
भारतीय विज्ञान शिक्षा एवं अनुसंधान संस्थान कोलकाता

**INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH KOLKATA**

# Courses of Study

## 5 Year BS-MS Dual Degree Programme

***(Batch MS23 onwards)***

Indian Institute of Science Education and Research Kolkata (IISER-K) offers a Bachelor of Science and Master of Science (BS-MS) Dual Degree Programme wherein a unique training programme is offered to students through a balanced schedule of classroom lessons, project and research work. While the Institute aims at comprehensively training the students in each of the major subjects, much attention is also directed to the development of an inter-disciplinary perspective.

## Level 1:

a) All subject topics have been assigned hours depending on whether the subject has a laboratory component in the teaching.
b) Each of the natural sciences (Biology, Chemistry, Physics) will have a single lab course (weekly three hours) in the first year. Together with computer sciences, there will be four laboratory courses (two in each semester) in the first year.
c) For courses (offered by DES, DMS) without a laboratory component, the weekly contact hours are 2+1+1 hours of classroom activities. It is 2 hours of theory class + 1 hour of optional tutorial class and 1 hour of a supplementary interactive session.
d) The mathematics courses offered in the first year (through the two semesters) will train students in mathematical methods (applied mathematics) as well as regular 1st year mathematics content from DMS (pure mathematics). This will ensure that every student has the choice of opting for any pre-major including mathematics.
e) Specifically, every week, the following are the weekly contact hours in the Autumn semester:

- Theoretical Physics, Chemistry, Biology: (2+1) x 3 = 9 Hours
- Experimental Biology and Chemistry laboratories (3) x 2 = 6 Hours
- Theoretical Earth Science, Mathematics: 4 x 2 = 8 Hours
- Humanities/English course (2) x 1 = 2 Hours. This English course will be a simple and advanced communicative English course. The students will be asked to take one of them.
- The total contact hours will be 25 Hours in the Autumn semester.

f) In the Spring semester:

- Theoretical Physics, Chemistry, Biology: (2+1) x 3 = 9 Hours
- Experimental Physics and Computer laboratories (3 + 4) = 7 Hours
- Theoretical Earth Science, Mathematics: 4 x 2 = 8 Hours
- The total contact hours will be 24 Hours in the Spring semester.

### SEMESTER 1

| Sl. No. | Course Code | Course Name | Course Type | Course category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | CH1101 | Elements of Chemistry | Theory | Core | 2 | 1 | 0 | 3 |
| 2 | CS1101 | Introduction to Computer Programming | Laboratory | Core | 1 | 0 | 3 | 4 |
| 3 | ES1101 | Introduction to Earth Science | Theory | Core | 2 | 1 | 1 | 4 |
| 4** | HU1101 | Communicative English | Theory | Elective | 2 | 0 | 0 | 2 |
| | HU1103 | Communicative English II | Theory | Elective | 2 | 0 | 0 | |
| 5 | LS1101 | Introduction to Biology I | Theory | Core | 2 | 1 | 0 | 3 |
| 6 | MA1101 | Mathematics I | Theory | Core | 3 | 1 | 0 | 4 |
| 7 | PH1101 | Mechanics I | Theory | Core | 2 | 1 | 0 | 3 |
| 8 | PH1102 | Physics Laboratory I | Laboratory | Core | 0 | 0 | 3 | 3 |
| Total Credits | | | | | | | | 26 |

***One of the two humanities courses HU1101 or HU1103 will be allotted after a screening test.*

## SEMESTER 2

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | CH1201 | Elements of Chemistry-II | Theory | Core | 2 | 1 | 0 | 3 |
| 2 | CH1202 | General Chemistry Laboratory | Laboratory | Core | 0 | 0 | 3 | 3 |
| 3 | ES1201 | Earth System Processes | Theory | Core | 2 | 1 | 1 | 4 |
| 4 | LS1201 | Introduction to Biology II | Theory | Core | 2 | 1 | 0 | 3 |
| 5 | LS1202 | Biology Laboratory I | Laboratory | Core | 0 | 0 | 3 | 3 |
| 6 | MA1201 | Mathematics II | Theory | Core | 3 | 1 | 0 | 4 |
| 7 | PH1201 | Electricity and Magnetism | Theory | Core | 2 | 1 | 0 | 3 |
| Total Credits | | | | | | | | 23 |

# Level 2

a) In Level 2, students need to choose premajors subjects. Premajors are three out of the five major subjects from Level 1 (other than HSS and CDS courses).
b) There will be three premajors in the Autumn semester and two premajors in the Spring semester.
c) The two premajors of the Spring semester would be (i) the Major, (ii) another one of the three. The Major will be decided after the third semester.
d) Total number of credits will be: 3x9=27 in Autumn and (2x10) +4 (CDS) =24 in Spring.

## SEMESTER 3:

One has to choose three pre-major disciplines (of 9 credits each) totalling to 27 credits.
The following are the courses for each pre-major.

