

**BS-MS Dual Degree**  
**BS-MS Course Curriculum**

**Semester I**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
BIO101	Biology I: Biomolecules	3
BIO103	General Biology Laboratory	1
CHM101	General Chemistry	3
EES101	Earth Materials and Processes	3
HSS101	English for Communication	2
MTH101	Calculus of One Variable	3
PHY101	Mechanics	3
PHY103	General Physics Laboratory I	1
PT101	Physical Training	1
Total Credits		20

**Semester II**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
BIO102	Biology II: Fundamentals of Cell Biology	3
CHM112	Basic Organic Chemistry	3
CHM114	Chemistry Laboratory I	1
EES102	Introduction to Environmental Sciences	3
ECS102	Introduction to Programming	3
MTH102	Linear Algebra	3
PHY106	Quantum Physics	3
Total Credits		19

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**Semester III**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
<b><i>Department of Biological Sciences</i></b>		
BIO201	Biology III: Fundamentals of Molecular Biology	3
BIO203	Biology V: Diversity of Life I	3
BIO205	Biology Laboratory I	1
<b><i>Department of Chemistry</i></b>		
CHM211	Basic Organic Chemistry II	3
CHM221	Basic Physical Chemistry	3
CHM223	Chemistry Laboratory II	1
<b><i>Department of Earth and Environmental Sciences</i></b>		
EES201	Atmospheric Sciences	3
EES205	Oceanography	3
EES207	Introduction to Earth and Environmental Sciences Laboratory	1
<b><i>Department of Data Science and Engineering</i></b>		
ECS201	Discrete Mathematics I	3
ECO201	Econometrics I	4
MTH201	Multivariable Calculus	3
<b><i>Department of Mathematics</i></b>		
MTH201	Multivariable Calculus	3
MTH203	Introduction to Groups and Symmetry	3
<b><i>Department of Physics</i></b>		
PHY201	Waves and Optics	3
PHY205	General Physics Laboratory II	1
PHY209	Electromagnetism	3
Minimum Credits to be Registered		20

**BS-MS Dual Degree**  
**BS-MS Course Curriculum**

**Semester IV**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
<b><i>Department of Biological Sciences</i></b>		
BIO202	Biology IV: Basic Genetics	3
BIO204	Biology VI: Diversity of Life II	3
BIO206	Biology Laboratory II	1
<b><i>Department of Chemistry</i></b>		
CHM204	Basic Inorganic Chemistry	3
CHM206	Chemistry Laboratory III	1
CHM222	Classical Thermodynamics	3
<b><i>Department of Earth and Environmental Sciences</i></b>		
EES202	The Evolution of the Earth	3
EES208	Geochemistry	4
<b><i>Department of Data Science and Engineering</i></b>		
ECS202	Data Structures and Algorithms	3
ECS204	Signals and Systems	3
MTH202	Probability and Statistics	3
<b><i>Department of Mathematics</i></b>		
MTH202	Probability and Statistics	3
MTH204	Complex Variables	3
<b><i>Department of Physics</i></b>		
PHY206	Physics Through Computational Thinking	3
PHY208	General Properties of Matter	3
PHY210	General Physics Laboratory III	1
Minimum Credits to be Registered		20

**Department of Biological Sciences**  
**BS-MS Course Curriculum**

**Semester V**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
BIO301	Cell Biology	4
BIO303	Biochemistry	4
BIO305	Plant Physiology	4
BIO307	Biology Laboratory III	3
BIO***	Department Elective I	4
*** **	Open Elective I	3/4
ECO500	Law Relating to Intellectual Property and Patents	1
Total Credits		23

**Semester VI**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
BIO304	Molecular Biology	4
BIO306	Immunology	4
BIO308	Biology Laboratory IV	3
BIO310	Animal Physiology	4
BIO***	Department Elective II	4
*** **	Open Elective II	3/4
Total Credits		22

**Semester VII**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
BIO405	Developmental Biology	4
BIO406	Evolutionary Ecology	4
BIO418	Biophysics and Structural Biology	4
BIO***	Department Elective III	4
BIO***	Department Elective IV	4
*** **	Open Elective III	3/4
Total Credits		23

**Department of Biological Sciences**  
**BS-MS Course Curriculum**

**Semester VIII**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
BIO402	Bioinformatics	4
BIO407	Biostatistics	4
BIO422	Biomolecular Metabolism	4
BIO***	Department Elective V	4
BIO***	Department Elective VI	4
*** **	Open Elective IV	3/4
Total Credits		23

