



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.

1. **Course Type:** Course Type can be Theory, Laboratory, or Project
2. **Course Category:** Course Category can be Core or Elective
 - a) Core courses are mandatory
 - b) Elective courses can be either Departmental or Open 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 parent/another department at a given Level,
Students should select Electives provided that the pre-requisites are met and there is no time-table clash.
3. **Course Credits:**
 - a) 'L' stands for 'Lecture' (*theory component*)
 - b) 'T' stands for 'Tutorial' classes
 - c) 'P' stands for 'Practical' (*laboratory component*)
4. **Contact Hours:** The number of contact hours per week are approximately the same as the number of credits. For example, the 4-credit courses will include 3 hours of teaching and 1 hour of tutorial (or an equivalent length of time devoted to term paper, assignments, etc.).

Level 1:

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 assigned 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

Students choose their Pre-majors in this Level, subject to fulfilment of academic requirements as detailed in the Academic Guidelines. All Level 2 courses offered by a department are treated as 'Core' courses and have mandatory enrolment.

SEMESTER 3:

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:**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	Basic 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	PH2205	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

Level 3:

In the third level, students are required to choose a 'Major' discipline, subject to fulfilment of academic requirements as detailed in the Academic Guidelines.

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 II	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	Multivariable calculus	Theory	Core	3	1	0	4
2	MA3103	Introduction to Graph Theory and Combinatorics	Theory	Core	3	1	0	4
3	MA3104	Linear Algebra II	Theory	Core	3	1	0	4
4	MA3110	Rings and Modules	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

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

Course Code	Course Name	Course Type	Course Category	Course Credits			Contact hours
				L	T	P	
CH3106	Chemical Kinetics	Theory	Elective	3	1	0	4
HU3101	History and Philosophy of Science	Theory	Elective	3	1	0	4
MA3108	Stochastic processes	Theory	Elective	3	1	0	4
CS3101	Programming and Data Structures I	Laboratory	Elective	1	0	3	4
CS3102	Programming in Python	Laboratory	Elective	1	0	3	4
ES3108	Principles of Atmospheric Science	Theory	Elective	3	1	0	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 III	Theory	Core	3	1	0	4
3	CH3203	Applications of Chemical Thermodynamics	Theory	Core	3	1	0	4
4	CH3204	Organic Chemistry 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	MA3203	Measure & Integration	Theory	Core	3	1	0	4
3	MA3208	Complex Analysis	Theory	Core	3	1	0	4
4	MA3210	Group Theory	Theory	Core	3	1	0	4
5		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

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

Course Code	Course Name	Course Type	Course Category	Course Credits			Contact hours
				L	T	P	
CH3206	Instrumentation in Chemistry	Theory	Elective	3	1	0	4
ES3208	Science of Human-induced climate change	Theory	Elective	3	1	0	4
HU3201	Introduction to Economics	Theory	Elective	3	1	0	4
HU3202	Introduction to Psychology	Theory	Elective	3	1	0	4
MA3209	Elementary Number Theory	Theory	Elective	3	1	0	4

Level 4:

In the fourth year, students will continue with the Core and Elective (Departmental and/or Open) courses as specified by their parent Department.

SEMESTER 7:

Major in Biological Sciences

Sl. No.	Course Code	Course Name	Course Type	Course Category	Course Credits			Contact hours
					L	T	P	
1	LS4104	Physiology and Developmental Biology Laboratory	Laboratory	Core	1	0	3	4
2	LS41XX	Departmental Elective I	Theory	Elective	3	1	0	4
3	LS41XX	Departmental Elective II	Theory	Elective	3	1	0	4
4	LS41XX	Departmental Elective III	Theory	Elective	3	1	0	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	Core	3	1	0	4
3	CH4121	Statistical Thermodynamics	Theory	Core	3	1	0	4
4	CH41XX	Departmental Elective I	Theory	Elective	3	1	0	4
5		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	MA4102	Functional Analysis	Theory	Core	3	1	0	4
2	MA41XX	Department Elective I (Stream-wise)	Theory	Elective	3	1	0	4
3	MA41XX	Department Elective II (Stream-wise)	Theory	Elective	3	1	0	4
4	MA41XX	Department Elective III (Stream-wise)	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

