

## BS-MS (Dual Degree) CURRICULUM

### First Year – Core Courses

#### I Semester

Course No.	Course Title	Credit
BIO 101	Biology I: Biomolecules	3
BIO 103	General Biology Laboratory	1
CHM 101	General Chemistry	3
HSS 101	English for Communication	2
EES 101	Earth Materials and Processes	3
MTH 101	Calculus of One Variable	3
PHY 101	Mechanics	3
PHY 103	General Physics Laboratory-I	1
PT 101	Physical Training	0
Total		19

#### II Semester

Course No.	Course Title	Credit
BIO 102	Biology II: Fundamentals of Cell Biology	3
CHM 112	Basic Organic Chemistry-I	3
CHM 114	Chemistry Laboratory- I	1
EES 102	Introduction to Environmental Sciences	3
ECS 102	Introduction to Programming	3
MTH 102	Linear Algebra	3
PHY 106	Quantum Physics	3
Total		19

## Pre-Major Year

During the Pre-Major year, credit requirement for per semester is a total of 18/21 credits. Student must register for courses specified by minimum of two disciplines.

### III Semester

#### Biological Sciences

Course No.	Course Title	Credit
BIO 201	Biology III: Fundamentals of Molecular Biology	3
BIO 203	Biology V: Diversity of Life I	3
BIO 205	Biology Laboratory I	1
CHM 211	Basic organic Chemistry-II	3

#### Chemical Engineering

Course No.	Course Title	Credit
CHE 201	Engineering Mechanics (Solid & Fluid)	3
CHE 203	Introduction to Thermodynamics	3
MTH 201	Multivariable Calculus	3

#### Chemistry

Course No.	Course Title	Credit
CHM 211	Basic Organic Chemistry-II	3
CHM 221	Basic Physical Chemistry	3
CHM 223	Chemistry Laboratory II	1

#### Earth and Environmental Sciences

Course No.	Course Title	Credit
EES 201	Atmospheric Sciences	3
EES 203	Geochemistry	4
MTH 201	Multivariable Calculus	3

## Electrical Engineering & Computer Science

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
ECS 201	Discrete Mathematics I	3
ECS 203	Basic Electronics	3
MTH 201	Multivariable Calculus	3

## Mathematics

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
MTH 201	Multivariable Calculus	3
MTH 203	Introduction to Groups and Symmetry	3

## Physics

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
PHY 201	Waves and Optics	3
PHY203	Electrodynamics	3
PHY 205	General Physics Laboratory-II	1
ECS 203	Basic Electronics	3
MTH 201*	Multivariable Calculus	3

\*Recommended Course from Other Department

## IV Semester

### Biological Sciences

Course No.	Course Title	Credit
BIO 202	Biology IV: Basic Genetics	3
BIO 204	Biology VI: Diversity of Life II	3
BIO 206	Biology Laboratory II	1
CHM 222	Classical Thermodynamics	3

### Chemical Engineering

Course No.	Course Title	Credit
CHE 202	Chemical Engineering Thermodynamics	3
CHE 204	Chemical Process Calculations	3
CHE 206	Introduction to Chemical Engineering Laboratory	1
MTH 202	Probability and Statistics	3

### Chemistry

Course No.	Course Title	Credit
CHM 204	Basic Inorganic Chemistry	3
CHM 206	Chemistry Laboratory III	1
CHM 222	Classical Thermodynamics	3

### Earth and Environmental Sciences

Course No.	Course Title	Credit
EES 202	The Evolution of the Earth	3
EES 204	Oceanography	3
EES 206	Introduction to Earth and Environmental Sciences Laboratory	1
CHM 222	Classical Thermodynamics	3

## Electrical Engineering & Computer Science

Course No.	Course Title	Credit
ECS 202	Data Structures and Algorithms	3
ECS 204	Introduction to Signal Processing and Systems	3
MTH 202	Probability and Statistics	3

## Mathematics

Course No.	Course Title	Credit
MTH 202	Probability and Statistics	3
MTH 204	Complex Variables	3

## Physics

Course No.	Course Title	Credit
PHY 202	Physics by Numerical Analysis	3
PHY 204	General Properties of Matter	3
PHY 206	General Physics Laboratory-III	1
CHM 222	Classical Thermodynamics	3
MTH 202*	Probability and Statistics	3

\*Recommended Course from Other Department

## Professional Courses

### BIOLOGICAL SCIENCES

#### V Semester

Course No.	Course Title	Credit
BIO 301/601	Cell Biology	4
BIO 303/603	Biochemistry I	4
BIO 305/605	Plant Biology I	4
BIO 307	Biology Laboratory III	3
BIO 309/609	Departmental Elective I	4
*** **	Open Elective I	3/4
Total		19

