B.Tech. DEGREE

(I Year - PHYSICS)

SYLLABUS

FOR

CREDIT BASED CURRICULUM

(2007 – 2008)

DEPARTMENT OF PHYSICS
National Institute of Technology
Tiruchirappalli – 620015

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DEPARTMENT OF PHYSICS

B.Tech - I Year

I SEMESTER

		L (Periods)	T	P (Periods)	C
PH 101	Physics - I	2	0	3	3

II SEMESTER

PH 102	Physics - II	2	0	3	3

L – Lecture, **T** – Tutorial, **P** – Practical and **C** – Credit

PH 101 PHYSICS - I

Unit – I: Lasers and Applications

Lasers – properties-spontaneous and stimulated emissions – Einstein's coefficients – population inversion – basic laser operation – types – He-Ne Laser – GaAs Laser – Applications – compact disk reader – holography – industrial applications, cutting, welding and drilling.

Unit – II: II Fiber Optics and Applications

Fiber optics-principle – total internal reflection – angle of acceptance – numerical aperture – fiber types – light sources – LED – lhoto detectors – fiber optics communication principles – fiber optic sensors.

Unit – III: Ultrasonics and Non-Destructive Testing

Ultrasonics – production – piezoelectric effect – properties – applications – ultrasonic inspection – time of flight diffraction technique (TOFD) – liquid penetration technique – MPI – radiography – thermography.

Unit – IV: Thermodynamics

Thermodynamic processes and gas equation - first law of thermodynamics – work done during isothermal and adiabatic processes – reversible and irreversible processes – second law of thermodynamics – Carnot's cycle – Carnot's theorem on efficiency – Kelvin's scale of temperature – entropy – Maxwell equation – applications.

Unit – V: Materials Characterization

Types of spectra – absorption, emission & continuous spectra – IR, UV-Visible spectroscopy-Raman spectra – NMR technique – applications – thin film preparation, characterization, property and applications – optical activity – specific rotary power – Lorentz half Shade polarimeter

References

1. P.K. Palanisamy, Physics for Engineers, Scitech Publications, Chennai (2004).
2. Brijlal and N.Subramaniam, Heat and Thermodynamics, S.Chand and Co. Ltd, New Delhi, (1982).
3. K.Thyagarajan and A.K.Ghatak, Lasers – Theory and Applications, Macmillan India Ltd., New Delhi (1984).

Lab Experiments

1. Thermal conductivity - Lee's disc method.
2. Half Shade Polarimeter – Determination of specific rotatory power.
3. Torsional Pendulum.
4. Determination of Dispersive power of Prism.
5. a) Determination of wavelength of Laser using Diffraction grating.
   b) Characteristics of Light Dependent Resistor (LDR).
6. Conversion of Galvanometer into Ammeter and Voltmeter.

PH 102 PHYSICS - II

Unit – I: Quantum Mechanics

Inadequacy of classical mechanics – wave and particle duality of radiation – de Broglie concept of matter waves – properties of matter waves – Heisenberg's uncertainty principle – Schrodinger's wave equation – physical interpretation of wave function – eigenvalues and eigenvectors – particle closed in 1D potential well of infinite height.

Unit – II: Crystallography

Crystalline and amorphous solids – crystal structure – symmetry operation – Bravais lattices – Miller indices – atomic radius – coordination number – atomic packing factor calculation – X-ray diffraction – phase problem and solving methods – powder photograph method.

Unit – III: Dielectric Materials

Free electron theory – band theory of solids (elementary ideas) – metals, semiconductor and insulators – dielectric materials – types of polarization – Lorentz field – Claussius-Mosotti equation – frequency dependence – ferroelectric materials

Unit – IV: Magnetic and Superconducting Materials

Magnetic materials – types and properties – domain structure – hard and soft magnetic materials – application – ferrites – superconductivity – types and properties – Meissner effect – BCS theory (basic ideas) – high temperature (Tc) superconductors – applications.

Unit – V: Electromagnetic Theory

Coulomb's law and Gauss law – electric current and equation of continuity – Biot-Savat law and Ampere's law – Faraday's law – Maxwell's equations – Poynting's theorem – electromagnetic waves in free space – istropic & anisotropic media – homogenous medium.

References

1. P.M. Mathews and K.Venkatesan, Text Book of Quantum Mechanics, Tata McGraw-Hill Publishing Company, New Delhi (1976).
2. Rajendran . V & Marikani, Applied Physics for Engineerins, 3rd edition, Tata McGraw Hill (2000).
3. R.K.Gaur and S.L.Gupta, Engineering Physics, Dhanpat Rai & Sons, New Delhi (1992).

Lab Experiments

1. Determination of Thickness of a thin wire – Air Wedge.
2. Determination of wavelength using Grating – Spectrometer.
3. Determination of Optical absorption coefficient of materials using Laser.
4. Determination of Numerical Aperture of an Optical Fiber.
5. Calibration of Voltmeter – Potentiometer.
6. Measurement of Temperature using Thermocouple.
7. a) Field along the axis of a circular coil.
   b) Determination of Magnetic moment of a bar Magnet.
8. Non-Destructive Testing by Ultrasonic method.

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