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

Course Code	Course Name	Course Type	Course Category	Course Credits			Contact hours
				L	T	P	
LS4101	Plant Biology	Theory	Elective	3	1	0	4
LS4102	Physiology	Theory	Elective	3	1	0	4
LS4103	Developmental Biology	Theory	Elective	3	1	0	4
LS4105	Neurobiology	Theory	Elective	3	1	0	4
LS4106	Cognition	Theory	Elective	3	1	0	4
LS4107	Epigenetics	Theory	Elective	3	1	0	4
LS4109	Protein Structure, Function and Engineering	Theory	Elective	3	1	0	4
LS4111	BS Project	Project	Elective	0	0	8	8
LS4112	Advanced Behavioural Biology	Theory	Elective	3	1	0	4
CH4105	Organic Functional Materials	Theory	Elective	3	1	0	4
CH4106	Fluorescence Spectroscopy: Principles and Applications	Theory	Elective	3	1	0	4
CH4107	Chemical Perspectives of Biological Pathways	Theory	Elective	3	1	0	4
CH4109	Polymer Chemistry	Theory	Elective	3	1	0	4
CH4114	Molecular Simulation	Theory	Elective	3	1	0	4
CH4115	Chemistry for Alternative Energy Solutions	Theory	Elective	3	1	0	4
CH4117	Advanced Organic Chemistry IV	Theory	Elective	3	1	0	4

CH4120	Research Methodology	Theory	Elective	3	1	0	4
CS4103	Artificial Intelligence for Data Science	Theory	Elective	3	1	0	4
ES4105	Geology of Natural Resources	Theory	Elective	3	1	0	4
ES4106	Environmental Science Fieldwork	Laboratory	Elective	1	0	3	4
ES4107	Inverse Theory	Theory	Elective	3	1	0	4
ES4108	Geotechnical Engineering	Theory	Elective	3	1	0	4
HU4102	Applied Micro-econometrics	Theory	Elective	3	1	0	4
MA4101	Field and Galois Theory	Theory	Elective	3	1	0	4
MA4104	Algebraic Topology	Theory	Elective	3	1	0	4
MA4106	Statistics II (Stream S)	Theory	Elective	3	1	0	4
MA4107	Statistical Inference	Theory	Elective	3	1	0	4
MA4110	Geometry of Curves and Surfaces	Theory	Elective	3	1	0	4
MA4111	Numerical Analysis	Theory	Elective	3	1	0	4
MA4112	Multivariate Statistics (Stream S)	Theory	Elective	3	1	0	4
PH4104	Nonlinear Dynamics	Theory	Elective	3	1	0	4
PH4105	Advanced Mathematical Methods of Physics	Theory	Elective	3	1	0	4
PH4106	Field Theory and Relativistic Quantum Mechanics	Theory	Elective	3	1	0	4
PH4107	Advanced Electricity, Magnetism, and Optics	Theory	Elective	3	1	0	4
PH4108	Biological Physics	Theory	Elective	3	1	0	4
PH4109	Research Methodology	Theory	Elective	3	1	0	4
PH4110	Soft Condensed Matter Physics	Theory	Elective	3	1	0	4
PH4113	General Theory of Relativity	Theory	Elective	3	1	0	4
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 IV	Theory	Elective	3	1	0	4
3	LS42XX	Departmental Elective V	Theory	Elective	3	1	0	4
4	LS42XX	Departmental Elective VI	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	CH4202	Symmetry in Chemistry	Theory	Core	3	1	0	4
2	CH4203	Organic Chemistry Laboratory III	Laboratory	Core	1	0	3	4
3	CH42XX	Departmental Elective II	Theory	Elective	3	1	0	4
4	CH42XX	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 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	ES4203	Isotope Geology	Theory	Core	3	1	0	4
3	ES4204	Structural Geology and Petrology Fieldwork	Laboratory	Core	1	0	3	4
4	ES42XX	Departmental Elective I		Elective				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	MA4202	Ordinary Differential Equations	Theory	Core	3	1	0	4
2	MA4203	Measure Theoretic Probability	Theory	Core	3	1	0	4
3	MA42XX	Departmental Elective IV (Stream-wise)	Theory	Elective	3	1	0	4
4	MA42XX	Departmental Elective V (except 'Independent Study')	Theory	Elective	3	1	0	4
5		Open Elective V						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

