

**School of Chemistry  
University of Hyderabad**

**Ph.D. Course Work : Manual**

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## General Guidelines for Students

Every student admitted to the Ph.D. program in the School of Chemistry has to undertake course work adding up to a total credit of 12. As per the UGC stipulations, the student can formally register for the Ph.D. programme, only on satisfactory completion of the course work requirements.

1. The course work is to be started in the Semester following the one during which the student was admitted, and should be completed in four semesters. For example, a student admitted to the Ph.D. program during August – December 2011, has to start the course work in the Winter Semester (January – April) of 2011 – '12 and complete the course work latest in the Monsoon Semester (July – November) of 2013 – '14.
2. The student has to complete a minimum of 12 credits for satisfactory completion of the course work. Out of the 12 credits, 6 would be from two mandatory courses. The courses for the remaining 6 credits will be prescribed by the Doctoral Committee of the student, taking into account the background, interest and needs of the student.
3. The student should obtain a minimum of 50% marks to pass a course.
4. The official course certificate will indicate only Pass/Fail and not marks or grades for each course. However a course grade sheet will be provided by the School.
5. Mandatory credits (6)

A. **CY-801. Research proposal** [3 credits]

The student will prepare and defend a research proposal based on self study. The defense may involve presentation in a seminar and *viva voce* examination by the Doctoral Committee.

B. *One of the following two courses:*

**CY-805. Instrumental Methods A (Analytical Techniques)** [3 credits]

**CY-806. Instrumental Methods B (Physical Measurements)** [3 credits]

Each of the above courses is expected to provide training in the use of various instruments and computer software. The student will work as an apprentice for short periods with instrument operators or senior students. The courses may include special lectures by the faculty as well as performing some assignments. Each course will have a faculty-in-charge who will evaluate and award grade based on input from the various instrument-in-charges and performance in assignments.

A: NMR, Mass spectrometry, Absorption fluorescence / CD spectroscopy, Polarimetry, Computer software.

B: Diffraction techniques, Microscopy, Calorimetry, Electrochemistry, Magnetic measurements, Computer software.

The Doctoral Committee may recommend additional techniques available in the central instrumentation or computational facilities of the University or substitution of one technique in a group by one from the other group.

It is expected that CY-801 and CY-805/CY-806 will provide effective training in research methodology to the Ph. D. student.

6. Elective credits (6)

Any combination of the following courses (some of the courses may have a credit different from 3; however, the total credits earned from this combination should not be less than 6).

- A. **CY-802. Chemistry Pedagogy.** [3 credits] - The student will work as a Teaching Assistant (TA) or Tutor for any chemistry course including 100/200/300 level ones (preference will be given for laboratory and 100 – 300 level courses). The course instructor will closely monitor the work of the Ph. D. student, provide mentoring, finally evaluate him for his pedagogic skills and knowledge of the subject and award a grade. Like any other course, CY-802 cannot be repeated, if already passed once.
  - B. One or more of the **400 - 800 level courses**, including the CY-805/CY-806, not already taken by the student. Students who did their M. Sc. in the School of Chemistry can take a 400/500 level course only if they have obtained a grade less than C in the same course during their M.Sc.. As the Ph.D courses are designated as CY-800 level, the 4XY courses will be shown as **CY-(800+XY)** and the 5XY as **CY-(830+XY)** for the purpose of the Ph.D. course work.
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### Responsibilities of the Course Coordinator

1. Meet with the entering Ph.D. students and familiarise them with the Ph.D. course curriculum and requirements.
2. Collect the course preferences of the students.
3. Identify and engage course-in-charge for the following courses.
  - a. **CY-801. Research Proposal**
  - b. **CY-802. Chemical Pedagogy**
  - c. **CY-805. Instrumental Methods A (Analytical Techniques)**
  - d. **CY-806. Instrumental Methods B (Physical Measurements)**

Appraise them about their responsibilities. Together with them, come up with a time table for the semester.

