4.0 Course numbering scheme

The following course numbering scheme is suggested for the courses in UGARC2020 to ensure that they are distinct from those in the current template.

- For all UG courses (up to and including 400 level courses), the letter A at the end of the course number will be dropped
- Even for the courses which have not undergone any change and carried forward to UGARC2020 the letter A will be dropped.
- Modular courses will be identified with an M at the end of the course number

The course numbers of second year IC and E/SO courses are proposed to be changed as given below

Current Course No	Title	New Course Number
ESC201A	Introduction to Electronics	ESC201
ESO201A	Thermodynamics	ESO201
ESO202A	Mechanics of Solids	ESO202
ESO203A	Introduction To Electrical Engineering (Revised)	ESO203
ESO204A	Fluid Mechanics and Rate Processes	ESO204
ESO206A	Principles of Biotechnology	ESO206
ESO207A	Data Structure & Algorithm	ESO207
ESO208A	Computational methods in engineering	ESO208
ESO213A	Fundamentals of Earth Sciences	ESO213
CSO201A	Organic Chemistry: Fundamentals and Applications	CSO201
CSO202A	Atoms, Molecules and Photons	CSO202
CSO203A	Inorganic Molecules, Materials and Medicine	CSO203
HSO201A	Applied Probability and Statistics	HSO201
MSO201A	Probability and Statistics	MSO201
MSO202A	Complex Variables	MSO202M
MSO203B	Partial Differential Equations	MSO203M
PSO201A	Quantum Physics	PSO201

The following two new courses are proposed in the E/SO basket

- ESO225A (2-1-0-8): Nature and Properties of Materials; proposed by MSE
- MSO205 (3-1-0-11): Introduction to probability theory; proposed by MTH

5.0 Recommendations on IC, SCHEME and E/SO courses starting the second year of the program

5.1 Grouping of students for IC course, ESC201

All students must take ESC201 (Old ESC201A) as an IC course in their second year. The students will be grouped department wise as follows.

Departments taking ESC201 in third semester: CHE, CSE, EE, ME and SDS (Total strength: 602)

Departments taking ESC201 in fourth semester: AE, BSBE, CE, CHM, ECO, ES, MSE, MTH and PHY (Total strength: 608)

5.2 Revision of courses TA201A and TA202A

In the previous UGARC, TA201A-Manufacturing processes -I (1-0-3-0) [6] offered by MSE and TA202A-Manufactorung Processes II (1-0-3-0) [6] offered by ME, were IC courses and hence compulsory for all Departments. UGARC2020 has recommended to move these courses from the IC basket to the E/SO basket and these courses will be optional for Departments to choose. Further the maximum credits allowed in the E/SO basket is capped at 45, including TA201A and TA202A.

The departments offering these courses, propose to revise the structure of these courses from 6 credits to three credits (0-0-3-0 [3]). The relevant background for each laboratory session will be introduced through a short lecture in the laboratory. The detailed proposal is provided in Appendix-A. Feedback from all departments was sought on this matter and the received responses are positive and the same are provided in Appendix-A.

Since this revision is not recommended by UGARC2020, the proposal for credit revision is placed to the Senate for consideration. Subject to the decision of the Senate, the process of circulation of the syllabus and its approval at SUGC level will be completed. In this case it is proposed that the course numbers also be changed to TA211 and TA212 respectively.

5.3 SCHEME basket: Economics/Management/Environment (EME) and HSS-I courses

UGARC recommendation in this regard is "*Economics/Management/Environment (EME) Courses: Each student must take a course from a basket of Economics/Management/Environment (EME) Courses. All three departments (Economics Science, IME and Civil Engineering) will contribute full semester course to EME basket, and students will be allotted to a course on the basis of a preference cum lottery basis. These basket courses will be offered in both the semesters and all three departments will share approximately equal load. Economics students should not opt for Economics course from EME basket*."

All students must take one course out of the EME basket and one HSS Level I course in their second year of the program. The department wise distribution of these courses is as follows.

- Students of departments AE, BSBE, CE, CHM, ES, MSE, MTH and PHY will take EME course in their third semester and HSS-I in their fourth semester (Total strength: 556).
- Students of departments CHE, CSE, ECO, EE, ME and SDS will take HSS-I in their third semester and EME course in their fourth semester (Total strength: 654).

A committee was constituted to draft the courses and their contents under the EME basket (refer to Appendix B)

The committee recommended the courses listed below:

- ECO101 (3-1-0-0) [11]: Economy, Society and Public Policy
- CE212 (3-0-0-0) [9]: Environment and Sustainability
- IME201 (3-0-0-0) [9]: Introduction to Management

Subsequently the Department of Sustainable Energy and Engineering has proposed to add the following course to the EME basket.

- SEE211 (3-0-0-0) [9]: Energy, Climate Change and Sustainability

All these courses are circulated and approved by SUGC

5.4 Allotment of EME courses:

AS per UGARC, EME and HSS-I courses will be allotted on a preference cum lottery basis so that the students are evenly distributed among the courses offered in a particular semester.

- *Department of Civil Engineering has requested that their students must be allotted CE212 under the EME basket without lottery in their third semester.*
- As mentioned already in the UGARC report, students of the Department of Economics cannot take ECO101 under the EME basket.

The UGARC implementation committee recommends the request from Department of CE

6.0 BTM/BSM program and Management Track Basket

UGARC 2020 gives the option to students of the BT/BS program to switch to the BTM/BSM (Bachelor of Technology/Science and Management) program after their $5^{th}/6^{th}$ semester regardless of their CPI. These students will have to do 54 credits (say 6 courses) from the Management Track Basket (MTB). The total credits of this program should be same as the BT/BS credits of the respective department. To keep the total credits the same, departments will have to release 27 DE credits and the OE credits will also be reduced by 27. A committee to formulate the criteria for migration to this program and evolve the courses in MTB was constituted. The report of this committee is provided in Appendix C.

The MTB basket has courses offered by Departments of Economics, Industrial Management and Engineering and Design as summarised below.

Courses from IME in MTB

- All the first-semester courses (core and elective) of MBA and M. Tech offered by IME.
- Other courses of MBA and M. Tech offered by IME that do not have any prerequisites.

Courses from Economics and Design in MTB

SL. NO.	COURSE NO.	COURSE NAME	DEPARTMENT	TYPE
1	ECO211	MICROECONOMICS I	ECONOMIC SCIENCES	Full
2	ECO507A	MANAGERIAL ECONOMICS & BUSINESS ANALYSIS	ECONOMIC SCIENCES	Full
3	ECO521A	MONEY AND BANKING	ECONOMIC SCIENCES	Full
4	DES633	INTEGRATED PRODUCT DEVELOPMENT I	DESIGN	Full

Students cannot take more than one ECO course in the MTB basket. Further details are provided in Appendix C.

The committee also proposed the following for the criteria for migration to BTM/BSM program

- The selection will be based on screening consisting of a written aptitude test (similar to CAT) and a personal interview exercised in an appropriate combination by the selection committee (either any of these two components or a combination of both).
- The maximum number of candidates admitted to BTM and BSM programs together will be 50 in a year. This may be reviewed once the program stabilizes.
- IME Department assumes the administrative responsibility of managing the selection process and running the program.

The UGARC implementation committee concurs with the recommendation of the sub-committee.

