrs]

Huygens' principle, superposition of waves –Theory of interference of light -Young's double slit experiment. Thin films- Newton's rings, Michelson interferometer-Anti reflection coating- Fresnel and Farunhofer diffraction – diffraction due to 'n' slits- plane transmission grating. Rayleigh criterion for limit of resolution - resolving power of grating

UNIT III – ELECTROMAGNETIC THEORY [12 hrs]

Coulomb law- Electric intensity – Intensity due to a point charge-Electric Potential – Relation between potential and intensity - unit of capacitance – capacity of a spherical, parallel plate and cylindrical capacitors – energy of a charged capacitor. Electromagnetic induction – Faraday's law – EMF – Self inductance and mutual inductance– Calculation of self and mutual inductance-Energy stored in a magnetic field – mutual inductance of solenoid.

UNIT IV – CRYSTAL PHYSICS [12 hrs]

Crystalline and amorphous solids – lattice and unit cell – seven crystal systems and Bravais lattices - crystal planes and directions- Atomic radius, Coordination number and packing factor for simple structures: SC, BCC & FCC. Miller indices-Determination of inter planar distance-Defects in crystal. Applications - Powder XRD.

UNIT V - SEMICONDUCTOR DEVICES AND APPLICATIONS [12hrs]

Introduction to P-N junction Diode and V-I characteristics, Zener diode and its characteristics, Introduction to BJT, its input-output and transfer characteristics, SCR characteristics and FET characteristics. MOSFET, CMOS. Basic logic gates - NAND, NOR as Universal building block.

TEXT BOOKS

1. Optics by Subramaniam N & BrijLal, S Chand & Co. Pvt. Ltd., New Delhi, 1990 [unit 1,2]
2. Electromagnetic theory – KK Chopra, GC Agrawal, Pearson publication [unit 3]
3. Solid state Physics – Gupta, Kumar [unit 4]
4. Principles of Electronics by V.K.Mehta, S.Chand publishers [unit 5]

REFERENCE BOOKS

1. Foundations of electromagnetic theory- Frederick J. Milford and John R. Reitz (1960, 4th ed, Pearson publications)
2. Concepts of Modern Physics by Arthur Beisser, McGraw Hill, 7th edition.
3. Introduction to Solid state Physics – C.Kittel, Wiley Student Edition
4. Modern Physics - R.Murugesan, S.Chand & Company Ltd.
5. Fundamentals of Physics, 6th Ed, D. Halliday, R. Resnick and J. Walker (Wiley)
6. Basic Electronics by B.L.Theraja, S.Chand publishers.

ENGINEERING PHYSICS PRACTICALS

[3hrs/week] Credit: 1.5

[one hour practical class = 0.5 credit]

Any SEVEN

1. Determination of Rigidity Modulus & Moment of Inertia using Torsional Pendulum.
2. Determination of Young's Modulus.
3. (a) Determination of Wavelength of Laser light using transmission grating.
(b) Measurement of numerical aperture of an optical fiber.
4. Determination of radius of curvature of the given lens using Newton's Rings.
5. Determination of Velocity of sound waves in liquid using Ultrasonic interferometer.
6. Determination of wavelength of prominent colours of mercury spectrum using grating.
7. Determination of number of lines per meter of the grating using normal incidence method.
8. Determination of refractive index of the given prism using minimum deviation method.
9. Determination of emissivity of the surface of a black body.
10. Basic logic gates- Verification of truth tables
11. NAND-Universal building block
12. NOR-Universal building block
13. Zener diode- I-V characteristics
14. Study of LCR circuit

REFERENCE BOOKS FOR PHYSICS PRACTICALS

1. Practical Physics - Ouseph and Rangarajan.
2. Engineering Practical Physics-K. Srinivasan.
3. Engineering Practical Physics - M.N. Avadhanulu.
4. Experimental Physics – K.Venkatramanan, R.Raja, M.Sundarrajan (Scitech)