Premajor in Biological Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | LS2101 | Biochemistry | Theory | Core | 3 | 0 | 0 | 3 |
| 2 | LS2102 | Biology Laboratory III | Laboratory | Core | 0 | 0 | 3 | 3 |
| 3 | LS2103 | Biophysics | Theory | Core | 3 | 0 | 0 | 3 |
| Total Credits | | | | | | | | 9 |

Premajor in Chemical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | CH2102 | Quantum Chemistry I | Theory | Core | 2 | 0 | 0 | 2 |
| 2 | CH2103 | Inorganic and Spectroscopy Laboratory | Laboratory | Core | 0 | 0 | 3 | 3 |
| 3 | CH2104 | Basic Inorganic Chemistry I | Theory | Core | 2 | 0 | 0 | 2 |
| 4 | CH2105 | Basic Organic Chemistry I | Theory | Core | 2 | 0 | 0 | 2 |
| Total Credits | | | | | | | | 9 |

Premajor in Geological Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | ES2103 | Minerals, rocks and deformation | Theory | Core | 3 | 0 | 0 | 3 |
| 2 | ES2104 | Geophysics and Hydrology | Theory | Core | 3 | 0 | 0 | 3 |
| 3 | ES2105 | Earth Science Laboratory I | Laboratory | Core | 0 | 0 | 3 | 3 |
| Total Credits | | | | | | | | 9 |

Premajor in Mathematical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | MA2101 | Analysis I | Theory | Core | 3 | 0 | 0 | 3 |
| 2 | MA2102 | Linear Algebra I | Theory | Core | 3 | 0 | 0 | 3 |
| 3 | MA2104 | Probability and Statistics I | Theory | Core | 3 | 0 | 0 | 3 |
| Total Credits | | | | | | | | 9 |

Premajor in Physical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | PH2101 | Waves and optics | Theory | Core | 3 | 0 | 0 | 3 |
| 2 | PH2103 | Physics Laboratory II | Laboratory | Core | 0 | 0 | 3 | 3 |
| 3 | PH2104 | Thermal Physics | Theory | Core | 2 | 0 | 0 | 3 |
| Total Credits | | | | | | | | 9 |

## SEMESTER 4:

One has to choose two pre-major disciplines (of 10 credits each) and a mandatory Computer Science course (of 4 credits) totalling to 24 credits, from the following courses.

Premajor in Biological Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | LS2201 | Evolutionary Biology | Theory | Core | 3 | 0 | 0 | 3 |
| 2 | LS2202 | Molecular Genetics | Theory | Core | 4 | 0 | 0 | 4 |
| 3 | LS2203 | Biology Laboratory IV | Laboratory | Core | 0 | 0 | 3 | 3 |
| Total Credits | | | | | | | | 10 |

Premajor in Chemical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | CH2201 | Fundamentals of Spectroscopy | Theory | Core | 3 | 0 | 0 | 3 |
| 2 | CH2204 | Organic Chemistry II | Theory | Core | 2 | 0 | 0 | 2 |
| 3 | CH2205 | Basic Inorganic Chemistry II | Theory | Core | 2 | 0 | 0 | 2 |
| 4 | CH2206 | Organic Chemistry Laboratory I | Laboratory | Core | 0 | 0 | 3 | 3 |
| Total Credits | | | | | | | | 10 |

Premajor in Geological Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | ES2203 | Dynamics, mechanisms and time scales of Earth Processes | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | ES2204 | Environment and Life | Theory | Core | 2 | 1 | 0 | 3 |
| 3 | ES2205 | Earth Science Laboratory II | Laboratory | Core | 0 | 0 | 3 | 3 |
| Total Credits | | | | | | | | 10 |

Premajor in Mathematical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | MA2201 | Analysis II | Theory | Core | 4 | 0 | 0 | 4 |
| 2 | MA2204 | Probability & Statistics II | Theory | Core | 3 | 0 | 0 | 3 |
| 3 | MA2205 | Basic Algebra | Theory | Core | 3 | 0 | 0 | 3 |
| Total Credits | | | | | | | | 10 |

Premajor in Physical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | PH2201 | Basic Quantum Mechanics | Theory | Core | 3 | 0 | 0 | 3 |
| 2 | PH2203 | Physics Laboratory III | Laboratory | Core | 0 | 0 | 3 | 3 |
| 3 | PH2204 | Mathematical Methods of Physics I | Theory | Core | 2 | 0 | 0 | 2 |
| 4 | PH22XX | Mechanics II | Theory | Core | 3 | 0 | 0 | 2 |
| Total Credits | | | | | | | | 10 |

Computational and Data Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | CS2201 | Introduction to Computation | Laboratory | Core | 0 | 0 | 3 | 3 |
| Total Credits | | | | | | | | 3 |

## Enrolment policies for Level 3 to Level 5 students:

a) Course enrolment in a semester will be done in the following order: incomplete courses (if any) of the relevant semester, followed by (i) core courses, (ii) departmental electives, (iii) open electives and (iv) audit, in the order. .
b) This policy will be applicable from the Academic Session 2024-25 for all Level 3 to Level 5 students.
c) Students will be allowed to take a maximum of 36 credits in a semester (32 for DMS).
d) Students have to take a minimum of 24 credits in a semester (20 for DMS).
e) After enrolling in the incomplete courses, if core courses cannot be accommodated due to lack of credits (in any of the two semesters), the student must repeat the year.
f) Students will not have to repeat any passed courses.