7.0 Templates for programs in Aerospace Engineering (AE)

7.1 Template for BT Program in Aerospace Engineering

Template for 3rd to 8th semester for BT program in Aerospace Engineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)	DE-1 (9)	SCHEME* HSS-II (9)
ESO202 (11)	ESC201 (14)	AE311 (9)	AE341 (11)	AE463 (3)	AE462 (4)
ESO204 (11)	ESO201(11)	AE321 (9)		AE461 (7)	AE421 (3)
TA 211 (3)§	AE211 (9)		AE351 (3)	AE451 (3)	OE-5 (9)
AE201M (5)	AE233M (5)	AE333 (9)	AE322 (9)	DE-2 (9)	UGP-2 /DE-3 (9)
MSO202M (6)	AE252M (4)	OE-1 (9)	AE334 (9)	UGP-1 (5)	OE-6 (9)
MSO203M (6)	TA212 (3) §	OE-2 (9)		OE-3 (9)	
AE209 (8)			AE 312 (9)	OE-4 (9)	
59-61	55-57	54	50	54	43

§ Subject to the decision of Senate on Section 5.2 of this report

Remarks:

- At least 9 credits of DE must be taken from Basket-A as below.
  - Basket-A: AE641 [9], AE662 [9], AE673 [9], AE747 [9], and AE777 [9]
- 05 credits of UGP-1 and up to 27 credits of OE may be waived off from the minimum BT requirements for category-A Dual Degree students.
- Up to 36 OE credits may be waived off for students opting either for Dual Degree in another department (category-B) or the Double Major program

List of courses		
Course No:	Title	Remarks
AE201M (3-0-0-0) [5]	Introduction to Aerospace Engineering	Revised AE201A [5]
AE209 (2-1-0-0) [8]	Dynamics	New course
AE211 (3-0-0-0) [9]	Incompressible Aerodynamics	Revised AE211A [11]
AE233M (3-0-0-0) [5]	Introduction to Vibrations	New course
AE252M (2-0-0-0) [4]	Experiments in Aerospace Engineering- I	New course
AE311 (3-0-0-0) [9]	Compressible Aerodynamics	Revised AE311A [9]
AE312 (3-0-0-0) [9]	Shear Flow	New course
AE321 (3-0-0-0) [9]	Flight Mechanics	Revised AE321A [9]
AE322 (3-0-0-0) [9]	Aircraft Control Systems	Revised AE322A [9]
AE333 (3-0-0-0) [9]	Aerospace Structures-I	New course
AE334 (3-0-0-0) [9]	Aerospace Structures-II	New course
AE341 (3-1-0-0) [11]	Aerospace Propulsion	Revised AE341A [11]
AE351 (0-0-3-0) [3]	Experiments in Aerospace Engineering- II	Revised 351A [5]
AE421M (1-0-2-0) [3]	Experiments in Flight Mechanics	Revised AE421A [3]
AE451 (0-0-3-0) [3]	Experiments in Aerospace Engineering- III	Revised AE451A [5]
AE461 (1-0-2-2) [7]	Aircraft Design - I	Revised AE461A [7]
AE462 (1-0-1-0) [4]	Aircraft Design - II	Revised AE462A [4]
AE463 (0-0-3-0) [3]	Aeromodel Design and Fabrication	Revised AE361A [3]

Credit Table for BT Program in Aerospace Engineering		
Course type	Allowable Credit range	Credit in the department template
Institute Core (IC)	112	112
E/SO	18-45	**51***
Department requirements	144-179	151 (124 DC + 27 DE)
Open electives (OE)	51-57	54
SCHEME	54-58	54-58
Total for 4-year BT/BS	391-420	**422-426***

* **Exceeds the credit range recommended by UGARC.**

7.2 Template for the BTH program in Aerospace Engineering

Template for 3rd to 8th semester for BTH program in Aerospace Engineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)	DE-1 (9)	SCHEME* HSS-II (9)
ESO202 (11)	ESC201 (14)	AE311 (9)	AE341 (11)	AE463 (3)	AE462 (4)
ESO204 (11)	ESO201(11)	AE321 (9)		AE461 (7)	AE421 (3)
TA 211 (3)	AE211 (9)		AE351 (3)	AE451 (3)	UGP-2 (9)
AE201M (5)		AE333 (9)	AE322 (9)	DE-2 (9)	OE-4 (9)
MSO202M (6)	AE233M (5)	OE-1 (9)	AE334 (9)	UGP-1 (5)	OE-5 (9)
MSO203M (6)	AE252M (4)	OE-2 (9)	DEH-1	OE-3 (9)	OE-6 (9)
AE209 (8)	TA212 (3)		AE 312 (9)	DEH-2	DEH-3 (9)
59-61	55-57	54	59	54	61

For BTH, students should take 27 credits of DEH courses which are DEs at 6 or 7 level.

- **CPI criteria for BTH: 8.0**

7.3 Template for the BTM program in Aerospace Engineering

Template for 3rd to 8th semester for BTM program in Aerospace Engineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)	MTB-1 (9)	SCHEME* HSS-II (9)
ESO202 (11)	ESC201 (14)	AE311 (9)	AE341 (11)	AE463 (3)	AE462 (4)
ESO204 (11)	ESO201(11)	AE321 (9)		AE461 (7)	AE421 (3)
TA 211 (3)	AE211 (9)		AE351 (3)	AE451 (3)	MTB-4 (9)
AE201M (5)		AE333 (9)	AE322 (9)	MTB-2 (9)	MTB-5 (9)
MSO202M (6)	AE233M (5)	OE-1 (9)	AE334 (9)	UGP-1 (5)	MTB-6 (9)
MSO203M (6)	AE252M (4)	OE-2 (9)		MTB-3 (9)	
AE209 (8)	TA212 (3)		AE 312 (9)	OE-3 (9)	
59-61	55-57	54	50	54	43

7.4 Template for five year dual-degree program in Aerospace Engineering

Template for 3rd to 10th semester of dual-degree program in Aerospace Engineering (Category-A)							
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8	Semester 9	Semester 10
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)	DE-1 (9)	SCHEME* HSS-II (9)	Thesis (36)	Thesis (36)
ESO202 (11)	ESC201A (14)	AE311 (9)	AE341 (11)	AE463 (3)	AE462 (4)		
ESO204 (11)	ESO201 (11)	AE321 (9)		AE461 (7)	AE421 (3)		
TA 211 (3)	AE211 (9)		AE351 (3)	AE451 (3)	OE-3 (9)		
AE201M (5)		AE333 (9)	AE322 (9)	DE-2 (9)	UGP-2 /DE-3 (9)		
MSO202M (6)	AE233M (5)	OE-1 (9)	AE334 (9)	PG-1 (9)	PG-4 (9)		
MSO203M (6)	AE252M (4)	OE-2 (9)		PG-2 (9)	PG-5 (9)		
AE209(8)	TA212 (3)		AE 312 (9)	PG-3 (9)	PG-6 (9)		
59-61	55-57	54	50	58	61	36	36

Minimum Credit Requirement in MT part:

- PG Component: 54 credits
- Thesis Component: 72 credits

Remarks:

- Up to 27 OE credits from the BT minimum requirements may be used to fulfil requirements of the PG course component of the MT part.
- 18 credits of PG DE courses may be substituted from the PG course basket (below) for Category-A Dual Degree students.

PG course basket:

ME641, ME642, ME671, ME674, ME685, ME723, ME728, ME763, EE650, EE653, EE654, EE705/EE651; AE674/CHE614; AE617/CHE614; AE621/ME647; AE614/ME631; AE604/ME630; AE622/ME630; AE605/ME634; AE615/ME634; AE696/ME649; AE653/ME617; AE663/ME643; AE754/ME745 (/ means any one of the two courses only)

Template for 7th to 10th semester of dual-degree program in Aerospace Engineering (Category B)			
Semester 7	Semester 8	Semester 9	Semester 10
AE601 (9)	PG-3 (9)	Thesis (36)	Thesis (36)
PG-1 (9)	PG-4 (9)	PG-6 (9)	
PG-2 (9)	PG-5 (9)		
27	27	45	36

Minimum Credit Requirement in MT part:

- PG Component: 63 credits
- Thesis Component: 72 credits

Remarks:

Up to 36 OE credits may be waived from the parent department's BT/BS graduation requirements to fulfil the PG requirements of Dual Degree.

