

PHYSICS

PHY-101: MECHANICS (3 credits, 36 hrs)

	No. of Lectures
1 Vectors, Kinematics in 2d and 3d Polar co-ordinates	6
2 Newton's laws, conservation of momentum and energy, Angular momentum conservation	8
3 Rigid-body motion	5
4 Small oscillations	6
5 Mechanics of deformable bodies, elasticity, Hydrostatics, hydrodynamics	7

IDC-102: THERMODYNAMICS & STATISTICAL MECHANICS (3 credits, 36 hrs)

	No of Lectures
1 Kinetic theory:- pressure, energy, entropy, transport	4
2 Laws of thermodynamics, Thermodynamic potentials	8
3 Thermodynamics of phase transitions	5
4 Energy conversion	4
5 Elementary classical statistical mechanics with numerical examples/exercises	10
6 Thermodynamics of black bodies	2

PHY-102: ELECTROMAGNETISM AND OPTICS (3 credits, 36 hrs)

	No. of Lectures
1 Sound Waves and optics	10
2 Review of Electrostatics, Magnetostatics	12
3 Displacement Current, Maxwell's Equations, Plane waves; Waves in a Medium	14

PHY-201: QUANTUM PHYSICS AND RELATIVITY (3 credits, 36 hrs)

	No. of Lectures
Quantum Mechanics	5
Need for Quantum Mechanics; Heisenberg's Uncertainty Principle; Build-up to Schrodinger equation	
Simple applications of Schrodinger Equation: Steps and wells, tunneling, particle in a box, Harmonic oscillator, Hydrogen atom (without spherical Harmonies)	15

Stern-Gerlach expt., electron spin, filling of shells, simple perturbation theory (The idea of approximate solutions), Zeeman effect	4
Two-level systems, lasers etc.	6
Relativity	6

PHYSICS - Third year course titles

<i>Semester-V</i>		<i>Semester-VI</i>	
Subject	Credits	Subject	Credits
Classical Mechanics	3	Statistical Mechanics and Thermodynamics	3
Electricity and Magnetism	3	Condensed Matter Physics I	3
Quantum Mechanics I	3	Quantum Mechanics II	3
Math Methods in physics	3	Nuclear and Particle Physics	3
Elective	3	Elective	3
Advanced Laboratory I	6	Advanced Laboratory	6

PHYSICS - Fourth Year Course titles

<i>Semester-V</i>		<i>Semester-VI</i>	
Subject	Credits	Subject	Credits
Classical Mechanics II	3	Advanced Electromagnetic theory	3
Condensed Matter Physics II	3	Advanced Statistical Mechanics	3
Elective	3	Elective	3
Elective	3	Elective	3
Elective	3	Elective	3
Project I	6	Project II	6

Fifth year program

Research/ training Project work for both semesters of the 5th year with two supplementary and/or optional courses each semester. Students will be required to write a Project Thesis. Total No. of Credits in the 5th Year is 48.

For selected students, the program in the fifth year may initiate research work towards a subsequent Ph D degree

In addition to the four major disciplines, IISER envisages a rich supplementary set of courses that may have strong influence in Sciences in the near and distant future. Disciplines, such as Planetary and Earth Sciences, Nano and Femto

Sciences, Space Sciences, Astrophysics, Humanities and Social Sciences, Engineering Sciences, (with strong Science interface) etc. may be represented through such courses during the fourth semester and subsequent years.

PRACTICALS

Physics – Semester 1

PHY-121: Mechanics and optics

- 1 Physical Pendulum
 - 2 Young's modulus/modulus of rigidity
 - 3 Viscosity
 - 4 Image formation by convex lens and image defects
 - 5 Spectrometer
 - 6 Interference
 - 7 Jaeger's method of surface tension
 - 8 Plane diffraction gratings
 - 9 Study of friction using Record Player/Optics bench and its usage
 - 10 Reflection, Refraction and Dispersion
 - 11 Geometrical Optics Experiments
 - 12 Diffraction, single slit and double slit experiments
 - 13 Concept of polarization and experiments on polarization by
 - 14 Absorption, reflection refraction and scattering
 - 15 Gyroscopes – precision, nutation experiments
 - 16 Air track experiments: estimating the friction
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Physics Semester 2

PHY-122: Electronics

- 1 DC/AC bridge using universal bridge
 - 2 LR and CR circuits
 - 3 Charging and Discharging of capacitors
 - 4 Use of CRO
 - 5 Study of transistor and basics of TTL gates
 - 6 Opamp: inverting, noninverting, summing and difference amplifiers
 - 7 Characterization of an electromagnetic relay
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- 8 Kundt's Tube experiments
 - 9 Usage of Analog Multimeter as a demo – error analysis, mean square deviation etc
 - 10 Study of a solar cell
 - 11 Study of series parallel combination of dry cells
 - 12 Doppler shift in sound; audibility experiments
 - 13 Surface Tension – limiting ST
 - 14 Coupled pendulum set-up
 - 15 Elastic collision by two hanging spheres
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