## Level 3:

i. In the third level, students are required to choose a 'Major' discipline from the two pre-major disciplines chosen in Semester 3, Level 2. Students would provide their first, second, and third choice of 'Majors', including the year-repeating students who wish to change their 'Major'. A score will be created for each such student eligible for promotion to Level 3. 40% of the score will be taken from the GPA of the first-choice subject (e.g. Bio), 30% from the second choice subject (e.g. Maths), and the remaining 30% from the overall CGPA. These GPAs will be calculated from the completed courses in Levels 1 and 2 (I-graded courses will not be counted). Scores could be used at the end of 4$^{th}$ semester to only decide the two pre-major subjects. The same procedure will be followed again at the end of the 4th semester to finalize the major subject with the same method. This would allow students to use their 4$^{th}$ semester grades to get better major choices.
ii. Each Department will specify the maximum number of students they can accommodate in a particular academic year, by taking into account the laboratory facilities and the faculty strength. However, this number cannot be less than 25% of the total number of students enrolled in the second year of that particular batch.
iii. If a student is unable to qualify for any Major after the second year owing to multiple failures or does not qualify for the major of his/her choice, he/she will be detained in the second year. In that case conditions of detainment (refer to "Promotion Policy") will be applied. He/she may seek permission to change the pre-major disciplines.
iv. In order to get Major in any discipline, a student must have cleared all courses offered by that department in the first and the second levels. However, a department may make an exception to admit a student who may have a failure in the same subject.
v. A student can change his/her Major within a week from the start of the 5$^{th}$ semester, provided he/she satisfies the requirements of that department. Also, the changing of Major will require consent from both the departments (leaving dept and joining dept). The student must submit proof of consent to the academic office to have their major changed.
vi. Students will have to take five core courses from the selected discipline (major). In addition, one course is to be chosen as elective (Departmental/Open) which must be a theory course. The elective course may be chosen from the same department or from another department that the student chose as pre-major in the 2$^{nd}$ level. A student cannot take a laboratory course as elective (excepting computer lab, which is equivalent to a theory course). Students should seek the advice of the departmental Under

Graduate Academic Committee (UGAC) members in choosing the electives. Departmental Elective can be any of the elective courses of the same level offered by the parent department. Open Elective can be any of the courses offered by the Major department or another department, provided that the pre-requisite requirements are met and that there is no timetable clash.

vii. Students can choose one Humanities course as an optional elective during 3rd to 5th years. If it is not offered by the Institute then one can opt for similar courses from the NPTEL, with advice from and intimation to the departmental coordinator. The examination questions will be set in-house and evaluation will also be done accordingly.

## SEMESTER 5

**Major in Biological Sciences**

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | LS3101 | Immunology | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | LS3102 | Cell Biology | Theory | Core | 3 | 1 | 0 | 4 |
| 3 | LS3103 | Microbiology | Theory | Core | 3 | 1 | 0 | 4 |
| 4 | LS3104 | Cell Biology and Imaging Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 5 | LS3105 | Gene Expression Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 6 | | Open Elective I * | | Elective | | | | 4 |
| Total Credits | | | | | | | | 24 |

**Major in Chemical Sciences**

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | CH3101 | Basic Transition Metal Chemistry | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | CH3102 | Organic Chemistry I | Theory | Core | 3 | 1 | 0 | 4 |
| 3 | CH3103 | Quantum Chemistry II | Theory | Core | 3 | 1 | 0 | 4 |
| 4 | CH3104 | Organic Chemistry | Theory | Core | 3 | 1 | 0 | 4 |
| 5 | CH3105 | Advanced Physical Chemistry Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 6 | | Open Elective I * | Theory | Elective | 3 | 1 | 0 | 4 |
| Total Credits | | | | | | | | 24 |

**Major in Geological Sciences**

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | ES3101 | Mineralogy and Crystallography | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | ES3102 | Mineralogy Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 3 | ES3103 | Sedimentology | Theory | Core | 3 | 1 | 0 | 4 |
| 4 | ES3104 | Sedimentology Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 5 | ES3105 | Seismology | Theory | Core | 3 | 1 | 0 | 4 |
| 6 | | Open Elective I * | | Elective | | | | 4 |
| Total Credits | | | | | | | | 24 |

**Major in Mathematical Sciences**

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | MA3101 | Analysis III | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | MA3102 | Algebra I | Theory | Core | 3 | 1 | 0 | 4 |
| 3 | MA3103 | Introduction to Graph Theory and Combinatories | Theory | Core | 3 | 1 | 0 | 4 |
| 4 | MA3104 | Linear Algebra II | Theory | Core | 3 | 1 | 0 | 4 |
| 5 | | Open Elective I * | Theory | Elective | 3 | 1 | 0 | 4 |
| Total Credits | | | | | | | | 20 |

**Major in Physical Sciences**

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | PH3101 | Classical Mechanics | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | PH3102 | Quantum Mechanics | Theory | Core | 3 | 1 | 0 | 4 |
| 3 | PH3103 | Mathematical Methods of Physics | Theory | Core | 3 | 1 | 0 | 4 |
| 4 | PH3104 | Electrical Circuits and Electronics | Theory | Core | 3 | 1 | 0 | 4 |
| 5 | PH3105 | Nuclear Physics Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 6 | | Open Elective I * | | Elective | | | | 4 |
| Total Credits | | | | | | | | 24 |

***Open Elective can be any of the courses, offered by the Major/another department, provided that the pre-requisites are met and there is no time-table clash.**

**In addition, the following elective courses are available.**

**List of Elective courses of Level 3 (Semester 5):**

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | CH3106 | Chemical Kinetics | Theory | Elective | 3 | 1 | 0 | 4 |
| 2 | HU3101 | History and Philosophy of Science | Theory | Elective | 3 | 1 | 0 | 4 |
| 3 | MA3105 | Numerical Analysis | Laboratory | Elective | 3 | 1 | 0 | 4 |
| 4 | CS3101 | Programming and Data Structures I | Laboratory | Elective | 1 | 0 | 3 | 4 |
| 5 | CS3102 | Programming in Python | Laboratory | Elective | 1 | 0 | 3 | 4 |