7.5 Template for double major: second major in Aerospace Engineering

Double Major – Aerospace Engineering	
Pre-Requisites (33)	
ESO201 (11)*	
ESO202 (11)*	
ESO204 (11)*	
AE Mandatory Courses (85)	
Odd Semester (45)	**Even Semester (40)**
AE209 (8)*	AE211 (9)
AE311 (9)	AE252 (4)
AE321 (9)	AE341 (11)
AE333 (9)	AE351 (3)
AE451 (3)	AE322 (9)
AE461 (7)	AE462 (4)

Remarks:

- *Other equivalent courses may be considered in consultation with AE DUGC
- Up to 36 OE credits may be waived from the parent department BT/BS graduation requirements to fulfil requirements of Double Major

7.6 Minors in Aerospace Engineering

Minor – Aerospace Engineering	
AE Compulsory Course	
AE201M (5)	
Any THREE:	Pre-Requisites
AE211 (9)	ESO204 OR ME231
AE321 (9)	NONE
AE333 (9)	NONE
AE341 (11)	AE311
32-34	

8.0 Templates for programs Biological Sciences and Bioengineering (BSBE)

8.1 Template for BT Program in Biological Sciences and Bioengineering

Template for 3rd to 8th semester for BT program in Biological Sciences and Bioengineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (11)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)
ESO206 (9)	ESC201 (14)	BSE311 (9)	BSE321 (8)	DE-4	DE-6
E/SO (9-11)	BSE222 (9)	BSE312 (9)	BSE421 (9)	DE-5	DE-7
BSE211 (9)	BSE223 (9)	BSE411 (9)	OE-2(9)	OE-3	OE-5
BSE221 (9)	BSE322 (9)	BSE412 (9)	DE-2 (9)	OE-4	OE-6
OE-1 (9)		DE-1 (9)	DE-3 (9)		
54-58	50-52	45-54	44-53	36-45	36-45

* Students need to take only three SCHME (HSS-II) courses in semesters 5 to 8

List of Courses		
Course No:	Title	Remarks
BSE211 (3-0-0-0) [9]	Organ System, Physiology and Anatomy	Same as BSE211A
BSE221 (3-0-0-0) [9]	Biochemistry	Same as BSE221A
BSE222 (3-0-0-0) [9]	Biochemical Engineering	Same as BSE222A
BSE223 (1-0-6-0) [9]	Biochemistry & Biochemical Engineering Lab	Same as BSE223A
BSE322 (3-0-0-0) [9]	Bioinformatics & Computational Biology	Revised BSE322A [10]
BSE311 (3-0-0-0) [9]	Molecular Cell Biology	Same as BSE311A
BSE312 (1-0-6-0) [9]	Molecular Biology Lab	Same as BSE312A
BSE411 (3-0-0-0) [9]	Biomaterials	Revised BSE411A [11]
BSE412 (1-0-6-0) [9]	Biomaterial, Physiology & Biomems Laboratory	Same as BSE412A
BSE321 (2-1-0-0) [8]	Structural Biology	Revised BSE321A [10]
BSE421 (3-0-0-0) [9]	Tissue Engineering	Revised BSE421A [11]

UGPs: BSE496 and BSE498 will be offered in ODD semesters and BSE497 and BSE499 will be offered in EVEN semesters. UGPs will be considered as DEs. All UGPs have 9 credits and letter grades. A student can take at most 1 UGP per semester (in any order).

Credit Table for BT Program in Biological Sciences and Bioengineering		
Course type	Recommended Credit range	Credit in the department template
Institute Core (IC)	112	112
E/SO	18-45	18-20
Department requirements	144-179	161 (98 DC + 63 DE)
Open electives (OE)	51-57	54
SCHEME	54-58	54-58
Total for 4-year BT/BS	391-420	399-405

8.2 Template for BTH program in Biological Sciences and Bioengineering

Two department UGPs (9 credits each) should be completed in place of two DEs of the BT program. Additional three DEs (27 credits) should be taken from the following Honors course basket.

— Honors course basket (list of courses):

- BSE611A (09): Modern instrumental methods in biological sciences

- BSE642A (09): Microbiology and Immunology
- BSE652A (09): Developmental Biology
- BSE653A (09): Functional Genomics
- BSE654A (09): Human Molecular Genetics
- BSE655A (09): Physiology
- BSE661A (09): Biological Membranes

— CPI criteria for BTH: 8.5

8.3 Template for the BTM program in Biological Sciences and Bioengineering

Students have to take 54 credits of course from the Management Track Basket (MTB)

Template for 3rd to 8th semester for BTM program in Biological Sciences and Bioengineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 EME (9-11)/ HSS-I (11)	SCHEME-3 HSS-I (11)/ EME (9-11)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)
ESO206 (9)	ESC201 (14)	BSE311 (9)	BSE321 (8)	DE-3	DE-4
E/SO (9-11)	BSE222 (9)	BSE312 (9)	BSE421 (9)	OE-3	MTB-4
BSE211 (9)	BSE223 (9)	BSE411 (9)	OE-2 (9)	MTB-2	MTB-5
BSE221 (9)	BSE322 (9)	BSE412 (9)	DE-2 (9)	MTB-3	MTB-6
OE-1 (9)		DE-1 (9)	MTB-1		
54-58	50-52	45-54	44-53	36-45	36-45

* Students have to take only three SCHME (HSS-II) courses in semesters 5 to 8

8.4 Template for five year dual-degree program in Biological Sciences and Bioengineering

Template for 7th to 10th semester of dual-degree program in BSBE (Category-A)			
7th sem	8th sem	9th sem	10th sem
DE PG-1 (9)	DE PG-3 (9)	BSE702A (0)	Thesis credits (36)
DE PG-2 (9)	DE PG-4 (9)	Thesis credits (36)	
BSE601A (0)	BSE602A (0)		
	BSE701A (0)		
18	18	36	36

Minimum Credit Requirements in MT part for graduation:
PG Components: 36 credits
Thesis: 72 credits

Remarks:
1) All DE courses should be taken with the consent of the Supervisor
2) Up to 36 OE credits may be waived from the BT program for students opting for the dual-degree program.

Category B dual-degree (UG from different department)

Template for 7th to 10th semester of dual-degree program in BSBE (Category-B)					
UG component		PG component			
Odd	Even	7th sem	8th sem	9th sem	10th sem
ESO206 (9)	UGP in BSBE (9)	BSE613A (9)	DE PG-3 (9)	BSE702A (0)	Thesis credits (36)
BSE221 (9)		DE PG-1 (9)	DE PG-4 (9)	Thesis credits (36)	
BSE311 (9)		DE PG-2 (9)	BSE602A (0)		
		BSE601A (0)	BSE701A (0)		
27	9	27	18	36	36

Minimum Credit Requirements in MT part for graduation:
PG Components: 45 credits
Thesis: 72 credits

Remarks:
1) All DE courses should be taken with the consent of the Supervisor
2) Upto 36 OE credits may be waived from the BT program for students opting for the dual-degree program.