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

Course Code	Course Name	Course Type	Course Category	Course Credits			Contact hours
				L	T	P	
LS4202	Biophysics II	Theory	Elective	3	1	0	4
LS4203	Gene Regulation	Theory	Elective	3	1	0	4
LS4204	Advances Biochemistry and Cellular Metabolism	Theory	Elective	3	1	0	4
LS4205	Cancer Biology	Theory	Elective	3	1	0	4
LS4206	Bioinformatics	Theory	Elective	3	1	0	4
LS4207	Marine Biology	Theory	Elective	3	1	0	4
LS4208	Plant Stress Biology	Theory	Elective	3	1	0	4
LS4209	Mass Spectrometry and its Application in Molecular Medicine	Theory	Elective	3	1	0	4
LS4211	Chemical Ecology	Theory	Elective	3	1	0	4
LS4212	BS Project	Theory	Elective	0	0	0	8
CH4201	Advanced Organic Chemistry II	Theory	Elective	3	1	0	4
CH4204	Physical Inorganic and Advanced Bioinorganic Chemistry	Theory	Elective	3	1	0	4
CH4205	Advanced Main group and Organometallic Chemistry	Theory	Elective	3	1	0	4
CH4206	Physical Methods of Structural Elucidation	Theory	Elective	3	1	0	4
CH4207	Chemistry of Materials	Theory	Elective	3	1	0	4
CH4208	Molecular Reaction Dynamics	Theory	Elective	3	1	0	4
CH4209	Advanced Quantum Chemistry	Theory	Elective	3	1	0	4
CH4212	Introductory DFT	Theory	Elective	3	1	0	4
CH4214	Heterocyclic Chemistry and Natural Products	Theory	Elective	3	1	0	4
CH4215	Frontiers at the Chemistry-Biology Interface	Theory	Elective	3	1	0	4
CH4217	Research Methodology	Theory	Elective	3	1	0	4
CH4222	BS Project	Theory	Elective	0	0	16	16
ES4202	Geochemistry Laboratory	Laboratory	Elective	1	0	3	4
ES4205	Crustal Evolution	Theory	Elective	3	1	0	4

ES4207	Mineral Physics	Theory	Elective	3	1	0	4
MA4204	Representation Theory of Finite Groups (Stream M)	Theory	Elective	3	1	0	4
MA4205	Differential Geometry (Stream M)	Theory	Elective	3	1	0	4
MA4206	Linear Models (Stream S)	Theory	Elective	3	1	0	4
MA4207	Machine Learning and Network Analysis (Stream S)	Theory	Elective	2	0	2	4
MA4208	Independent Study I	Theory	Elective	3	1	0	4
MA4209	Advanced Measure Theory and Applications	Theory	Elective	3	1	0	4
PH4202	Advanced Statistical Mechanics	Theory	Elective	3	1	0	4
PH4203	Research Methodology	Theory	Elective	3	1	0	4
PH4204	High Energy Physics	Theory	Elective	3	1	0	4
PH4206	Quantum Many-body Theory	Theory	Elective	3	1	0	4
PH4207	Quantum Information Processing	Theory	Elective	3	1	0	4
PH4208	Quantum Field Theory II	Theory	Elective	3	1	0	4
PH4209	Evolutionary Dynamics	Theory	Elective	3	1	0	4
PH4212	Atomic and Optical Physics	Theory	Elective	3	1	0	4
PH4213	Symmetry Methods in Physics	Theory	Elective	3	1	0	4
PH4214	Research Project II	Project	Elective	4	0	0	4
PH4215	BS Project	Theory	Elective	0	0	12	12
PH4218	Cosmology	Theory	Elective	3	1	0	4
CS4201	Information Retrieval and Web Search	Theory	Elective	3	1	0	4
SS4202	Space Astronomy	Theory	Elective	3	1	0	4

Level 5

In the fifth year, students have to do a dissertation (research project) along with some advanced courses.