4. Based on the preferences expressed by the Ph.D. students for the 400 - 800 level courses offered during the semester, contact the respective course instructors and arrange for the Ph.D. students to take those courses.
  5. At the end of the semester, collect the grades from
    - a. The course-in-charge for CY-801, CY-802, CY-805, CY-806.
    - b. The instructors of 400 - 800 level courses taken by the Ph.D. students and submit the consolidated data to the School Office.
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**CY-801. Research Proposal [3 credits]**

The student will prepare and defend a research proposal based on self study. The defense may involve presentation in a seminar and *viva voce* examination by the Doctoral Committee. This course has to be taken as part of the mandatory requirement of the Ph.D. course work.

**Responsibilities of the course-in-charge**

1. Contact the research supervisors of all the Ph.D. students and inform them at the beginning of the semester, the mandatory nature of this course. Request them to mobilise the respective Doctoral Committee to monitor the course.
  2. Collect the grade for each student from their supervisor.
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### **CY-802. Chemistry Pedagogy [3 credits]**

The student will work as a Teaching Assistant (TA) or Tutor for any chemistry course including 100/200/300 level ones. The course instructor closely monitors the work of the Ph. D. student, provides mentoring and finally evaluates him for his pedagogic skills and knowledge of the subject and awards a grade.

#### Responsibilities of the course-in-charge

1. Enquire with all the faculty at the beginning of the semester, the requirements of TAs / Tutors in their respective courses.
  2. Meet with the Ph.D. students and collect information on their preferences for being a TA/tutor from among the courses being offered in that semester.
  3. Prepare the assignment of course for the Ph.D. students, trying as far as possible, to match their interest and the requirement in the courses.
  4. Inform the faculty instructors about the goals of the Chemistry Pedagogy course. Stress in particular the responsibilities of the TAs / Tutors:
    - a. They should be encouraged to attend the regular lectures by the faculty instructor.
    - b. They will conduct tutorial sessions, help students with their assignments and clarification of doubts, and discuss the minor tests after the instructor returns the graded test papers.
    - c. They will help with the conduct of the examinations, but not in the grading process.
  5. Inform the faculty instructors also the need to grade the TAs / Tutors. This could be based on monitoring them in the tutorial classes:
    - a. In problem solving sessions.
    - b. While responding to students' queries.
    - c. When making brief presentations on topics related to the course.
    - d. Help with preparation of assignments / problems.
  6. Collect the grades for each TA / Tutor from the faculty instructor.
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**CY-805. Instrumental Methods A (Analytical Techniques) [3 credits]**

The course is expected to provide training in the use of various instruments and software. The student will work as apprentice for short periods with instrument operators or senior students. The courses may include special lectures by the faculty as well as performing some assignments. Each course will have a faculty-in-charge who will evaluate and award grade based on input from the various instrument-in-charges and performance in assignments. One of the two courses, CY-805 / CY-806 has to be taken as part of the mandatory requirement of the Ph.D. course work.

Recommended modules (can be modified based on requirements/equipment availability):

NMR, Mass spectrometry, Absorption / Fluorescence / CD spectroscopy, Polarimetry, Computer software

Responsibilities of the course-in-charge

1. In consultation with the technical staff/faculty-in-charge of each equipment, prepare a time-table for the course (approximately 3 – 4 h for each equipment).
2. Formulate with the help of the technical staff/faculty-in-charge for the instrument,
  - a. A routine for training on each equipment.
  - b. An assignment / quiz to test the learning about the principles/operation of the equipment at the end of each routine.
3. Submit the overall grade for each student who has taken the course.

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The parallel course: CY-806. Instrumental Methods B (Physical Measurements)

Recommended modules: Diffraction techniques, Microscopy, Calorimetry, Electrochemistry, Magnetic measurements, Computer software.