#### VI Semester

Course No.	Course Title	Credit
BIO 302/602	Biochemistry II	4
BIO 304/604	Molecular Biology	4
BIO 306/606	Immunology I	4
BIO 308	Biology Laboratory IV	3
BIO 310/610	Departmental Elective II	4
*** **	Open Elective II	3/4
Total		<b>22/23</b>

#### VII Semester

Course No.	Course Title	Credit
BIO 401/621	Immunology II	4
BIO 403/623	Structural Biology	4
BIO 405/625	Developmental Biology	4
BIO 407/627	Departmental Elective III	4
BIO 409/629	Departmental Elective IV	4
*** **	Open Elective III	3/4
Total		<b>23/24</b>

### VIII Semester

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
BIO 402/622	Bioinformatics	4
BIO 404/624	Neurobiology	4
BIO 406/626	Evolutionary Ecology	4
BIO 408/628	Departmental Elective V	4
BIO 410/630	Departmental Elective VI	4
*** **	Open Elective VII	3/4
Total		<b>23/24</b>

### IX Semester

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
BIO 501	MS Thesis	18
HSS 503	Law Relating to Intellectual Property and Patents	1
Total		19

### X Semester

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
BIO 501	MS Thesis	18
Total		18

## CHEMICAL ENGINEERING

### V Semester

Course No.	Course Title	Credit
CHE 301	Heat Transfer Operations	4
CHE 303	Fluid Mechanics and Mechanical Operations	4
CHE 305	Numerical Methods in Chemical Engineering	4
CHE 307	Thermodynamics Laboratory	2
CHE ***	Department Elective – I	4
*** **	Open Elective – I	4
Total		22

### VI Semester

Course No.	Course Title	Credit
CHE 302	Chemical Reaction Engineering-I	4
CHE 304	Mass Transfer and Separation Process	4
CHE 306	Heat Transfer Laboratory	2
CHE 308	Fluid Mechanics Laboratory	2
CHE ***	Department Elective – II	4
*** **	Open Elective – II	4
Total		20

### VII Semester

Course No.	Course Title	Credit
CHE 401/ 421	Statistical Mechanics	4
CHE 403	Process Dynamics and Control	4
CHE 407	Chemical Reaction Engineering Laboratory	2
CHE 409	Mass Transfer Laboratory	2
CHE ***	Department Elective – III	4
*** **	Open Elective – III	4
Total		20



### VIII Semester

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
CHE 402	Process Design and Economics	4
CHE 404	Chemical Reaction Engineering-II	4
CHE 406	Advanced Transport Phenomena	4
CHE 408	Process Control and Instrumentation Laboratory	2
CHE ***	Department Elective – IV	4
*** **	Open Elective – IV	4
Total		22

### IX Semester

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
CHE 501	MS Thesis	12
CHE ***	Department Elective – V	4
*** **	Open Elective – V	4
HSS 503	Law Relating to Intellectual Property and Patents	1
Total		21

### X Semester

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
CHE 501	MS Thesis	18
Total		18

## CHEMISTRY

### V Semester

Course No.	Course Title	Credit
CHM 301	Symmetry and Group Theory	4
CHM 311	Organic Chemistry I	4
CHM 313	Organic Chemistry Laboratory	3
CHM 321	Physical Chemistry of Solutions	4
CHM 325	Mathematical Methods for Chemists	4
*** **	Department/Open Elective I	3/4
Total		22/23

### VI Semester

Course No.	Course Title	Credit
CHM 302	Chemistry of Transition Metals	4
CHM 312	Organic Chemistry II	4
CHM 314	Quantitative Methods in Chemistry	4
CHM 322	Principles of Quantum Chemistry	4
CHM ***	Departmental Elective II	4
*** **	Open Elective II	3/4
Total		23/24

### VII Semester

Course No.	Course Title	Credit
CHM 401	Main Group Chemistry	4
CHM 403	Inorganic Chemistry Laboratory	3
CHM 411	Physical Organic Chemistry	4
CHM 421	Statistical Mechanics	4
CHM ***	Departmental Elective III	4
*** **	Open Elective III	3/4
Total		22/23

### VIII Semester

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
CHM 402	Applications of Modern Physical Methods	4
CHM 416	Spectroscopy and Its Application in Organic Molecules	4
CHM 422	Molecular Spectroscopy	4
CHM 426	Physical Chemistry Laboratory	3
CHM ***	Departmental Elective IV	4
*** **	Open Elective IV	3/4
Total		22/23