8.5 Template for the double major: second major in Biological Sciences and Bioengineering

BSBE Double Major Template	
Odd Semester	Even Semester
Pre-requisites	
ESO206 (9)	
Mandatory BSBE Core Courses	
BSE211 (9)	BSE222 (9)
BSE221 (9)	BSE223 (9)
BSE311 (9)	BSE322 (9)
BSE312 (9)	BSE321 (8)
BSE411 (9)	BSE421 (9)
BSE412 (9)	
DC credits: 54	DC Credits: 45

8.6 Minors in Biological Sciences and Bioengineering

1. Tissue Engineering: (this Minor already exists)

- Three compulsory courses: BSE211 [09], BSE411 [09], BSE421 [09] *(the courses are the same as before but their credits are changing in the new UGARC)*

2. Engineering in Medicine:

(This is a new Minor offered in the new UGARC)
Requirement: Any 3 from the following basket of courses:

- BSE616A [09]: Biopharmaceuticals
- BSE644A [09]: Optical microscopy & bioimaging
- BSE656A [09]: Neurobiology
- BSE662A [09]: Decision making and the brain
- BSEXXXA [09]: Biodesign (to be floated)
- BSEYYYA [09]: Biosensors and Biomedical Devices (to be floated)

9.0 Templates for programs in Chemical Engineering (CHE)

9.1 Template for the BT program in Chemical Engineering

Template for 3rd to 8th semester for BT program in Chemical Engineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	SCHEME-4 HSS-II (9)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)	
ESC201 (14)	CHE212 (12)	CHE311 (12)	CHE352 (12)	CHE453 (6)	
ESO201 (11)	CHE213 (12)	CHE331 (12)	CHE655 (12) /CHE668 (9)		
ESO204 (11)	CHE221 (12)	CHE381 (12)	DE-2 (9)	DE-3 (9)	OE-4 (9)
CHE201 (3)	CHE261 (9)	DE-1 (9)	OE-1 (9)	OE-2 (9)	OE-5 (9)
CHE251 (12)	CHE200 (2)			OE-3 (9)	OE-6 (9)
60-62	56-58	54	48-51	42	27
27 credits of DEs and 54 credits of OEs to be taken in the 5th to 8th semester.					

Credit table for BT program in Chemical Engineering		
Course type	Recommended Credit range	Credit in the department template
Institute Core (IC)	112	112
E/SO	18-45	22
Department requirements	144-179	152-155 (125-128 DC + 27 DE)
Open electives (OE)	51-57	54
SCHEME	54-58	54-58
Total for 4-year BT/BS	391-420	394-401

List of courses		
Course No:	Title	Remarks
CHE200 (0-0-2-0) [2]	Chemical Engineering Communication Skills	New course
CHE201 (1-0-0-0) [3]	Introduction to Chemical Engineering	New course
CHE251 (3-0-3-0) [12]	Introduction to ChE + Process Calculation	New course
CHE212 (3-0-3-0) [12]	Heat Transfer	New course
CHE213 (3-0-3-0) [12]	Mass Transfer and Separation Processes	New course
CHE221 (3-0-3-0) [12]	Chemical Engineering Thermodynamics	New course
CHE261 (3-0-0-0) [9]	Chemical Process Technology	New course
CHE311 (3-0-3-0) [12]	Transport Phenomena: Fundamentals and Applications	New course
CHE331 (3-0-3-0) [12]	Chemical Reaction Engineering	New course
CHE381 (3-0-3-0) [12]	Process Dynamics and Control	New course
CHE352 (3-0-3-0) [12]	Chemical Process Synthesis and Design	New course
CHE655 (3-0-3-0) [12]	Data Science for Process Engineers	New course
CHE668 (3-0-0-0) [9]	Bioprocess Engineering	New course
CHE453 (0-1-4-0) [6]	Process Design Capstone Project	New course

9.2 Template for the BTH program in Chemical Engineering

Template for 3rd to 8th semester for BTH program in Chemical Engineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	SCHEME-4 HSS-II (9)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)	
ESC201 (14)	CHE212 (12)	CHE311 (12)	CHE352 (12)	CHE453 (6)	
ESO201 (11)	CHE213 (12)	CHE331 (12)	CHE655 (12) /CHE668 (9)	UGP-2 (9)	OE-4 (9)
ESO204 (11)	CHE221 (12)	CHE381 (12)	UGP-1 (9)	OE-2 (9)	OE-5 (9)
CHE201 (3)	CHE261 (9)	DE-1 (9)	OE-1 (9)	OE-3 (9)	OE-6 (9)
CHE251 (12)	CHE200 (2)		DEH-1 (9)	DEH-2 (9)	DEH-3 (9)
60-62	56-58	54	57-60	51	36
2 UGPS (in lieu of two DEs in the BT template), 9 credits of DE, 27 credits at 6/7 level as DEH and 54 credits of OEs to be taken in the 5th to 8th semester.					

— CPI criteria for BTH: 8.0

9.3 Template for the BTM program in Chemical Engineering

Template for 3rd to 8th semester for BTM program in Chemical Engineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	SCHEME-4 HSS-II (9)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)	
ESC201 (14)	CHE212 (12)	CHE311 (12)	CHE352 (12)	CHE453 (6)	
ESO201 (11)	CHE213 (12)	CHE331 (12)	CHE655 (12) /CHE668 (9)		
ESO204 (11)	CHE221 (12)	CHE381 (12)	OE-2 (9)	MTB-1 (9)	MTB-4 (9)
CHE201 (3)	CHE261 (9)	OE-1 (9)	OE-3 (9)	MTB-2 (9)	MTB-5 (9)
CHE251 (12)	CHE200 (2)			MTB-3 (9)	MTB-6 (9)
60-62	56-58	54	48-51	42	27
27 OE credits and 54 MTB credits in the 5th to 8th semester.					

9.4 Template for five year dual-degree program in Chemical Engineering

<table>
<tr><td colspan="6">Template for dual degree program in Chemical Engineering (Category A)</td></tr>
<tr><td>Sem I-VI</td><td>Sem VII</td><td>Sem VIII</td><td>Summer</td><td>Sem IX</td><td>Sem X</td></tr>
<tr><td rowspan="2">Same as BT Template</td><td>CHE453 (6)</td><td></td><td rowspan="2">CHE699 (9)</td><td rowspan="2">CHE699 (36)</td><td rowspan="2">CHE699 (36)</td></tr>
<tr><td colspan="2">Complete 54 CHE PG course credits using OE/DE slots.
Must do any 2 of CHE611, CHE621, CHE631 and CHE641 in the 54 CHE PG course credits</td></tr>
<tr><td colspan="6">PG Credits Summary- Thesis: 81; CHE PG Courses: 54</td></tr>
</table>

<table>
<tr><td colspan="6">Template for dual degree program in Chemical Engineering (Category B)</td></tr>
<tr><td colspan="2">UG Pre-requisites</td><td>Sem VII</td><td>Sem VIII</td><td>Summer</td><td>Sem IX</td><td>Sem X</td></tr>
<tr><td>Odd Sem</td><td>Even Sem</td><td>CHE453 (6)</td><td></td><td rowspan="2">CHE699 (9)</td><td rowspan="2">CHE699 (36)</td><td rowspan="2">CHE699 (36)</td></tr>
<tr><td>ESO204/
CHE311</td><td>ESO201/
CHE221

CHE331</td><td colspan="2">Complete 54 CHE PG course credits using OE/DE slots.
Must do CHE611, CHE621 and CHE631/CHE633 (any one) in the 54 ChE PG course credits</td></tr>
<tr><td colspan="7">PG Credits Summary- Thesis: 81; CHE PG Courses: 54</td></tr>
</table>

9.5 Template for double major: second major in Chemical Engineering

Odd Sem	Even SEM
Pre-requisites	
ESO201 (11)	
Mandatory CHE courses	
CHE251 (12)	CHE212 (12)
CHE311 (12)	CHE213 (12)
CHE331 (12)	CHE221 (12)
CHE381 (12)	CHE352 (12)
Total CHE course credits: 96	

9.6 Minor in Chemical Engineering

Student should complete any three of the following courses:

CHE251, CHE212, CHE213*, CHE221*, CHE311, CHE331*, CHE381

* Offered in minor slots

10.0 Templates for programs in Civil Engineering (CE)

10.1 Template for BT Program in Civil Engineering

Template for 3rd to 8th semester for BT program in Civil Engineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 EME (CE212-9)*	SCHEME-3 HSS-I (9-11)	ESO208A [11] (E/SO)	SCHEME HSS-II (9)	SCHEME HSS-II (9)	SCHEME HSS-II (9)
ESO202 [11] (E/SO)	ESC201 (14)	CE351 [10] (DC)	CE441M [5] (DC)	DE-5 [9]	DE-8 [9]
MSO203M [6] (E/SO)	TA212 [3] § (E/SO)	CE361 [6] (DC)	DE-2 [9]	DE-6 [9]	OE-4 [9]
HSO201 [11] (E/SO)	CE272 [9] (DC)	CE331 [8] (DC)	DE-3 [9]	DE-7 [5]	OE-5 [9]
CE261 (10) (DC)	CE252 [11] (DC)	CE311 [4] (DC)	DE-4 [9]	OE-2 [9]	OE-6 [6]
CE243 (8) (DC)	CE214 [9] (DC)	CE381 [9] (DC)	OE-1 [9]	OE-3 [9]	
CE341 [2] (DC)		DE-1 [9]			
TA211 [3]§ (E/SO)			UGP-1 (CE332) Extra Credits (DE) [4]		UGP-4 (CE493) Extra Credits (DE) [9]
60	55-57	57	50	50	42

§ Subject to the decision of Senate on Section 5.2 of this report

1. *All CE student must opt for environment part from the EME basket in semester 3.
2. Students need to ensure that the courses chosen as DE must include
   i) at least one course from CE371 and CE372, and
   ii) at least one course from CE412, CE432, CE462, CE481.
   iii) Total DE credits should be minimum of 68.
3. The DE basket may also contain departmental PG courses. However, some of the 300 level DE courses are pre-requisite to those PG courses.
4. UGP-1 and UGP-4 do not count towards DE/OE credits or minimum graduation requirements.

Courses that are mandatorily offered in DE:

- Odd semester – CE371, CE481.
- Even semester – CE372, CE334, CE362, CE382, CE412, CE462, CE432,
- Other courses – CE491, CE492, CE605A, CE606A.

List of courses		
CE261 (3-0-1-0) [10]	Fluid Mechanics for Civil Engineers	Revised CE262A [8]
CE243 (2-0-2-0) [8]	Civil Engineering Materials	Revised CE241A [8]
CE341 (0-0-2-0) [2]	Civil Engineering Communication Skills	Same as CE341A
CE272 (3-0-0-0) [9]	Structural Analysis	Same as CE272A
CE252 (3-0-2 -0) [11]	Soil Mechanics	Revised CE351A [8]
CE214 (3-0-0-0) [9]	Environmental Quality and Processes	Revised (theory part of) CE311A

CE311 (0-0-4-0) [4]	Environmental Quality and Processes Practical	Revised (Practical part of) CE311A
CE331 (2-0-2-0) [8]	Principles of Geoinformatics	Revised CE331A [11]
CE351 (3-0-1-0) [10]	Foundation Design	Revised CE352A [7]
CE361 (2-0-0-0) [6]	Engineering Hydrology	Revised CE361A [6]
CE381 (3-0-0-0) [9]	Introduction to Transportation Engineering	Revised CE382A [9]
CE441M (3-0-0-0) [5]	Construction Management	Same as CE441B
CE334 (2-0-2-0) [8]	Modern Methods in Geoinformatics	New course
CE412 (3-0-2-0) [11]	Water Supply and Water Disposal Systems	Same as CE412A
CE432 (3-0-2-0) [11]	Geographical Information System	Same as CE432A
CE462 (2-1.5-0-0) [9]	Hydraulics and Hydrologic Design	Revised CE462A [11]
CE481 (3-0-0-2) [11]	Transportation Facilities Design	Revised CE481A [11]
CE371 (3-0-0-0) [9]	Design of Reinforced Concrete Structures	Revised CE372A [6]
CE372 (3-0-0-0) [9]	Design of Steel Structures	Revised CE371A [6]
CE362 (2-1-0-0) [8]	Engineering Hydraulics	Revised CE262A [8]
CE382 (3-0-0-0) [9]	Transportation Systems Analysis	New course
CE451 (3-0-0-0) [9]	Application of Geotechnical Engineering	Revised CE451A [11]
CE491 (9)	Under Graduate Research – II	Same as CE491A
CE492 (9)	Under Graduate Research - III	Same as CE492A
CE493 [9]	Under Graduate Research - IV	Same as CE493A

Credit Table for BT program in Civil Engineering		
Course type	Allowable Credit range	Credit in the department template
Institute Core (IC)	112	112
E/SO	18-45	45
Department requirements	144-179	159 (91 DC + 68 DE)
Open electives (OE)	51-57	51
SCHEME	54-58	54-58
Total for 4-year BT/BS	391-420	**421-425***

***Exceeds the credit range recommended by UGARC**

10.2 Template for BTH Program in Civil Engineering

Template for 3rd to 8th semester for BTH program in Civil Engineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 EME (CE212- 9)*	SCHEME-3 HSS-I (9-11)	ESO208A [11] (E/SO)	SCHEME HSS-II (9)	SCHEME HSS-II (9)	SCHEME HSS-II (9)
ESO202 [11] (E/SO)	ESC201 (14)	CE351 [10] (DC)	CE441M [5] (DC)	DE-5 [9]	DE-9 [9]
MSO203M [6] (E/SO)	TA212 [3] (E/SO)	CE361 [6] (DC)	DE-2 [9]	DE-6 [9]	OE-4 [9]
HSO201 [11] (E/SO)	CE272 [9] (DC)	CE331 [8] (DC)	DE-3 [9]	DE-7 [5]	OE-5 [9]
CE261 (10) (DC)	CE252 [11] (DC)	CE311 [4] (DC)	DE-4 [9]	OE-2 [9]	OE-6 [6]
CE243 (8) (DC)	CE214 [9] (DC)	CE381 [9] (DC)	OE-1 [9]	OE-3 [9]	DE-10 (9)
CE341 [2] (DC)		DE-1 [9]		DE-8 (9)	DE-11 (9)
TA211 [3] (E/SO)			UGP-1 (CE332A) Extra		UGP-4 (CE493A)

			Credits (DE) [4]		Extra Credits (DE) [9]
60	55-57	57	50	59	60

1. *All CE student must opt for environment part from the EME in semester 3.
2. Students need to ensure that the courses chosen as DE must include
   i. at least one course from CE371 and CE372, and
   ii. at least one course from CE412, CE432, CE462, CE481;
   iii. two UGPs (CE491 and CE492); and
   iv. **minimum 27 credits of DE (6/7 level) courses**.
   v. Total DE credits should be minimum of 95.
3. The DE basket may also contain departmental PG courses. However, some of the 300 level DE courses are pre-requisite to those PG courses.
4. UGP-1 and UGP-4 do not count towards DE/OE credits or minimum graduation. requirements.

– **CPI criteria for BTH: 8.5**

Courses that are mandatorily offered in DE:

– Odd semester – CE371, CE481.
– Even semester – CE372, CE334, CE362, CE382, CE412, CE462, CE432
– Other courses – CE491, CE492, CE605A, CE606A.