**Semester IX**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
BIO501	MS Thesis	18
Total Credits		18

**Semester X**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
BIO501	MS Thesis	18
Total Credits		18

**Department of Chemistry**  
**BS-MS Course Curriculum**

**Semester V**

Course No.	Course Title	Credits
CHM301	Symmetry and Group Theory	4
CHM311	Organic Chemistry I	4
CHM313	Organic Chemistry Laboratory	3
CHM321	Physical Chemistry of Solutions	4
CHM325	Mathematical Methods for Chemists	4
*** **	Open Elective I	3/4
ECO500	Law Relating to Intellectual Property and Patents	1
Total Credits		23

**Semester VI**

Course No.	Course Title	Credits
CHM302	Chemistry of Transition Metals	4
CHM312	Organic Chemistry II	4
CHM314	Quantitative Methods in Chemistry	4
CHM322	Principles of Quantum Chemistry	4
CHM***	Departmental Elective I	4
*** **	Open Elective II	3/4
Total Credits		23

**Semester VII**

Course No.	Course Title	Credits
CHM401	Main Group Chemistry	4
CHM403	Inorganic Chemistry Laboratory	3
CHM411	Physical Organic Chemistry	4
CHM421	Statistical Mechanics	4
CHM***	Departmental Elective II	4
*** **	Open Elective III	3/4
Total Credits		22

**Department of Chemistry**  
**BS-MS Course Curriculum**

**Semester VIII**

Course No.	Course Title	Credits
CHM402	Applications of Modern Physical Methods	4
CHM416	Spectroscopy and its Application in Organic Molecules	4
CHM422	Molecular Spectroscopy	4
CHM426	Physical Chemistry Laboratory	3
CHM***	Departmental Elective III	4
*** **	Open Elective IV	3/4
Total Credits		22

**Semester IX**

Course No.	Course Title	Credits
CHM501X	MS Thesis	10/14/18
<i>Optional Courses*</i>		
CHM***	Departmental Elective IV	4
CHM***	Departmental Elective V	4
Total Credits		18

\* Students may register for a total of 18 credits with any of the following combination.

1. MS Thesis with 18 Credits
2. MS Thesis with 14 Credits + One Departmental Elective (4 Credits)

**Semester X**

Course No.	Course Title	Credits
CHM501Y	MS Thesis	18
Total Credits		18

**Earth and Environmental Sciences - Geology**  
**BS-MS Course Curriculum**

**Semester V**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
EES301	Mineralogy	3
EES311	Mineralogy Laboratory	1
EES331	Geohydrology	4
EES333	Environmental Chemistry	3
EES335	Environmental Chemistry Laboratory	1
EES337	Solid Earth Geophysics	4
*** **	Open Elective I	3/4
ECO500	Law Relating to Intellectual Property and Patents	1
Total Credits		20

**Semester VI**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
EES302	Igneous Petrology	3
EES312	Igneous Petrology Laboratory	1
EES318	Basic Field Geology	2
EES332	Sedimentology and Principles of Stratigraphy	3
EES334	Sedimentology Laboratory	1
EES336	Remote Sensing and GIS	3
EES338	Remote Sensing and GIS Laboratory	1
EES340	Structural Geology	3
EES342	Structural Geology Laboratory	1
*** **	Open Elective II	3/4
Total Credits		21

**Semester VII**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
EES431	Earth Surface Processes	4
EES433	Metamorphic Petrology	3
EES435	Metamorphic Petrology Laboratory	1
EES437	Data Analyses and Statistics for Geosciences	4
EES439	Evolution of the Indian Plate	4
EES***	Departmental Elective I	4
*** **	Open Elective III	3/4
Total Credits		23



## Earth and Environmental Sciences - Geology

### BS-MS Course Curriculum

#### Semester VIII

Course No.	Course Title	Credits
EES412	Advanced Field Geology	2
EES432	Geodynamics	4
EES502	Contemporary Environmental Issues	4
EES***	Departmental Elective II	4
EES***	Departmental Elective III	4
EES***	Departmental Elective IV	4
*** **	Open Elective IV	3/4
Total Credits		25

#### Semester IX

Course No.	Course Title	Credits
EES501	MS Thesis	18
Total Credits		18

#### Semester X

Course No.	Course Title	Credits
EES501	MS Thesis	18
Total Credits		18

**\*Out of Four Departmental Electives, at least three departmental electives should be taken from the following**

Course No.	Course Title	Credits
EES422/602	Marine Biogeochemical Cycles	4
EES601	Isotope Geochemistry	4
EES603	Mineral Thermodynamics	4
EES607	Advanced Remote Sensing and GIS	4
EES615	Reconstructing Quaternary Continental Environments and Climates of South Asia	4
EES620	Introduction to Paleontology	4
EES622	Economic Geology	4
EES624	Geology of Fules	4
EES627	Geo-analytical Techniques	4
EES629	Advanced Mineralogy	4
EES649	Advanced Structural Geology	4
EES651	Surface Water Hydrology	4
EES652	Geochemical Modelling in Aqueous Geochemistry	4
EES654	Geoinformatics	4