**CY-806. Instrumental Methods B (Physical Measurements) [3 credits]**

The course is expected to provide training in the use of various instruments and software. The student will work as apprentice for short periods with instrument operators or senior students. The courses may include special lectures by the faculty as well as performing some assignments. Each course will have a faculty-in-charge who will evaluate and award grade based on input from the various instrument-in-charges and performance in assignments. One of the two courses, CY-805 / CY-806 has to be taken as part of the mandatory requirement of the Ph.D. course work.

Recommended modules (can be modified based on requirements/equipment availability):

Diffraction techniques, Microscopy, Calorimetry, Electrochemistry, Magnetic measurements, Computer software.

Responsibilities of the course-in-charge

1. In consultation with the technical staff/faculty-in-charge of each equipment, prepare a time-table for the course (approximately 3 – 4 h for each equipment).
2. Formulate with the help of the technical staff/faculty-in-charge for the instrument,
  - a. A routine for training on each equipment.
  - b. An assignment / quiz to test the learning about the principles/operation of the equipment at the end of each routine.
3. Submit the overall grade for each student who has taken the course.

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The parallel course: CY-805. Instrumental Methods A (Analytical Techniques)

Recommended modules: NMR, Mass spectrometry, Absorption / Fluorescence / CD spectroscopy, Polarimetry, Computer software



### Ph. D. Course Numbers (School of Chemistry)

Course title	Old No.	New No.*	Credits
Research Proposal	CY-801	CY-801	3
Chemistry Pedagogy	CY-802	CY-802	3
Seminar I	-	CY-803	3
Seminar II	-	CY-804	3
Instrumental Methods A (Analytical Techniques)	CY-811	CY-805	3
Instrumental Methods B (Physical Measurements)	CY-812	CY-806	3
	<b>CH-4XY</b>	<b>CY-8XY</b>	
Basic concepts and coordination chemistry	CH-410	CY-810	3
Basic concepts of organic chemistry	CH-411	CY-811	3
Physical chemistry	CH-412	CY-812	3
Mathematics for chemists	CH-413	CY-813	3
Inorganic chemistry Lab I	CH-414	CY-814	3
Organic chemistry Lab I	CH-415	CY-815	3
Main group and inner transition elements	CH-420	CY-820	3
Organic reactions and mechanisms	CH-421	CY-821	3
Symmetry and spectroscopy	CH-422	CY-822	4
Chemical and statistical thermodynamics	CH-423	CY-823	3
Inorganic chemistry Lab II	CH-424	CY-824	3
Physical chemistry Lab	CH-425	CY-825	3
	<b>CH-5XY</b>	<b>CY-(830+XY)</b>	
Spectroscopic and other physical methods	CH-510	CY-840	3
Reactive intermediates and synthesis in organic chemistry	CH-511	CY-841	3
Chemical dynamics	CH-512	CY-842	3
Chemical binding	CH-513	CY-843	3
Bioinorganic and organometallic chemistry	CH-514	CY-844	3
Organic chemistry Lab II	CH-515	CY-845	3
Instrumentation and computer applications Lab	CH-516	CY-846	3
Chemistry of Materials	CH-520	CY-850	3
Biological chemistry	CH-521	CY-851	3
Seminar course	CH-522	CY-852	3
Polymer chemistry	CH-551	CY-881	2
Organometallic chemistry	CH-552	CY-882	2
Theoretical organic chemistry	CH-553	CY-883	2
Advanced quantum chemistry	CH-554	CY-884	2
Advanced chemical dynamics	CH-555	CY-885	2
Supramolecular chemistry	CH-556	CY-886	2
Nuclear and radiochemistry	CH-557	CY-887	2
Bioorganic chemistry	CH-558	CY-888	2
Natural products	CH-559	CY-889	2
Environmental chemistry	CH-560	CY-890	2
Advanced techniques in mass spectrometry and NMR spectroscopy	CH-561	CY-891	2
Stereoselective organic synthesis	CH-562	CY-892	2
Advanced magnetic resonance	CH-563	CY-893	2

\* Courses to be introduced in future can be given numbers: 807-809, 826-839, 853-880 etc.