10.3 Template for BTM Program in Civil Engineering

Template for 3rd to 8th semester for BTM program in Civil Engineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 EME (CE212-9)*	SCHEME-3 HSS-I (9-11)	ESO208A [11] (E/SO)	SCHEME HSS-II (9)	SCHEME HSS-II (9)	SCHEME HSS-II (9)
ESO202 [11] (E/SO)	ESC201 (14)	CE351 [10] (DC)	CE441M [5] (DC)	MTB-1 [9]	MTB-4 [9]
MSO203M [6] (E/SO)	TA212 [3] (E/SO)	CE361 [6] (DC)	DE-2 [9]	MTB-2 [9]	MTB-5 [9]
HSO201 [11] (E/SO)	CE272 [9] (DC)	CE331 [8] (DC)	DE-3 [9]	DE-5 [5]	MTB-6 [9]
CE261 (10) (DC)	CE252 [11] (DC)	CE311 [4] (DC)	DE-4 [9]	OE-2 [9]	OE-3 [6]
CE243 (8) (DC)	CE214 [9] (DC)	CE381 [9] (DC)	OE-1 [9]	MTB-3 [9]	
CE341 [2] (DC)		DE-1 [9]			
TA211 [3] (E/SO)			UGP-1 (CE332) Extra Credits (DE) [4]		UGP-4 (CE493) Extra Credits (DE) [9]
60	55-57	57	50	50	42

1. *All CE student must opt for environment part from the EME basket in semester 3.
2. Students need to ensure that the courses chosen as DE must include
   iv) at least one course from CE371 and CE372, and
   v) at least one course from CE412, CE432, CE462, CE481.
   vi) Total DE credits should be minimum of 41.

3. The DE basket may also contain departmental PG courses. However, some of the 300 level DE courses are pre-requisite to those PG courses.
4. UGP-1 and UGP-4 do not count towards DE/OE credits or minimum graduation requirements.

Courses that are mandatorily offered in DE:

- Odd semester – CE371, CE481.
- Even semester – CE372, CE334, CE362, CE382, CE412, CE462, CE432
- Other courses – CE491, CE492, CE605A, CE606A.

10.4 Template for five-year dual degree in Civil Engineering

Template for 3rd to 10th semester for BT-MT dual degree program in Civil Engineering (Category A)							
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8	Semester 9	Semester 10
SCHEME-2 EME (CE212-9)*	SCHEME-3 HSS-I (9-11)	ESO208A [11] (E/SO)	SCHEME HSS-II (9)	SCHEME HSS-II (9)	SCHEME HSS-II (9)	CE699A (36) M. Tech Thesis	CE699A (36) M. Tech Thesis
ESO202 [11] (E/SO)	ESC201 (14)	CE351 [10] (DC)	CE441M [5] (DC)	DE-5 [9]	PGOE-4 [9]		
MSO203M [6] (E/SO)	TA212 [3] (E/SO)	CE361 [6] (DC)	DE-2 [9]	DE-6 [9]	PGOE-5 [9]		CE698A (0) M. Tech Seminar
HSO201 [11] (E/SO)	CE272 [9] (DC)	CE331 [8] (DC)	DE-3 [9]	PGOE-1 [9]	PGOE-7 [9]		
CE261 (10) (DC)	CE252 [11] (DC)	CE311 [4] (DC)	DE-4 [9]	PGOE-2 [9]	PGOE-8 [9]	Additional PG-OE courses in consultation and with consent of thesis supervisor	
CE243 (8) (DC)	CE214 [9] (DC)	CE381 [9] (DC)	OE-1 [9]	PGOE-3 [9]			
CE341 [2] (DC)		DE-1 [9]				Any remaining courses from the BT template	
TA211 [3] (E/SO)			UGP-1 (CE332) Extra Credits (DE) [4]		UGP-4 (CE493) Extra Credits (DE) [9]		
60	55-57	57	50	54	45	Max. 45	Max. 45

1. *All CE student must opt for environment part from the EME basket in semester 3.
2. Up to 42 OE and 14 DE credits may be waived from the minimum BT template requirement.
3. Students need to ensure that the courses chosen as DE must include
   i) at least one course from CE371 and CE372, and
   ii) at least one course from CE412, CE432, CE462, CE481.
   iii) Total DE credits should be minimum of 54.
4. Minimum 63 credits of PG courses and 72 credits of M. Thesis is required.
5. Students, opting for the dual degree programme within CE, please check the list of mandatory PG courses for the respective specialization.
6. The DE basket may also contain departmental PG courses. However, some of the 300 level DE courses are pre-requisite to those PG courses.
7. UGP-1 and UGP-4 do not count towards DE/OE credits or minimum graduation requirements.

8. Students opting for the dual degree programme within CE are allowed to take CE491 or CE492 as DEs or as OE.

<table>
<tr><td colspan="5">Template for 7th to 10th semester for dual degree program in Civil Engineering- Environmental Engineering (Category B)</td></tr>
<tr><td>Semester 3 – Semester 6</td><td>Semester 7</td><td>Semester 8</td><td>Semester 9</td><td>Semester 10</td></tr>
<tr><td rowspan="6">BT / BS Template of Parent Department (BSBE, CHE, CHM, ECO, ME, MME, MTH, PHY)</td><td>CE664A [9]</td><td>CE667A [5]</td><td>CE699A [36] (M. Tech. Thesis)</td><td>CE699A [36] (M. Tech. Thesis)</td></tr>
<tr><td>CE665A [9]</td><td>CE668A [10]</td><td></td><td>CE698A [0] (M. Tech. Seminar)</td></tr>
<tr><td>CE666A [9]</td><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="3">At least additional 21 PG-OE credits in consultation and with consent of thesis supervisor</td></tr>
<tr><td colspan="4">Other Courses from BT template of parent Department</td></tr>
<tr><td>Max 65</td><td>Max 65</td><td>Max 65</td><td>Max 65</td></tr>
</table>

1. 36 OE credits waived from the BT/BS program of the parent department.
2. Minimum 63 credits of PG course and 72 credits of M. Tech thesis required.
3. These 63 PG course credits may include 1 UG course taken for PG credits on advice of the thesis supervisor.
4. Another UG/PG course (over and above the first 63 PG credits) may also be taken for PG credits on advice of the thesis supervisor.

<table>
<tr><td colspan="5">Template for 7th to 10th semester for dual degree program in Civil Engineering- Hydraulics and Water Resources (Category B)</td></tr>
<tr><td>Semester 3 – Semester 6</td><td>Semester 7</td><td>Semester 8</td><td>Semester 9</td><td>Semester 10</td></tr>
<tr><td rowspan="5">BT / BS Template of Parent Department (AE, CHE, ME)</td><td>CE610A [9]</td><td>CE612A [9]</td><td>CE699A [36] (M. Tech. Thesis)</td><td>CE699A [36] (M. Tech. Thesis)</td></tr>
<tr><td>CE611A [9]</td><td>CE613A [9]</td><td></td><td>CE698A [0] (M. Tech. Seminar)</td></tr>
<tr><td colspan="4">At least additional 27 PG-OE credits in consultation and with consent of thesis supervisor</td></tr>
<tr><td colspan="4">Other Courses from BT template of parent Department</td></tr>
<tr><td>Max 65</td><td>Max 65</td><td>Max 65</td><td>Max 65</td></tr>
</table>

1. 36 OE credits waived from the BT/BS program of the parent department.
2. Minimum 63 credits of PG course and 72 credits of M. Tech thesis required.
3. These 63 PG course credits may include 1 UG course taken for PG credits on advice of the thesis supervisor.
4. Another UG/PG course (over and above the first 63 PG credits) may also be taken for PG credits on advice of the thesis supervisor.