### IX Semester

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
CHM 501	MS Thesis	10
CHM ***	Departmental Elective V/ Research Credit	4
CHM ***	Departmental Elective VI/ Research Credit	4
HSS 503	Law Relating to Intellectual Property and Patents	1
Total		19

### X Semester

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
CHM 501	MS Thesis	18
Total		18

## EARTH AND ENVIRONMENTAL SCIENCES

### V Semester

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
EES 301	Mineralogy	3
EES 303	Structural Geology	3
EES 305	Geohydrology	3
*** **	Open Elective I	3/4
EES ***	Department Elective I	4
EES 311	Mineralogy Laboratory	1
EES 313	Structural Geology Laboratory	1
Total		21/22

### VI Semester

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
EES 302	Igneous Petrology	3
EES 304	Environmental Chemistry	3
EES 306	Solid Earth Geophysics	3
*** **	Open Elective II	3/4
EES ***	Department Elective II	4
EES 312	Igneous Petrology Laboratory	1
EES 314	Environmental Chemistry Laboratory	1
EES 316	Basic Field Geology	2
Total		20/21

### VII Semester

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
EES 401	Sedimentology and Principles of Stratigraphy	3
EES 403	Metamorphic Petrology	3
EES 405/647	Data Analyses and Statistics for Geosciences	4
*** **	Open Elective III	3/4
EES ***	Departmental Elective III	4
EES 411	Sedimentology Laboratory	1
EES 413	Metamorphic Petrology Laboratory	1
Total		19/20

## VIII Semester

Course No.	Course Title	Credit
EES 402/614	Earth Surface Processes	4
EES 404	Geodynamics*	3
EES 406	Global Climate Change**	3
*** **	Open Elective IV	3/4
EES ***	Departmental Elective IV	4
EES 414	Geodynamics Laboratory*	1
EES 416	Global Climate Change Laboratory**	1
EES 408	Advanced Field Geology <sup>#</sup>	3
EES 410	Field Work in Environmental Sciences <sup>#</sup>	3
Total		18/19

<sup>#</sup> Students should register for either one of these two courses

Students should register for both the \* or both the \*\* courses

## IX Semester

Course No.	Course Title	Credit
EES 501	MS Thesis	12
EES 505/645	Remote Sensing and GIS	4
EES ***	Departmental Elective V	4
HSS 503 <sup>§</sup>	Law Relating to Intellectual Property and Patents <sup>§</sup>	1
Total		21

<sup>§</sup> Students can credit this course during any semester of their BS-MS study

<sup>#</sup> Students can credit this course in the 9<sup>th</sup> or 10<sup>th</sup> semester

## X Semester

Course No.	Course Title	Credit
EES 501	MS Thesis	16
EES 502/503	Contemporary Environmental Issues	3
Total		19

## ELECTRICAL ENGINEERING & COMPUTER SCIENCE

### Computer Science

#### V Semester

Course No.	Course Title	Credit
ECS 301	Principles of Communication	4
ECS 303	Computer Organization	4
ECS 305	Discrete Mathematics II	4
ECS 307	Theory of Computation	4
ECS 309	Departmental Elective I	4
Total		20

#### VI Semester

Course No.	Course Title	Credit
ECS 302	Operating Systems	4
ECS 304	Introduction to Data Science and Machine Learning	4
ECS 306	Algorithms	4
ECS 308	Departmental Elective II	4
*** **	Open Elective VII	3/4
Total		19/20

#### VII Semester

Course No.	Course Title	Credit
ECS 401	Departmental Elective III	4
ECS 403	Departmental Elective IV	4
ECS 405	Departmental Elective V	4
ECS 407	Departmental Elective VI	4
*** **	Open Elective VIII	3/4
Total		19/20

### VIII Semester

Course No.	Course Title	Credit
ECS 402	Concurrency Theory	4
ECS 404	Departmental Elective VIII	4
ECS 406	Departmental Elective IX	4
ECS 408	Departmental Elective X	4
*** **	Open Elective IX	3/4
Total		19/20

### IX Semester

Course No.	Course Title	Credit
ECS 501	MS Thesis	16
ECS 599	Departmental Elective XI	4
Total		20

### X Semester

Course No.	Course Title	Credit
ECS 501	MS Thesis	16
Total		16

## Electrical Engineering

### V Semester

Course No.	Course Title	Credit
ECS 301	Principles of Communication	4
ECS 303	Computer Organization	4
ECS 321	Electronic Devices	4
ECS 323	Control Systems	4
ECS 325	Analog Circuits	4
ECS 327	Electronics Lab I	1
Total		21