**Earth and Environmental Sciences - Environmental Sc.  
BS-MS Course Curriculum**

**Semester V**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
EES301	Mineralogy	3
EES311	Mineralogy Laboratory	1
EES331	Geohydrology	4
EES333	Environmental Chemistry	3
EES335	Environmental Chemistry Laboratory	1
EES337	Solid Earth Geophysics	4
*** **	Open Elective I	3/4
ECO500	Law Relating to Intellectual Property and Patents	1
Total Credits		20

**Semester VI**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
EES318	Basic Field Geology	2
EES336	Remote Sensing and GIS	3
EES338	Remote Sensing and GIS Laboratory	1
EES344	Petrology	3
EES346	Petrology Laboratory	1
EES348	Science of Sustainability	4
EES350	Environmental Pollution	4
*** **	Open Elective II	3/4
Total Credits		21

**Semester VII**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
EES404	Global Climate Change	3
EES410	Global Climate Change Laboratory	1
EES431	Earth Surface Processes	4
EES437	Data Analyses and Statistics for Geosciences	4
EES441	Environmental Impact Assessment	4
EES***	Departmental Elective I	4
*** **	Open Elective III	3/4
Total Credits		23

**Earth and Environmental Sciences - Environmental Sc.  
BS-MS Course Curriculum**

**Semester VIII**

Course No.	Course Title	Credits
EES414	Field Work in Environmental Sciences	2
EES422	Marine Biogeochemical Cycles	4
EES502	Contemporary Environmental Issues	4
EES***	Departmental Elective II	4
EES***	Departmental Elective III	4
EES***	Departmental Elective IV	4
*** **	Open Elective IV	3/4
Total Credits		25

**Semester IX**

Course No.	Course Title	Credits
EES501	MS Thesis	18
Total Credits		18

**Semester X**

Course No.	Course Title	Credits
EES501	MS Thesis	18
Total Credits		18

**\*Out of Four Departmental Electives, at least three departmental electives should be taken from the following**

Course No.	Course Title	Credits
EES604	Aerosol Science	4
EES601	Isotope Geochemistry	4
EES645	Global Climate Change	4
EES607	Advanced Remote Sensing and GIS	4
EES630	Climate Change - Extreme Events	4
EES631	Greenhouse Gas Budgets and Climate Change	4
EES627	Geo-analytical Techniques	4
EES651	Surface Water Hydrology	4
EES652	Geochemical Modelling in Aqueous Geochemistry	4
EES654	Geoinformatics	4
EES605	Indian Monsoon and its Variability	4

## Earth and Environmental Sciences BS-MS Course Curriculum

### Semester V

Course No.	Course Title	Credits
EES301	Mineralogy	3
EES311	Mineralogy Laboratory	1
EES331	Geohydrology	4
EES333	Environmental Chemistry	3
EES335	Environmental Chemistry Laboratory	1
EES337	Solid Earth Geophysics	4
*** **	Open Elective I	3/4
ECO500	Law Relating to Intellectual Property and Patents	1
Total Credits		20

### Semester VI

Course No.	Course Title	Credits
EES318	Basic Field Geology	2
EES336	Remote Sensing and GIS	3
EES338	Remote Sensing and GIS Laboratory	1
EES340	Structural Geology	3
EES342	Structural Geology Laboratory	1
EES344	Petrology	3
EES346	Petrology Laboratory	1
EES348	Science of Sustainability	4
*** **	Open Elective II	3/4
Total Credits		21

### Semester VII

Course No.	Course Title	Credits
EES404	Global Climate Change	3
EES410	Global Climate Change Laboratory	1
EES431	Earth Surface Processes	4
EES437	Data Analyses and Statistics for Geosciences	4
EES441	Environmental Impact Assessment	4
EES***	Departmental Elective I	4
*** **	Open Elective III	3/4
Total Credits		23

## Earth and Environmental Sciences BS-MS Course Curriculum

### Semester VIII

Course No.	Course Title	Credits
EES414	Field Work in Environmental Sciences	2
EES432	Geodynamics	4
EES502	Contemporary Environmental Issues	4
EES***	Departmental Elective II	4
EES***	Departmental Elective III	4
EES***	Departmental Elective IV	4
*** **	Open Elective IV	3/4
Total Credits		25