Template for 7th to 10th semester for dual degree program in Civil Engineering- Geoinformatics (Category B)				
Semester 3 – Semester 6	Semester 7	Semester 8	Semester 9	Semester 10
BT / BS Template of Parent Department (CSE, MTH, PHY)	CE331 [8] (UG Pre-Requisite)	CE334 [8] (as PG)	CE699A [36] (M. Tech. Thesis)	CE699A [36] (M. Tech. Thesis)
	CE671A [11]			CE698A [0] (M. Tech. Seminar)
	CE677A [9]			
		At least additional 35 PG-OE credits in consultation and with consent of thesis supervisor		
	Other Courses from BT template of parent Department			
	Max 65	Max 65	Max 65	Max 65

1. 36 OE credits waived from the BT/BS program of the parent department.
2. Minimum 63 credits of PG course and 72 credits of M. Tech thesis required.
3. These 63 PG course credits include 1 UG course (CE334 [8]) taken for PG credits.
4. Another UG/PG course (over and above the first 63 PG credits) may also be taken for PG credits on advice of the thesis supervisor.

Template for 7th to 10th semester for dual degree program in Civil Engineering- Transportation Engineering (Category B)				
Semester 3 – Semester 6	Semester 7	Semester 8	Semester 9	Semester 10
BT / BS Template of Parent Department (AE, ECO, ME, MTH, PHY)	CE682A [9]	CE684b [5]	CE699A [36] (M. Tech. Thesis)	CE699A [36] (M. Tech. Thesis)
	CE683A [9]	CE685a [5]		CE698A [0] (M. Tech. Seminar)
		CE780A [9]		
	At least additional 26 PG-OE credits in consultation and with consent of thesis supervisor			
	Other Courses from BT template of parent Department			
	Max. 65	Max. 65	Max. 65	Max. 65

1. 36 OE credits waived from the BT/BS program of the parent department.
2. Minimum 63 credits of PG course and 72 credits of M. Tech thesis required.
3. These 63 PG course credits may include 1 UG course taken for PG credits on advice of the thesis supervisor.
4. Another UG/PG course (over and above the first 63 PG credits) may also be taken for PG credits on advice of the thesis supervisor.

10.5 Template for double major: second major in Civil Engineering

<table>
<tr><td colspan="5">Template for 7th to 10th semester for double major with second major in Civil Engineering</td></tr>
<tr><td>Semester 3 – Semester 6</td><td>Semester 7</td><td>Semester 8</td><td>Semester 9</td><td>Semester 10</td></tr>
<tr><td rowspan="8">BT/BS Template of Parent Department

Pre-Requisites
1) ESO204 or equivalent else CE261 in 7th Sem
2) ESO202
3) CE212 as part of SCHEME else in 7th Sem</td><td>CE341 [2] (DC)</td><td>CE272 [9] (DC)</td><td>CE351 [10] (DC)</td><td>CE411 [5] (DC)</td></tr>
<tr><td>CE243 [8] (DC)</td><td>CE252 [11] (DC)</td><td>CE361 [6] (DC)</td><td>DE [9]</td></tr>
<tr><td>CE331 [8] (DC)</td><td>CE214 [9] (DC)</td><td>CE381 [9] (DC)</td><td>DE [9]</td></tr>
<tr><td></td><td></td><td>CE311 [4] (DC)</td><td>DE [9]</td></tr>
<tr><td></td><td></td><td>DE [9]</td><td>DE [9]</td></tr>
<tr><td colspan="4">Other Courses from BT template of parent Department</td></tr>
<tr><td>Max 65</td><td>Max 65</td><td>Max 65</td><td>Max 65</td></tr>
</table>

1. Students need to ensure that the courses chosen as DE must include –
   i. at least one course from CE371 and CE372, and
   ii. at least one course from CE412, CE432, CE462, CE481.
   iii. Total DE credits should be minimum of 45.
2. The DE basket may also contain departmental PG courses. However, some of the 300 level DE courses are pre-requisite to those PG courses.
3. UGP-1 and UGP-4 do not count towards DE/OE credits or minimum graduation requirements.
4. 36 OE credits waived from the BT/BS program of the parent department.

Courses that are mandatorily offered in DE:

- Odd semester – CE371, CE481.
- Even semester – CE372, CE334, CE362, CE382, CE412, CE462, CE432.
- Other courses – CE491, CE492, CE605A, CE606A.

11.0 Templates for programs Computer Science and Engineering (CSE)

11.1 Template for the BT program in Computer Science and Engineering

Template for 3rd to 8th semester for BT program in Computer Science and Engineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	SCHEME-4 HSS-II (9)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)	DE-8 (9)
ESC201 (14)	CS220 (13)	CS330 (13)	DE-2 (9-13)	DE-5 (9)	OE-4 (9)
ESO207 (12)	CS253 (12)	CS340 (9)	DE-3 (9)	DE-6 (9)	OE-5 (9)
CS201 (11)	CS202M (5)	CS345 (9)	DE-4 (9)	DE-7 (9)	OE-6 (9)
ESO-2 (9-11)	CS203M (5)	DE-1 (9)	OE-1 (9)	OE-3 (9)	OE-7 (9)
			OE-2 (5-9)		
54-58	44-46	49	50-58	45	45

Remarks

- ESO/SO courses are available in 6-14 credits each. ESO207A is compulsory for CSE students in the 3rd semester
- Students can take up to 4 UGPs, but only at most 3 UGPs (27 credits) can be counted towards graduation requirements.
- At least 2 DEs must be selected from Basket – A.
- All the four UGPs are optional.
- Up to 36 OE credits may be waived from the minimum requirements for students opting for either Dual Degree or Double Major programme

List of courses		
CS201 (3-1-0-0) [11]	Mathematics for computer Science I	Revised CS201A [9]
CS220 (3-0-4-0) [13]	Computer Organization	Revised CS220A [12]
CS253 (3-0-3-0) [12]	Software Development and Operations	Revised CS253A [12]
CS202M (3-0-0-0) [5]	Mathematics for Computer Science - II	Same as CS202A
CS203M (3-0-0-0) [5]	Mathematics for Computer Science - III	Revised CS203B [5]
CS330 (3-0-4-0) [13]	Operating Systems	Revised CS330A [12]
CS340 (3-0-0-0) [9]	Theory of Computation	Revised CS340A [9]
CS345 (3-0-0-0) [9]	Algorithms II	Same as CS345A
CS396 [9]	Under Graduate Project – 1	Same as CS396A
CS498 [9]	Under Graduate Project – 3	Same as CS498A
CS499 [9]	Under Graduate Project – 4	Same as CS499A

BASKET A for DE		
CS335 (3-0-4-0) [13]	Compiler Design	Revised CS335A [13]
CS315 (3-0-0-0) [9]	Principles of Database Systems	Revised CS315A [9]
CS350 (3-0-0-0) [9]	Principles of Programming Languages	Same as CS350A
CS360 (3-0-0-0) [9]	Introduction to Computer Graphics	Same as CS360A
CS771A (3-0-0-0) [9]	Introduction to Machine Learning	Same as CS771A
CS422 (3-0-0-0) [9]	Computer Architecture	Revised CS422A [9]
CS425 (3-0-0-0) [9]	Computer Networks	Revised CS425A [9]
CS433 (3-0-0-0) [9]	Parallel Programming	Revised CS433A [9]
CS455 (3-0-0-0) [9]	Introduction to Software Engineering	Same as CS455A (9)

CS423 (3-0-0-0) [9]	Multicore and Multiprocessor Architecture	Same as CS423A (9)

Credit Table for BT Program in Computer Science and Engineering		
Course type	Recommended Credit range	Minimum Credits required for graduation
Institute Core (IC)	112	112
E/SO	18-45	21-23
Department requirements	144-179	149 (77 DC + 72 DE)
Open electives (OE)	51-57	**59-63***
SCHEME	54-58	54-58
Total for 4-year BT/BS	391-420	395-405