## SEMESTER 6:

**Major in Biological Sciences**

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | LS3201 | Ecology | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | LS3202 | Biostatistics | Theory | Core | 3 | 1 | 0 | 4 |
| 3 | LS3203 | Structural Biology | Theory | Core | 3 | 1 | 0 | 4 |
| 4 | LS3204 | Ecology and Behaviour Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 5 | LS3205 | Cloning and Protein Expression Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 6 | | Open Elective II * | Theory | Elective | 3 | 1 | 0 | 4 |
| Total Credits | | | | | | | | 24 |

**Major in Chemical Sciences**

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | CH3201 | Main Group elements I | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | CH3202 | Organic Chemistry II | Theory | Core | 3 | 1 | 0 | 4 |
| 3 | CH3203 | Applications of Chemical Thermodynamics | Theory | Core | 3 | 1 | 0 | 4 |
| 4 | CH3204 | Organic Synthesis Laboratory II | Laboratory | Core | 1 | 0 | 3 | 4 |
| 5 | CH3205 | Inorganic synthesis and characterization Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 6 | | Open Elective II * | Theory | Elective | 3 | 1 | 0 | 4 |
| Total Credits | | | | | | | | 24 |

**Major in Geological Sciences**

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | ES3201 | Geomorphology and Remote Sensing | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | ES3202 | Sedimentology Fieldwork | Laboratory | Core | 1 | 0 | 3 | 4 |
| 3 | ES3203 | Seismology Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 4 | ES3204 | Principles of Paleontology | Theory | Core | 3 | 1 | 0 | 4 |
| 5 | ES3205 | Paleontology Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 6 | | Open Elective II * | | Elective | | | | 4 |
| Total Credits | | | | | | | | 24 |

**Major in Mathematical Sciences**

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | MA3201 | Topology | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | MA3202 | Algebra II | Theory | Core | 3 | 1 | 0 | 4 |
| 3 | MA3203 | Analysis IV | Theory | Core | 3 | 1 | 0 | 4 |
| 4 | MA32XX | Department Elective I^ | Theory | Elective | 3 | 1 | 0 | 4 |
| 6 | | Open Elective II * | Theory | Elective | 3 | 1 | 0 | 4 |
| Total Credits | | | | | | | | 20 |

**Major in Physical Sciences**

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | PH3201 | Statistical Mechanics | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | PH3202 | Electricity and Magnetism | Theory | Core | 3 | 1 | 0 | 4 |
| 3 | PH3203 | Advanced Quantum Mechanics | Theory | Core | 3 | 1 | 0 | 4 |
| 4 | PH3204 | Electronics Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 5 | PH3205 | Computational Physics | Laboratory | Core | 1 | 0 | 3 | 4 |
| 6 | | Open Elective II * | | Elective | | | | 4 |
| Total Credits | | | | | | | | 24 |

**^Departmental Elective can be any of the elective courses of the same level, offered by the parent department.**
***Open Elective can be any of the courses, offered by the Major/another department, provided that the pre-requisites are met and there is no time-table clash.**

**In addition, the following elective courses are available.**

**List of Elective courses of Level 3 (Semester 6):**

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | CH3206 | Instrumentation in Chemistry | Theory | Elective | 3 | 1 | 0 | 4 |
| 2 | CS3201 | Programming and Data Structures II | Laboratory | Elective | 1 | 0 | 3 | 4 |
| 3 | HU3201 | Introduction to Economics | Theory | Elective | 3 | 1 | 0 | 4 |
| 4 | HU3202 | Introduction to Psychology | Theory | Elective | 3 | 1 | 0 | 4 |
| 5 | MA3205 | Geometry of Curves and Surfaces | Theory | Elective | 3 | 1 | 0 | 4 |
| 6 | MA3206 | Statistics I | Theory | Elective | 3 | 1 | 0 | 4 |

## Level 4:

In the fourth year, core and elective courses are offered. There will be departmental electives (which have to be chosen from among the electives offered by the major department), and open electives (which can be chosen from any department including the major department). Students can choose one Humanities course as an optional elective during 3rd to 5th years. If it is not offered by the Institute then one can opt for similar courses from the NPTEL, with advice from and intimation to the departmental coordinator. The examination questions will be set in-house and evaluation will also be done accordingly.
Students may also choose to do NPTEL online courses as electives in the $4^{th}$ or $5^{th}$ Levels of the BS-MS Programme. These courses have to be in areas where courses are not offered by IISER Kolkata. However, the following points must be ensured
(a) The timing of the chosen NPTEL course(s) should be concurrent to IISER-K class and exam schedule, and
(b) A student wishing to take an NPTEL course should first submit a request to the concerned department. The UGAC will consider the details of the offered course and will approve / disapprove. (c) At the time of listing of courses for an upcoming semester, the concerned instructor/Department must intimate the Academic Office about any NPTEL course(s) in which the students plan to get enrolled. The same will then be assigned a unique course code by the Academic Office and will be included in the Teaching Plan for that semester.

