I B.TECH. DEGREE

(PHYSICS)

SYLLABUS
FOR
CREDIT BASED CURRICULUM

(2008 - 2009)

DEPARTMENT OF PHYSICS

NATIONAL INSTITUTE OF TECHNOLOGY
TIRUCHIRAPPALLI - 620015

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DEPARTMENT OF PHYSICS

SEMESTER I

		L (Periods)	T	P (Periods)	C
PH101	Physics-I	2	0	3	3

SEMESTER II

PH102	Physics-II	3	0	3	4

PH101 PHYSICS - I

I Waves and Oscillations

Traveling wave in one dimension – wave equation – examples – simple harmonic motion – examples: simple pendulum, LC circuit – damped oscillation – forced oscillation and resonance – origin of refractive index – dispersion.

II Acoustics

Characteristics of musical sound – loudness – Weber-Fechner law – decibel – absorption coefficient – reverberation – reverberation time – Sabine's formula – acoustics of buildings – Ultrasonic production: Magnetostriction and piezoelectric methods – determination of velocity of ultrasonic waves (acoustic grating) – applications.

III Thermodynamics

Mole – ideal gas – heat capacity – exact differential – first law – Meyer's relation – isothermal and adiabatic processes – work done – second law – Carnot engine – Carnot's theorem – Kelvin's scale of temperature – Clausius' theorem and entropy – first law revisited – statistical interpretations of temperature and entropy.

IV Crystallography

Crystalline and amorphous solids – system of crystals – symmetry operation – Miller indices – atomic radius – coordination number – atomic packing factor calculation – X-ray diffraction – powder photograph method.

V Quantum Mechanics

Inadequacy of classical mechanics – wave and particle duality of radiation – de Broglie concept of matter waves – Heisenberg's uncertainty principle – Schrodinger's wave equation – interpretation of wave function – eigenvalues and eigenfunctions – superposition principle – particle confined in one dimensional infinite square well potential.

Text Books

1. *Material Science,V. Rajendran and A. Marikani, Tata McGraw-Hill (2004).*
2. *Engineering Physics, M.N. Avadhanulu, S. Chand & Co. (2007).*

References

1. *Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J. Walker, John Wiley and Sons (2001).*
2. *Waves – Berkeley Physics Course Vol. 3, F.S. Crawford Jr., Tata McCraw-Hill (2008).*
3. *Optics, 3rd edition, A. Ghatak, Tata McGraw-Hill (2005).*

Lab Experiments

1. Torsional pendulum
2. Sonometer – Frequency of fork.
3. Measurement of temperature using thermocouple
4. Thermal conductivity – Lee's disc method
5. Half shade polarimeter – determination of specific rotatory power
6. Determination of dispersive power of prism
7. Conversion of Galvanometer into ammeter and voltmeter

Reference

1. *Physics Laboratory Manual, Department of Physics, NITT.*

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PH102 PHYSICS - II

I Lasers and Fiber Optics

Spontaneous and stimulated emissions – Einstein's coefficients – population inversion and lasing action – coherence – properties and types of lasers – applications – Fermat's principle and Snell's law – optical fiber – numerical aperture – types of fibers – fiber optics communication principle – fiber optic sensors.

II Conductors, Dielectrics and Magnetic Materials

Free electron theory (classical and quantum) – Fermi-Dirac statistics – band theory of solids – – dielectrics – types of polarization – internal field and Claussius-Mosotti equation – ferroelectric materials – magnetic materials – types and properties – domain theory – hard and soft magnetic materials – application – superconductivity and types – Meissner effect – high temperature superconductors – applications.

III Advanced Materials

Liquid crystals – types – application as display devices – photonic crystals – nanomaterials (one, two and three dimensional) – physical properties and applications.

IV Materials Evaluation

Ultrasonic inspection – pulse echo method – liquid penetration technique – magnetic particle inspection – radiography – thermography – types of spectra – IR, UV and Visible spectroscopy – Raman spectra – NMR technique – applications.

V Electrodynamics

Coulomb's law for distribution of charges – polarization and Gauss's law – electric current and equation of continuity – magnetic induction and Lorentz force – steady current and Biot-Savart law – Ampere's law – magnetization and magnetic intensity – Faraday's law of induction – generalization of Ampere's law – Maxwell's equation – electromagnetic wave equation – propagation of EM waves in free space.

Text Books

1. *Material Science,V. Rajendran and A. Marikani, Tata McGraw-Hill (2004).*
2. *Engineering Physics, M.N. Avadhanulu, S. Chand & Co. (2007).*

References

1. *Electricity and Magnetism – Berkeley Physics Course Vol. 2, E.M. Purcell, Tata McCraw-Hill (2008).*
2. *Foundations of Electromagnetic Theory, 3rd edition, J.R. Reitz, F.J. Milford and R.W. Christy, Narosa (1979).*

Lab Experiments

1. Determination of thickness of a thin wire – Air wedge
2. Determination of wavelength of mercury spectrum using Grating
3. Determination of Optical absorption coefficient of materials using laser
4. Determination of Numerical aperture of an optical fiber
5. (i) Determination of wavelength of laser using diffraction grating
   (ii) Characteristics of light dependent resistor (LDR)
6. Calibration of Voltmeter - Potentiometer
7. Nondestructive testing by Ultrasonic inspection
8. Field along the axis of a Circular coil

Reference

1. *Physics Laboratory Manual, Department of Physics, NITT.*

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