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 IV	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 VI	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

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

Course Code	Course Name	Course Type	Course Category	Course Credits			Contact hours
				L	T	P	
CH5102	Glycochemistry, glycobiology and Medicinal Chemistry	Theory	Elective	3	1	0	4
CH5103	Supramolecular Chemistry and Applications	Theory	Elective	3	1	0	4
CH5104	Computational Chemistry	Theory	Elective	3	1	0	4
CH5106	Sustainability and Chemistry	Theory	Elective	3	1	0	4
CS5102	Artificial Intelligence: Search Methods For Problem solving	Theory	Elective	3	1	0	4
CS5103	Applied Machine Learning	Theory	Elective	3	1	0	4
MA5103	Fourier Analysis	Theory	Elective	3	1	0	4
MA5104	Operator Theory	Theory	Elective	3	1	0	4
MA5106	Topics in Complex Analysis	Theory	Elective	3	1	0	4
MA5107	Stochastic Processes	Theory	Elective	3	1	0	4
MA5111	Statistical Decision Theory	Theory	Elective	3	1	0	4
MA5112	Theory of Sample Surveys	Theory	Elective	3	1	0	4
MA5113	Reliability theory	Theory	Elective	3	1	0	4
MA5114	Riemannian Geometry	Theory	Elective	3	1	0	4
MA5115	Independent study I	Project	Elective				4
MA5116	Introduction to Ergodic Theory	Theory	Elective	3	1	0	4
MA5120	C and Data Structures	Theory	Elective	3	1	0	4
MA5121	Nonparametric Statistics	Theory	Elective	3	1	0	4

MA5122	Commutative Algebra	Theory	Elective	3	1	0	4
PH5102	Independent Study	Project	Elective				4
PH5103	Advanced Condensed Matter Physics	Theory	Elective	3	1	0	4
PH5110	Fluid and Magnetohydrodynamics	Theory	Elective	3	1	0	4
PH5114	Nonequilibrium Quantum Dynamics	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 VII	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

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

Course Code	Course Name	Course Type	Course Category	Course Credits			Contact hours
				L	T	P	
MA5202	Algebraic Geometry	Theory	Elective	3	1	0	4
MA5203	Topics in Operator Theory	Theory	Elective	3	1	0	4
MA5204	Several Complex Variables	Theory	Elective	3	1	0	4
MA5205	Advanced Partial Differential Equations	Theory	Elective	3	1	0	4
MA5206	Topics in Analysis	Theory	Elective	3	1	0	4
MA5207	Topology and geometry	Theory	Elective	3	1	0	4
MA5208	Introduction to Bayesian Analysis	Theory	Elective	3	1	0	4
MA5210	Advanced Data Structures and Algorithms	Theory	Elective	3	1	0	4
MA5211	High Dimensional Statistics	Theory	Elective	3	1	0	4
MA5212	Regression Analysis	Theory	Elective	3	1	0	4
MA5213	Sobolev Spaces: Theory and Applications	Theory	Elective	3	1	0	4
MA5214	Independent Study II	Theory	Elective	3	1	0	4
MA5215	Independent Study III	Theory	Elective	3	1	0	4
MA5216	Principal Bundles and Representation Ring	Theory	Elective	3	1	0	4
MA5218	Time Series Analysis	Theory	Elective	3	1	0	4
MA5219	Analytic Number Theory	Theory	Elective	3	1	0	4
MA5220	Algebraic Number Theory	Theory	Elective	3	1	0	4
MA5221	Complex Dynamics I	Theory	Elective	3	1	0	4