### SEMESTER 7:

Major in Biological Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | LS4101 | Plant Biology | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | LS4102 | Physiology | Theory | Core | 3 | 1 | 0 | 4 |
| 3 | LS4103 | Developmental Biology | Theory | Core | 3 | 1 | 0 | 4 |
| 4 | LS4104 | Physiology and Developmental Biology Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 5 | | Open Elective III* | | Elective | | | | 4 |
| 6 | | Open Elective IV* | | Elective | | | | 4 |
| Total Credits | | | | | | | | 24 |

Major in Chemical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | CH4102 | Advanced Transition Metal Chemistry | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | CH4104 | Advanced Organic Chemistry III | Theory | Elective | 3 | 1 | 0 | 4 |
| 3 | CH4121 | Statistical Thermodynamics | Theory | Core | 3 | 1 | 0 | 4 |
| 4 | CH41XX | Departmental Elective II^ | Theory | Elective | 3 | 1 | 0 | 4 |
| 5 | CH41XX | Departmental Elective III^ | Theory | Elective | 3 | 1 | 0 | 4 |
| 6 | | Open Elective III* | | Elective | | | | 4 |
| 6 | | Open Elective IV* | | Elective | | | | 4 |
| Total Credits | | | | | | | | 24 |

Major in Geological Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | ES4101 | Structural Geology | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | ES4102 | Structural Geology Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 3 | ES4103 | Petrology | Theory | Core | 3 | 1 | 0 | 4 |
| 4 | ES4104 | Petrology Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 5 | | Open Elective III* | | Elective | | | | 4 |
| 6 | | Open Elective IV* | | Elective | | | | 4 |
| Total Credits | | | | | | | | 24 |

Major in Mathematical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | MA4101 | Algebra III | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | MA4102 | Functional Analysis | Theory | Core | 3 | 1 | 0 | 4 |
| 3 | MA4103 | Analysis V | Theory | Core | 3 | 1 | 0 | 4 |
| 4 | MA41XX | Department Elective II^ (MA4104 or MA4107) | Theory | Elective | 3 | 1 | 0 | 4 |
| 5 | | Open Elective III* | | Elective | | | | 4 |
| Total Credits | | | | | | | | 20 |

Major in Physical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | PH4101 | Condensed Matter Physics | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | PH4102 | Introductory Astrophysics | Theory | Core | 1 | 0 | 3 | 4 |
| 3 | PH4103 | Condensed Matter Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 4 | PH41XX | Departmental Elective I^ | Theory | Elective | 3 | 1 | 0 | 4 |
| 5 | | Open Elective III* | | Elective | | | | 4 |
| 6 | | Open Elective IV* | | Elective | | | | 4 |
| **Total Credits** | | | | | | | | **24** |

^Departmental Elective can be any of the elective courses of the same level, offered by the parent department.
*Open Elective can be any of the courses, offered by the Major/another department, provided that the pre-requisites are met and there is no time-table clash.

In addition, the following elective courses are available.

**List of Elective courses of Level 4 (Semester 7):**

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | LS4105 | Neurobiology | Theory | Elective | 3 | 1 | 0 | 4 |
| 2 | LS4106 | Cognition | Theory | Elective | 3 | 1 | 0 | 4 |
| 3 | LS4107 | Epigenetics | Theory | Elective | 3 | 1 | 0 | 4 |
| 4 | LS4109 | Protein Structure, Function and Engineering | Theory | Elective | 3 | 1 | 0 | 4 |
| 5 | CH4105 | Organic Functional Materials | Theory | Elective | 3 | 1 | 0 | 4 |
| 6 | CH4106 | Fluorescence Spectroscopy: Principles and Applications | Theory | Elective | 3 | 1 | 0 | 4 |
| 7 | CH4107 | Chemical Perspectives of Biological Pathways | Theory | Elective | 3 | 1 | 0 | 4 |
| 8 | CH4109 | Polymer Chemistry | Theory | Elective | 3 | 1 | 0 | 4 |
| 9 | CH4114 | Molecular Simulation | Theory | Elective | 3 | 1 | 0 | 4 |
| 10 | CH4115 | Chemistry for Alternative Energy Solutions | Theory | Elective | 3 | 1 | 0 | 4 |
| 11 | CH4117 | Advanced Organic Chemistry IV | Theory | Elective | 3 | 1 | 0 | 4 |
| 12 | CH4120 | Research Methodology | Theory | Elective | 3 | 1 | 0 | 4 |
| 13 | CH4121 | Statistical Thermodynamics | Theory | Elective | 3 | 1 | 0 | 4 |
| 14 | CS4101 | Natural Language Processing (NPTEL course) | Theory | Elective | 3 | 1 | 0 | 4 |
| 15 | CS4103 | Artificial Intelligence for Data Science | Theory | Elective | 3 | 1 | 0 | 4 |
| 16 | ES4105 | Geology of Natural Resources | Theory | Elective | 3 | 1 | 0 | 4 |
| 17 | ES4106 | Environmental Science Fieldwork | Laboratory | Elective | 1 | 0 | 3 | 4 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 18 | ES4107 | Inverse Theory | Theory | Elective | 3 | 1 | 0 | 4 |
| 19 | ES41 | Environmental Geoscience | Theory | Elective | 3 | 1 | 0 | 4 |
| 20 | ES4108 | Geotechnical Engineering | Theory | Elective | 3 | 1 | 0 | 4 |
| 21 | ES4109 | Remote Sensing and GIS Laboratory | Laboratory | Elective | 1 | 3 | 0 | 4 |
| 22 | HU4102 | Applied Micro-econometrics | Theory | Elective | 3 | 1 | 0 | 4 |
| 23 | MA4104 | Algebraic Topology | Theory | Elective | 3 | 1 | 0 | 4 |
| 24 | MA4105 | Elementary Number Theory | Theory | Elective | 3 | 1 | 0 | 4 |
| 25 | MA4106 | Statistics II | Theory | Elective | 3 | 1 | 0 | 4 |
| 26 | MA4107 | Statistical Inference | Theory | Elective | 3 | 1 | 0 | 4 |
| 27 | PH4104 | Nonlinear Dynamics | Theory | Elective | 3 | 1 | 0 | 4 |
| 28 | PH4105 | Advanced Mathematical Methods of Physics | Theory | Elective | 3 | 1 | 0 | 4 |
| 29 | PH4106 | Field Theory and Relativistic Quantum Mechanics | Theory | Elective | 3 | 1 | 0 | 4 |
| 30 | PH4107 | Advanced Electricity, Magnetism, and Optics | Theory | Elective | 3 | 1 | 0 | 4 |
| 31 | PH4108 | Biological Physics | Theory | Elective | 3 | 1 | 0 | 4 |
| 32 | PH4109 | Research Methodology | Theory | Elective | 3 | 1 | 0 | 4 |
| 33 | PH4110 | Soft Condensed Matter Physics | Theory | Elective | 3 | 1 | 0 | 4 |
| 34 | PH4113 | General Theory of Relativity and Cosmology | Theory | Elective | 3 | 1 | 0 | 4 |
| 35 | SS4101 | Space Astronomy | Theory | Elective | 3 | 1 | 0 | 4 |

