

**An Integrated Post-B. Sc. Ph. D. Program in  
Chemical Sciences**

**Jointly Conducted By**

**S. N. Bose National Centre for Basic Sciences, Kolkata**

**And**

**Indian Association for the Cultivation of Science, Kolkata**

## **INTRODUCTION**

In an unusual development in interinstitutional scientific collaboration in our country, S. N. Bose National Centre for Basic Sciences (SNBNCBS) and the Indian Association for the Cultivation of Science (IACS) will jointly run a Post B. Sc. integrated Ph. D. program in Chemical Sciences, starting from the academic session 2005-2006. The program will be multidisciplinary, including not only the traditional branches of chemistry, like inorganic chemistry, organic chemistry and physical chemistry, but will also have wide coverage of the areas like material sciences, molecular biology, biochemistry, bio-informatics along with other areas of science, namely, physics, mathematics, electronics and scientific computation. The present day scientific activities are advancing in a direction that needs simultaneous familiarity of the researchers with different disciplines of science like physics, chemistry, biology, mathematics and computation. In this broad perspective, it is hoped that the students trained in this integrated program will become researchers and scientists with broad, dynamic and integrated minds, with diverse capabilities to pursue research in any direction so that they can lead the upcoming researches at an international level.

The program is meant for the students after their Bachelor's degree, especially for talented and motivated students who wish to pursue a career in research and development in the areas of science and technology having multidisciplinary character. Admission to the course would

be based on a written examination, followed by an oral examination of the short-listed candidates. The entire entrance test will be jointly conducted by SNBNCBS and IACS. The program begins with 4 semesters of a two-year M. Sc., each semester comprising 18 weeks. After successful completion of these four semesters, the students will receive an M. Sc. degree in Chemical Sciences, provided they attain the eligibility criteria. Students with Chemistry, Physics and Mathematics at the B. Sc. level would be eligible to compete. They will be provided with a scholarship from the very beginning, up to the completion of Ph.D.

The program should develop strong intellectual and manual skills in the students. Great care would be taken in designing the laboratory courses. Student initiatives would be an essential part of the learning process. Consequently, the total number of students needs to be restricted to 15 every year. A teaching laboratory would be set up to accommodate 30 students so that the first year and second year M. Sc, students can work together. However, considering the practical constraints, admission will be restricted to only 10 students in the first year.

The required funding for the course including student scholarships and running costs will be equally shared by SNBNCBS and IACS. Although the program will be conducted jointly by SNBNCBS and IACS, it will be a multi-institutional one with faculty members drawn from several institutions, even outside Calcutta. A major part of the teaching program will be shared between SNBNCBS and IACS.

It is hoped that the program would complement the traditional university system of education and revitalize chemical sciences, giving a boost to multidisciplinary research in our country.

## Course Structure for M.Sc.

### First Year

#### Semester I

Course Number	Course Title	L+T - P
CH411	Mathematical Methods	3 - 0
CH412	Quantum Chemistry	3 - 0
CH413	Equilibrium and Non-Equilibrium Thermodynamics	3 - 0
CH414	Organic Chemistry: Structure & Dynamics	3 - 0
CH415	Inorganic Chemistry I	3 - 0
CH416	Electronics & Instrumentation	1 - 3
CH 417	Laboratory	1 - 4
	<i>Total Contact Hours per week</i>	24
	<i>Total Credits</i>	24

#### Semester II

Course Number	Course Title	L+T - P
CH421	Symmetry in Chemistry	3 - 0
CH422	Elements of Chemical Biology	3 - 0
CH423	Molecular Structure and Dynamics by Single and Multi-photon Spectroscopy I	3 - 0
CH424	Inorganic Chemistry II	3 - 0
CH425	Synthetic and Biological Chemistry	3 - 0
CH426	Numerical Methods and Computer Programming	2 - 2
CH 427	Laboratory	1 - 4
	<i>Total Contact Hours per week</i>	24
	<i>Total Credits</i>	24

#### Notes:

1. "L+T" means 3 hours of lecture are followed by 1 hour of tutorial
2. "P" means practicals
3. For every course, course credits are equal to the number of contact hours per week

## Second Year

### Semester III

Course Number	Course Title	L+T - P
CH511	Equilibrium & Non-Equilibrium Statistical Mechanics	3 - 0
CH512	Chemical Dynamics of Atoms, Molecules and Soft Condensed Matter	3 - 0
CH513	Molecular Structure and Dynamics by Single and Multi-photon Spectroscopy II	3 - 0
CH514	Elective I	3 - 0
CH515	Elective II	3 - 0
CH516	Research Project (With Seminar)	0 - 12
	<i>Total Contact Hours per week</i>	27
	<i>Total Credits</i>	27

### Semester IV

Course Number	Course Title	L+T - P
CH521	Chemistry and Physics of Materials	3 - 0
CH522	Equilibrium and Non-Equilibrium Electrochemistry	3 - 0
CH523	Elective III	3 - 0
CH524	Elective IV	3 - 0
CH525	Research Project Continued (With seminar)	0 - 16
	<i>Total Contact Hours per week</i>	28
	<i>Total Credits</i>	28

#### Suggested Electives:

1. Electronic Structure and Properties of Materials
  2. Chemistry and Physics of Polymers
  3. Small Scales in Space and Time
  4. Structure, Properties and Design of Drugs
  5. Structure, Folding and Function of Proteins
  6. Electrochemical Technology
  7. Bioinformatics in Chemistry
  8. Advanced Quantum Chemistry
  9. Advanced Numerical Methods
- Etc.

New electives may come in from year to year. Each elective would have a package of courses to choose from.