

BS-MS (Dual Degree) CURRICULUM

First Year – Core Courses

I Semester

Course No.	Course Title	Credit
CHM 101	General Chemistry	3
MTH 101	Calculus of One Variable	3
PHY 101	Mechanics	3
EES 101	Earth Materials and Processes	3
CHE 103	Engineering Design and Drawing	3
HSS 101	English for Communication	2
PHY 103	General Physics Laboratory I	1
PT 101	Physical Training	0
BIO 101/ ECO 101#	Biology I: Biomolecules / Principles of Economics I	3
Total		21

II Semester

Course No.	Course Title	Credit
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
BIO 102/ ECO 102#	Biology II: Fundamentals of Cell Biology/ Principles of Economics II	3
Total		19

#BS-MS (Engineering Sciences) students can take either BIO101 or ECO101 in their 1st semester, followed by BIO102 or ECO102, respectively in their 2nd semester. In other words, these students must either do both BIO101 and BIO102 in their 1st year or both ECO101 and ECO102.

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

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

Mathematics

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

Physics

Course No.	Course Title	Credit
PHY 201	Waves and Optics	3
PHY 203	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	Signals 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		22/23

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		23/24

VIII Semester

Course No.	Course Title	Credit
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		23/24

IX Semester

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

X Semester

Course No.	Course Title	Credit
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

Course No.	Course Title	Credit
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

Course No.	Course Title	Credit
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

Course No.	Course Title	Credit
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

Course No.	Course Title	Credit
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

Course No.	Course Title	Credit
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

Course No.	Course Title	Credit
CHM 501	MS Thesis	18
Total		18

EARTH AND ENVIRONMENTAL SCIENCES

V Semester

Course No.	Course Title	Credit
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

Course No.	Course Title	Credit
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

Course No.	Course Title	Credit
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 [#]	3
EES 410	Field Work in Environmental Sciences [#]	3
Total		18/19

[#] 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 [§]	Law Relating to Intellectual Property and Patents [§]	1
Total		21

[§] Students can credit this course during any semester of their BS-MS study

[#] Students can credit this course in the 9th or 10th 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 ***	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 ***	Departmental Elective II	4
*** **	Open Elective VII	3/4
Total		19/20

VII Semester

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

VIII Semester

Course No.	Course Title	Credit
ECS ***	Departmental Elective VII	4
ECS ***	Departmental Elective VIII	4
ECS ***	Departmental Elective IX	4
ECS ***	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 ***	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 ***	Departmental Elective I	4
ECS ***	Departmental Elective II	4
ECS ***	Departmental Elective III	4
ECS ***	Departmental Elective IV	4
*** **	Open Elective VIII	3/4
Total		19/20

VIII Semester

Course No.	Course Title	Credit
ECS ***	Departmental Elective V	4
ECS ***	Departmental Elective VI	4
ECS ***	Departmental Elective VII	4
ECS ***	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 ***	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

Course No.	Course Title	Credit
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

Course No.	Course Title	Credit
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

Course No.	Course Title	Credit
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

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