### Semester IX

Course No.	Course Title	Credits
EES501	MS Thesis	18
Total Credits		18

### Semester X

Course No.	Course Title	Credits
EES501	MS Thesis	18
Total Credits		18

**\*Out of Four Departmental Electives, at least two departmental electives should be taken from each of Geology and Environmental Science basket.**

**Department of Mathematics**  
**BS-MS Course Curriculum**

**Semester V**

Course No.	Course Title	Credits
MTH301A	Group Theory	4
MTH303	Real Analysis I	4
MTH305N	Elementary Number Theory	4
MTH***	Department Elective I	4
*** **	Open Elective I	3/4
ECO500	Law Relating to Intellectual Property and Patents	1
Total Credits		20

**Semester VI**

Course No.	Course Title	Credits
MTH302X	Rings and Modules	4
MTH304X	General Topology	4
MTH306	Ordinary Differential Equations	4
MTH***	Department Elective II	4
*** **	Open Elective II	3/4
Total Credits		19

**Semester VII**

Course No.	Course Title	Credits
MTH401	Fields and Galois Theory	4
MTH403	Real Analysis II	4
MTH405	Partial Differential Equations	4
MTH407N	Complex Analysis I	4
*** **	Open Elective III	3/4
Total Credits		19

**Semester VIII**

Course No.	Course Title	Credits
MTH404	Measure and Integration	4
MTH406	Differential Geometry of Curves and Surfaces	4
MTH***	Department Elective III	4
*** **	Open Elective IV	3/4
*** **	Open Elective V	3/4
Total Credits		19

## Department of Mathematics

### BS-MS Course Curriculum

#### Semester IX

Course No.	Course Title	Credits
MTH501X	MS Thesis	12,16
MTH503	Functional Analysis	4
<i>Optional*</i>		
MTH***	Department Elective IV	4
Total Credits		20

\* Students may register for a total of 20 credits with any of the following combination.

1. MS Thesis with 16 Credits + Functional Analysis
2. MS Thesis with 12 Credits + Functional Analysis + Departmental Electives

#### Semester X

Course No.	Course Title	Credits
MTH501Y	MS Thesis	12,16,20
<i>Optional</i>		
MTH***	Department Elective IV	4
Total Credits		20

**Note:**

1. Students who had registered during IX Semester with Option 1 i.e. MS Thesis with 16 Credits + Functional Analysis may register as **MS Thesis with 16 Credits + Departmental Electives**
2. Students who had registered during IX Semester with Option 2 i.e. Students who had registered during IX Semester with Option 1 i.e. MS Thesis with 16 Credits + Functional Analysis may register as MS Thesis with 16 Credits + Departmental Electives may register as **MS Thesis with 20 Credits**

A Student must register for 32 Credits of MS Thesis along with two courses (1) Functional Analysis and (2) Departmental Elective during the Fifth Year of Study.

**Department of Physics**  
**BS-MS Course Curriculum**

**Semester V**

Course No.	Course Title	Credits
PHY301	Mathematical Methods I	4
PHY303	Introduction to Quantum Mechanics	4
PHY305	Classical Mechanics	4
PHY307	Physics Laboratory I	3
*** **	Open Elective I	3/4
ECO500	Law Relating to Intellectual Property and Patents	1
Total Credits		19

**Semester VI**

Course No.	Course Title	Credits
PHY302	Mathematical Methods II	4
PHY304	Advanced Quantum Mechanics	4
PHY306	Statistical Mechanics	4
PHY308	Physics Laboratory II	3
*** **	Open Elective II	3/4
Total Credits		18

**Semester VII**

Course No.	Course Title	Credits
PHY401	Electrodynamics and Special Theory of Relativity	4
PHY403	Condensed Matter Physics	4
PHY405	Condensed Matter Physics Laboratory	3
*** **	Open Elective III	3/4
*** **	Open Elective IV	3/4
Total Credits		19

**Semester VIII**

Course No.	Course Title	Credits
PHY402	Atomic and Molecular Physics	4
PHY404	Nuclear and Particle Physics	4
PHY406	Nuclear Laboratory	3
*** **	Open Elective V	3/4
*** **	Open Elective IV	3/4
Total Credits		19



**Department of Physics**  
**BS-MS Course Curriculum**

**Semester IX**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
PHY501	MS Thesis	14
*** **	Open Elective VII	3/4
*** **	Open Elective VIII	3/4
Total Credits		19

**Semester X**

<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
PHY501	MS Thesis	14
*** **	Open Elective IX	3/4
*** **	Open Elective X	3/4
Total Credits		19