

S. N BOSE NATIONAL CENTRE FOR BASIC SCIENCES  
INTEGRATED Ph.D. PROGRAMME IN PHYSICAL SCIENCES  
(IPhD)

**UNIVERSITY OF CALCUTTA**  
**COURSE STRUCTURE**

[Revised by the Students' Curriculum & Research Evaluation Committee,  
effective from 01.08.2010 - Fall Semester]

L=Lectures T=Tutorials P=Practicals in hours per week & C=Credit points

**First Semester**

<b>Course No.</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
PHY101	Classical Dynamics	3	1	0	4
PHY102	Mathematical Methods I	3	1	0	4
PHY103	Quantum Mechanics I	3	1	0	4
PHY104	Electromagnetic Theory I	3	1	0	4
PHY191	Basic Laboratory I *	0	2	6	6
PHY105	Computational Methods in Physics I	2	0	2	4

**Second Semester**

<b>Course No.</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
PHY201	Statistical Mechanics	3	1	0	4
PHY202	Mathematical Methods II	3	1	0	4
PHY203	Quantum Mechanics II	3	1	0	4
PHY204	Electromagnetic Theory II	3	1	0	4
PHY291	Basic Laboratory II *	0	2	6	6
PHY205	Computational Methods in Physics II	2	0	2	4

\*For these laboratory based courses tutorials involve discussions on the underlying theory and methodology of the experiments. Each such course would occupy eight lab-hours distributed over two days in each week. In the Summer following the Second Semester students will start taking up projects to enable him or her to develop an integrated research attitude towards physics.

<b>Course No.</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
PHY292	Project based Course I**	-	-	8	6

\*\*In the case of Project-based Courses "P" indicates the number of interaction hours per week.

### Third Semester

<b>Course No.</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
PHY391	Methods of Experimental Physics*	3	1	3	7
PHY301	Quantum Mechanics III	3	1	0	4
PHY302	Condensed Matter Physics	3	1	0	4
PHY303	Nuclear & Particle Physics	3	1	0	4
PHY304	Project-based Course II**	-	-	8	6

\* "Advanced Laboratory" involving routine experiments [such as NMR, Mossbauer, X-Ray Diffraction, Electron Microscopy, Accelerators etc in the research laboratories of the participating institutions], shall be integrated into this course.

### Fourth Semester

<b>Course No.</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
PHY401	Project-based Course III**	-	-	8	6
PHY402	Seminar Course***	-	-	-	2
PHY###	Elective	3	1	0	4
PHY###	Elective	3	1	0	4
PHY###	Elective	3	1	0	4

\*\*In the case of Project-based Courses "P" indicates the number of interaction hours per week.

\*\*\*The Seminar course is meant to reinforce good scientific communication skills among the students. The course involves each student making a seminar presentation on a topic that he/she has read up during the semester.

Course numbers of the Electives will be assigned from year to year in accordance with the courses offered.

Possible Electives which may be offered in the Fourth Semester could be for example:

PHY 403	Advanced Mathematical Methods
PHY 404	Advanced Quantum Field Theory
PHY 405	Advanced Statistical Physics
PHY 406	Astrophysics
PHY 407	Chemical Physics
PHY 408	Advanced Techniques in Experimental Physics
PHY 409	General Relativity and Cosmology
PHY 410	Magnetism and Superconductivity
PHY 411	Non-Linear Dynamics
PHY 412	Optical Physics
PHY 413	Physics of Materials
PHY 414	Physics of Nano-materials
PHY 415	Plasma Physics
PHY 416	Quantum Information Theory
PHY 417	Quantum Theory of Many Body Systems
PHY 418	Soft Condensed Matter Physics (Advanced Simulation)

etc. etc.

The actual courses offered will vary from year to year depending on the choice of specialization made by the students in consultation with the Students' Curriculum and Research Evaluation Committee (SCREC), availability of teachers, and topicality of the subject etc.