## SEMESTER 8:

Major in Biological Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | LS4201 | Biochemistry and Structural Biology Laboratory | Laboratory | Core | 3 | 1 | 0 | 4 |
| 2 | LS42XX | Departmental Elective I^ | Theory | Elective | 3 | 1 | 0 | 4 |
| 3 | LS42XX | Departmental Elective II^ | Theory | Elective | 3 | 1 | 0 | 4 |
| 4 | LS42XX | Departmental Elective III^ | Theory | Elective | 3 | 1 | 0 | 4 |
| 5 | | Open Elective V* | | Elective | | | | 4 |
| 6 | | Open Elective VI* | | Elective | | | | 4 |
| **Total Credits** | | | | | | | | **24** |

Major in Chemical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | CH4201 | Advanced Organic Synthesis | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | CH4202 | Symmetry in Chemistry | Theory | Core | 3 | 1 | 0 | 4 |
| 3 | CH4203 | Organic Chemistry Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 4 | CH42XX | Departmental Elective V^ | Theory | Elective | 3 | 1 | 0 | 4 |
| 5 | | Open Elective V* | | Elective | | | | 4 |
| 6 | | Open Elective VI* | | Elective | | | | 4 |
| **Total Credits** | | | | | | | | **24** |

Major in Geological Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | ES4201 | Geochemistry | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | ES4202 | Geochemistry Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 3 | ES4203 | Isotope Geology | Theory | Core | 3 | 1 | 0 | 4 |
| 4 | ES4204 | Structural Geology and Petrology Fieldwork | Laboratory | Core | 1 | 0 | 3 | 4 |
| 5 | | Open Elective V* | | Elective | | | | 4 |
| 6 | | Open Elective VI* | | Elective | | | | 4 |
| **Total Credits** | | | | | | | | **24** |

Major in Mathematical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | MA4201 | Complex Analysis | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | MA4202 | Ordinary Differential Equations | Theory | Core | 3 | 1 | 0 | 4 |
| 3 | MA4203 | Probability II | Theory | Core | 3 | 1 | 0 | 4 |
| 4 | MA42XX | Departmental Elective III^ (Stream-wise) | Theory | Elective | 3 | 1 | 0 | 4 |
| 5 | | Open Elective IV* | | | | | | 4 |
| **Total Credits** | | | | | | | | **20** |

Major in Physical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | PH4201 | Advanced Optics Laboratory | Laboratory | Core | 1 | 0 | 3 | 4 |
| 2 | PH42XX | Departmental Elective II^ | Theory | Elective | 3 | 1 | 0 | 4 |
| 3 | PH42XX | Departmental Elective III^ | Theory | Elective | 3 | 1 | 0 | 4 |
| 4 | PH42XX | Departmental Elective IV^ | Theory | Elective | 3 | 1 | 0 | 4 |
| 5 | | Open Elective V* | | Elective | | | | 4 |
| 6 | | Open Elective VI* | | Elective | | | | 4 |
| **Total Credits** | | | | | | | | **24** |

^Departmental Elective can be any of the elective courses of the same level, offered by the parent department.
*Open Elective can be any of the courses, offered by the Major/another department, provided that the pre-requisites are met and there is no time-table clash.

In addition, the following elective courses are available.