## VI Semester

Course No.	Course Title	Credit
ECS 322	Electromagnetic Theory	4
ECS 324	Digital Signal Processing	4
ECS 326	Digital Circuits and Systems	4
ECS 328	Communication Systems	4
ECS 330	Electronics Lab II	3
*** **	Open Elective VII	3/4
Total		21/23

## VII Semester

Course No.	Course Title	Credit
ECS 421	Departmental Elective I	4
ECS 423	Departmental Elective II	4
ECS 425	Departmental Elective III	4
ECS 427	Departmental Elective IV	4
*** **	Open Elective VIII	3/4
Total		19/20

## VIII Semester

Course No.	Course Title	Credit
ECS 422	Departmental Elective V	4
ECS 424	Departmental Elective VI	4
ECS 426	Departmental Elective VII	4
ECS 428	Departmental Elective VIII	4
*** **	Open Elective IX	3/4
Total		19/20

## IX Semester

Course No.	Course Title	Credit
ECS 501	MS Thesis	16
ECS 521	Departmental Elective IX	4
Total		20

## X Semester

Course No.	Course Title	Credit
ECS 501	MS Thesis	16
Total		16



## MATHEMATICS

### V Semester

Course No.	Course Title	Credit
MTH 301	Group Theory	4
MTH 303	Real Analysis I	4
MTH 305	Elementary Number Theory	4
MTH ***	Departmental Elective I	4
*** **	Open Elective I	3/4
Total		19/20

### VI Semester

Course No.	Course Title	Credit
MTH 302	Rings and Modules	4
MTH 304	General Topology	4
MTH 306	Ordinary Differential Equations	4
MTH ***	Departmental Elective II	4
*** **	Open Elective II	3/4
Total		19/20

### VII Semester

Course No.	Course Title	Credit
MTH 401	Fields and Galois Theory	4
MTH 403	Real Analysis II	4
MTH 405	Partial Differential Equations	4
MTH 407	Complex Analysis I	4
*** **	Open Elective III	3/4
Total		19/20

### VIII Semester

Course No.	Course Title	Credit
MTH 404	Measure and Integration	4
MTH 406	Differential Geometry of Curves and Surfaces	4
MTH ***	Departmental Elective III	4
*** **	Open Elective IV	3/4
*** **	Open Elective V	3/4
Total		18/20

**IX Semester**

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
MTH 501	MS Thesis	12
MTH 503	Functional Analysis	4
MTH ***	Departmental Elective V	4
HSS 503	Law Relating to Intellectual Property and Patents	1
Total		21

**X Semester**

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
MTH 501	MS Thesis	12
MTH ***	Departmental Elective VI	4
MTH ***	Departmental Elective VII	4
Total		20

## PHYSICS

### V Semester

Course No.	Course Title	Credit
PHY 301	Mathematical Methods I	4
PHY 303	Quantum Mechanics I	4
PHY 305	Classical Mechanics	4
PHY 307	Physics Laboratory I	3
*** **	Open Elective I	3/4
Total		18/19

### VI Semester

Course No.	Course Title	Credit
PHY 302	Mathematical Methods II	4
PHY 304	Quantum Mechanics II	4
PHY 306	Statistical Mechanics	4
PHY 308	Physics Laboratory II	3
*** **	Open Elective II	3/4
Total		18/19

### VII Semester

Course No.	Course Title	Credit
PHY 401	Electrodynamics and Special Theory of Relativity	4
PHY 403	Condensed Matter Physics	4
PHY 405	Condensed Matter Physics Laboratory	3
*** **	Open Elective III	3/4
*** **	Open Elective IV	3/4
Total		17/19

### VIII Semester

Course No.	Course Title	Credit
PHY 402	Atomic and Molecular Physics	4
PHY 404	Nuclear and Particle Physics	4
PHY 406	Nuclear Laboratory	3
*** **	Open Elective V	3/4
*** **	Open Elective VI	3/4
Total		17/19

## IX Semester

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
PHY 501	Project Work	14
*** **	Open Elective VII	4
*** **	Open Elective VIII	4
HSS 503	Law Relating to Intellectual Property and Patents	1
Total		23

## X Semester

<b>Course No.</b>	<b>Course Title</b>	<b>Credit</b>
PHY 501	Project Work	14
*** **	Open Elective IX	4
*** **	Open Elective X	4
Total		22