**List of Elective courses of Level 4 (Semester 8):**

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | LS4202 | Biophysics II | Theory | Elective | 3 | 1 | 0 | 4 |
| 2 | LS4203 | Gene Regulation | Theory | Elective | 3 | 1 | 0 | 4 |
| 3 | LS4204 | Advances Biochemistry and Cellular Metabolism | Theory | Elective | 3 | 1 | 0 | 4 |
| 4 | LS4205 | Cancer Biology | Theory | Elective | 3 | 1 | 0 | 4 |
| 5 | LS4206 | Bioinformatics | Theory | Elective | 3 | 1 | 0 | 4 |
| 6 | LS4207 | Marine Biology | Theory | Elective | 3 | 1 | 0 | 4 |
| 7 | LS4208 | Plant Stress Biology | Theory | Elective | 3 | 1 | 0 | 4 |
| 8 | LS4209 | Mass Spectrometry and its Application in Molecular Medicine | Theory | Elective | 3 | 1 | 0 | 4 |
| 9 | CH4204 | Physical Inorganic and Advanced Bioinorganic Chemistry | Theory | Elective | 3 | 1 | 0 | 4 |
| 10 | CH4205 | Advanced Main group and Organometallic Chemistry | Theory | Elective | 3 | 1 | 0 | 4 |
| 11 | CH4206 | Physical Methods of Structural Elucidation | Theory | Elective | 3 | 1 | 0 | 4 |
| 12 | CH4207 | Chemistry of Materials | Theory | Elective | 3 | 1 | 0 | 4 |
| 13 | CH4208 | Molecular Reaction Dynamics | Theory | Elective | 3 | 1 | 0 | 4 |
| 14 | CH4209 | Advanced Quantum Chemistry | Theory | Elective | 3 | 1 | 0 | 4 |
| 15 | CH4212 | Introductory DFT | Theory | Elective | 3 | 1 | 0 | 4 |
| 16 | CH4214 | Heterocyclic Chemistry and Natural Products | Theory | Elective | 3 | 1 | 0 | 4 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 17 | CH4215 | Frontiers at the Chemistry-Biology Interface | Theory | Elective | 3 | 1 | 0 | 4 |
| 18 | CH4217 | Research Methodology | Theory | Elective | 3 | 1 | 0 | 4 |
| 19 | CH4222 | BS Project | Theory | Elective | 0 | 0 | 16 | 16 |
| 20 | ES4205 | Crustal Evolution | Theory | Elective | 3 | 1 | 0 | 4 |
| 21 | ES4207 | Mineral Physics | Theory | Elective | 3 | 1 | 0 | 4 |
| 22 | MA4204 | Representation Theory of Finite Groups (Stream M) | Theory | Elective | 3 | 1 | 0 | 4 |
| 23 | MA4205 | Differential Geometry (Stream M) | Theory | Elective | 3 | 1 | 0 | 4 |
| 24 | MA4206 | Linear Models (Stream S) | Theory | Elective | 3 | 1 | 0 | 4 |
| 25 | MA4207 | Machine Learning and Network Analysis (Stream S) | Theory | Elective | 2 | 0 | 2 | 4 |
| 26 | MA4208 | Independent Study I | Theory | Elective | 3 | 1 | 0 | 4 |
| 27 | PH4202 | Advanced Statistical Mechanics | Theory | Elective | 3 | 1 | 0 | 4 |
| 28 | PH4203 | Research Methodology | Theory | Elective | 3 | 1 | 0 | 4 |
| 29 | PH4204 | High Energy Physics | Theory | Elective | 3 | 1 | 0 | 4 |
| 30 | PH4206 | Quantum Many-body Theory | Theory | Elective | 3 | 1 | 0 | 4 |
| 31 | PH4207 | Quantum Information Processing | Theory | Elective | 3 | 1 | 0 | 4 |
| 32 | PH4208 | Quantum Field Theory II | Theory | Elective | 3 | 1 | 0 | 4 |
| 33 | PH4209 | Evolutionary Dynamics | Theory | Elective | 3 | 1 | 0 | 4 |
| 34 | PH4212 | Atomic and Optical Physics | Theory | Elective | 3 | 1 | 0 | 4 |
| 35 | PH4213 | Symmetry Methods in Physics | Theory | Elective | 3 | 1 | 0 | 4 |
| 36 | PH4215 | BS Project | Theory | Elective | 0 | 0 | 12 | 12 |
| 37 | CS4201 | Information Retrieval and Web Search | Theory | Elective | 3 | 1 | 0 | 4 |
| 38 | SS4202 | Space Astronomy | Theory | Elective | 3 | 1 | 0 | 4 |

## Level 5

In the fifth year, a student has to do a dissertation (research project) along with some advanced courses. The project work will be evaluated on the basis of the project report and a seminar. Students may also choose to do NPTEL online courses as Electives in the 5th level.

### SEMESTER 9:

Major in Biological Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | LS5101 | Scientific Communication | Theory | Core | 3 | 1 | 0 | 4 |
| 2 | LS5102 | MS Project | Project | Core | 0 | 0 | 20 | 20 |
| **Total Credits** | | | | | | | | **24** |

Major in Chemical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | CH5101 | MS Project | Project | Core | | | 20 | 20 |
| 2 | CH51XX | Departmental Elective VII^ | Theory | Elective | 3 | 1 | 0 | 4 |
| **Total Credits** | | | | | | | | **24** |

Major in Geological Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | ES5101 | MS Project | Project | Core | 0 | 0 | 24 | 24 |
| **Total Credits** | | | | | | | | **24** |

Major in Mathematical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | MA5101 | MS Project | Project | Core | 0 | 0 | 8 | 8 |
| 2 | MA5102 | Partial Differential Equations | Theory | Core | 3 | 1 | 0 | 4 |
| 3 | MA51XX | Departmental Elective IV^ | Theory | Elective | 3 | 1 | 0 | 4 |
| 4 | | Open Elective V* | | Elective | | | | 4 |
| **Total Credits** | | | | | | | | **20** |

Major in Physical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | PH5101 | MS Project | Project | Core | 0 | 0 | 16 | 20 |
| 2 | PH51XX | Departmental Elective V^ | Theory | Elective | 3 | 1 | 0 | 4 |
| **Total Credits** | | | | | | | | **24** |

^Departmental Elective can be any of the elective courses of the same level, offered by the parent department.
*Open Elective can be any of the courses, offered by the Major/another department, provided that the pre-requisites are met and there is no time-table clash.

In addition, the following elective courses are available.

**List of Elective courses of Level 5 (Semester 9):**

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | CH5102 | Glycochemistry, glycobiology and Medicinal Chemistry | Theory | Elective | 3 | 1 | 0 | 4 |
| 2 | CH5103 | Supramolecular Chemistry and Applications | Theory | Elective | 3 | 1 | 0 | 4 |
| 3 | CH5104 | Computational Chemistry | Theory | Elective | 3 | 1 | 0 | 4 |
| 4 | CH5106 | Sustainabilty and Chemistry | Theory | Elective | 3 | 1 | 0 | 4 |
| 5 | CS5102 | Artificial Intelligence: Search Methods For Problem solving | Theory | Elective | 3 | 1 | 0 | 4 |
| 6 | CS5103 | Applied Machine Learning | Theory | Elective | 3 | 1 | 0 | 4 |
| 7 | MA5103 | Fourier Analysis | Theory | Elective | 3 | 1 | 0 | 4 |
| 8 | MA5104 | Operator Theory | Theory | Elective | 3 | 1 | 0 | 4 |
| 9 | MA5105 | Algebraic Number Theory | Theory | Elective | 3 | 1 | 0 | 4 |
| 10 | MA5106 | Topics in Complex Analysis | Theory | Elective | 3 | 1 | 0 | 4 |
| 11 | MA5107 | Stochastic Processes | Theory | Elective | 3 | 1 | 0 | 4 |
| 12 | MA5108 | Multivariate Statistics | Theory | Elective | 3 | 1 | 0 | 4 |
| 13 | MA5111 | Statistical Decision Theory | Theory | Elective | 3 | 1 | 0 | 4 |
| 14 | MA5112 | Theory of Sample Surveys | Theory | Elective | 3 | 1 | 0 | 4 |
| 15 | MA5113 | Reliability theory | Theory | Elective | 3 | 1 | 0 | 4 |
| 16 | MA5114 | Riemannian Geometry | Theory | Elective | 3 | 1 | 0 | 4 |
| 17 | MA5115 | Independent study I | Project | Elective | | | | 4 |
| 18 | MA5116 | Introduction to Ergodic Theory | Theory | Elective | 3 | 1 | 0 | 4 |
| 19 | MA5120 | C and Data Structures | Theory | Elective | 3 | 1 | 0 | 4 |
| 20 | MA5121 | Nonparametric Statistics | Theory | Elective | 3 | 1 | 0 | 4 |
| 21 | MA5122 | Commutative Algebra | Theory | Elective | 3 | 1 | 0 | 4 |
| 22 | PH5102 | Independent Study | Project | Elective | | | | 4 |
| 23 | PH5103 | Advanced Condensed Matter Physics | Theory | Elective | 3 | 1 | 0 | 4 |
| 24 | PH5110 | Fluid and Magnetohydrodynamics | Theory | Elective | 3 | 1 | 0 | 4 |

## SEMESTER 10:

Major in Biological Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | LS5201 | MS Project | Project | Core | 0 | 0 | 24 | 24 |
| **Total Credits** | | | | | | | | **24** |

Major in Chemical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | CH5201 | MS Project | Project | Core | 0 | 0 | 24 | 24 |
| **Total Credits** | | | | | | | | **24** |

Major in Geological Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | ES5201 | MS Project | Project | Core | 0 | 0 | 24 | 24 |
| **Total Credits** | | | | | | | | **24** |

Major in Mathematical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | MA5201 | MS Project | Project | Core | 0 | 0 | 12 | 12 |
| 2 | MA52XX | Departmental Elective V^ | Theory | Elective | 3 | 1 | 0 | 4 |
| 3 | | Open Elective VI* | | Elective | | | | 4 |
| **Total Credits** | | | | | | | | 20 |

Major in Physical Sciences

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | PH5201 | MS Project | Project | Core | 0 | 0 | 24 | 24 |
| **Total Credits** | | | | | | | | **24** |

^Departmental Elective can be any of the elective courses of the same level, offered by the parent department.
*Open Elective can be any of the courses, offered by the Major/another department, provided that the pre-requisites are met and there is no time-table clash.

In addition, the following elective courses are available.

List of Elective courses of Level 5 (Semester 10):

| Sl. No. | Course Code | Course Name | Course Type | Course Category | Course Credits | | | Contact hours |
|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | |
| 1 | MA5202 | Algebraic Geometry | Theory | Elective | 3 | 1 | 0 | 4 |
| 2 | MA5203 | Topics in Operator Theory | Theory | Elective | 3 | 1 | 0 | 4 |
| 3 | MA5204 | Several Complex Variables | Theory | Elective | 3 | 1 | 0 | 4 |
| 4 | MA5205 | Advanced Partial Differential Equations | Theory | Elective | 3 | 1 | 0 | 4 |
| 5 | MA5206 | Topics in Analysis | Theory | Elective | 3 | 1 | 0 | 4 |
| 6 | MA5207 | Topology and geometry | Theory | Elective | 3 | 1 | 0 | 4 |
| 7 | MA5208 | Introduction to Bayesian Analysis | Theory | Elective | 3 | 1 | 0 | 4 |
| 8 | MA5210 | Advanced Data Structures and Algorithims | Theory | Elective | 3 | 1 | 0 | 4 |
| 9 | MA5211 | High Dimensional Statistics | Theory | Elective | 3 | 1 | 0 | 4 |
| 10 | MA5212 | Regression Analysis | Theory | Elective | 3 | 1 | 0 | 4 |
| 11 | MA5213 | Sobolev Spaces: Theory and Applications | Theory | Elective | 3 | 1 | 0 | 4 |
| 12 | MA5214 | Independent Study II | Theory | Elective | 3 | 1 | 0 | 4 |
| 13 | MA5215 | Independent Study III | Theory | Elective | 3 | 1 | 0 | 4 |
| 14 | MA5216 | Principal Bundles and Representation Ring | Theory | Elective | 3 | 1 | 0 | 4 |
| 15 | MA5218 | Time Series Analysis | Theory | Elective | 3 | 1 | 0 | 4 |
| 16 | MA5219 | Analytic Number Theory | Theory | Elective | 3 | 1 | 0 | 4 |