* **Exceeds the credit range recommended by UGARC**

11.2 Template for the BTH program in Computer Science and Engineering

Template for 3rd to 8th semester for BTH program in Computer Science and Engineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	SCHEME-4 HSS-II (9)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)	DE-8 (9)
ESC201 (14)	CS220 (13)	CS330 (13)	DE-2 (9-13)	DE-5 (9)	OE-4 (9)
ESO207 (12)	CS253 (12)	CS340 (9)	DE-3 (9)	DE-6 (9)	OE-5 (9)
CS201 (11)	CS202M (5)	CS345 (9)	DE-4 (9)	DE-7 (9)	OE-6 (9)
ESO-2 (9-11)	CS203M (5)	DE-1 (9)	OE-1 (9)	OE-3 (9)	OE-7 (9)
	DEH-1 (9)	DEH-2 (9)	OE-2 (5-9)	DEH-3 (9)	
54-58	53-55	58	50-58	45	45

- **CPI Criteria for BTH: Above 8.5**

Remarks

- ESO/SO courses are available in 6-14 credits each. ESO207 is compulsory for CSE students in the 3rd semester.
- At least 2 UGPs are compulsory (DE) for BTH
- At least 27 credits of DEH should be completed by taking CS6XX and CS7XX level courses
- Students can take up to 4 UGPs, but only at most 3 UGPs (27 credits) can be counted towards graduation requirements.
- At least 2 DEs must be selected from Basket – A.
- Up to 36 OE credits may be waived from the minimum requirements for students opting for either Dual Degree or Double Major programme

11.3 Template for the BTM program in Computer Science and Engineering

Template for 3rd to 8th semester for BTM program in Computer Science and Engineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	SCHEME-4 HSS-II (9)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)	OE-2 (9)
ESC201 (14)	CS220 (13)	CS330 (13)	DE-2 (9-13)	DE-4 (9)	OE-3 (9)
ESO207 (12)	CS253 (12)	CS340 (9)	DE-3 (9)	DE-5 (9)	OE-4 (9)
CS201 (11)	CS202M (5)	CS345 (9)	MTB-1 (9)	MTB-3 (9)	MTB-5 (9)
ESO-2 (9-11)	CS203M (5)	DE-1 (9)	MTB-2 (9)	MTB-4 (9)	MTB-6 (9)
			OE-1 (5-9)		
54-58	44-46	49	50-58	45	45

Remarks

- ESO/SO courses are available in 6-14 credits each. ESO207A is compulsory for CSE students in the 3rd semester.
- Students can take up to 4 UGPs, but only at most 3 UGPs (27 credits) can be counted towards graduation requirements.
- At least 2 DEs must be selected from Basket – A.
- All the four UGPs are optional.
- Up to 36 OE credits may be waived from the minimum requirements for students opting for either Dual Degree or Double Major programme

11.4 Template for five-year dual degree program in Computer Science and Engineering

Template for semester 3 to 6 same as the BT program

Semester 7	Semester 8	Summer	Semester 7	Semester 7
SCHEME-6, HSS-II (9)	DE PG-1 (9)	M. Tech Thesis (9)	DE PG-4 (9)	DE PG-6 (9)
DE-5 (9)	DE PG-2 (9)		DE PG-5 (9)	M. Tech Thesis (36)
OE-2 (9)	DE PG-3 (9)		M. Tech Thesis (27)	
DE-6 (9)	M. Tech Thesis (9)			
DE-7 (9)				
DE-8 (9)				
54	36	9	45	45

MINIMUM CREDIT REQUIREMENT IN M. TECH FOR GRADUATION

PG Component: 54 credits

Thesis Component: 81 credits

REMARKS:

- Up to 36 OE credits may be used from the BT minimum requirements to fulfil requirements for the BT-MT dual degree programme. These will be waived from the BT programme and counted towards PG requirements.
- All other minimum BT credit requirements need to be fulfilled, including those that are slotted in the 7th and 8th semester of the BT template.

11.5 Template for double major: second major in Computer Science and Engineering

Odd Semester	Even Semester
CS330 (13)	CS202M (5) and CS203M (5)
CS340 (9)	CS220 (13)
CS345 (9)	CS253 (12)
CS DE-1 (9)	CS DE-2 (9-13)
CS DE-3 (9)	CS DE-4 (9)
49	53-57

- Total mandatory credits for second major in computer science: 102

Course and credit Waiver policy: Following waivers will be granted automatically:

- Course and credits to be waived If the student has done

CS340	MTH401
CS202	MTH302
CS203	MSO201 OR HSO201

- To clarify, if a student gets waiver for all the three courses above, he will need to do only 102-19=83 credits to finish his/her CSE second major requirement. If a student gets a waiver for CS202 only, he will need to do 102-5=97 credits to finish his/her CSE second major requirement. The table above may be extended in future if other courses similar to those in CSE major template are added/discovered in the other departments. Any other course waivers (without credit waivers) may be recommended by CSE DUGC based on its discretion.

REMARKS:

- Two DEs should be selected from Basket-A (Details of Basket-A are available in CSE B.Tech. template).
- Total CSE-DE credits should be at least 36.
- Up to 36 OE credits may be waived from the parent department BT/BS graduation requirements when they are used to fulfil requirements for the double major.
- *ESO207 is a compulsory course to be done, but its credits will be counted against the ESO requirement of the first major.

11.6 Minors in Computer Science and Engineering

The minors offered by CSE are listed in the table below.

- For each minor stream, the minimum total credit requirement is 30
- In each minor stream, any related course(s), if not mentioned in the list of optional courses, may be taken as optional with the permission of the CSE DUGC
- The course ESO207 can be waived if the student has done an equivalent course. CSE DUGC convener can give more information about it.

MINOR

ALGORITHMS	COMPUTER SYSTEMS	THEORETICAL COMPUTER SCIENCE	MACHINE LEARNING
COMPULSORY COURSE(S):	COMPULSORY COURSE(S):	COMPULSORY COURSE(S):	COMPULSORY COURSE(S):
ESO207	ESO207	ESO207	ESO207
CS345 (9)		CS340 (9)	CS771 (9)
And, ONE from:	And, TWO from:	And, ONE from:	And, ONE from:
CS635	CS220 (12)	CS640	CS360
CS645	CS315 (9)	CS641	CS365 (9)
CS646	CS330 (12)	CS642	CS616
CS647	CS335 (12)	CS643	CS657
CS648	CS350 (9)	CS644	CS660
CS651	CS422 (9)	CS649	CS671
CS655B (9)	CS425 (9)	CS650	CS672
CS656 (9)	CS433 (9)	CS680	CS673
CS663	CS455 (9)	CS681	CS674
CS664	CS610 (9)	CS682	CS676
CS684	CS614 (9)	CS687	CS677
CS711 (9)	CS615	CS688	CS678
CS712 (9)	CS617	CS740	CS685
CS718	CS618	CS741	CS686
CS719	CS619	CS744	CS690
CS742	CS621	CS745	CS771
CS743	CS622	CS746	CS772
CS785	CS623	CS747	CS773
	CS624	CS748	CS774
	CS625	CS749	CS775
	CS626	CS750	CS776
	CS627		CS777
	CS628		CS779 (9)
	CS629		CS781
	CS630 (9)		CS782
	CS631		CS783 (9)
	CS632		CS784
	CS633 (9)		CS786
	CS634		CS789
	CS636		
	CS637		
	CS638 (9)		
	CS639		
	CS652 (9)		
	CS653		
	CS654		
	CS659		
	CS665		
	CS720		
	CS725		
	CS726		
	CS727		
	CS728		
	CS730 (9)		
	CS731 (9)		
	CS738		
	CS755		

12.0 Templates for programs in Electrical Engineering (EE)

12.1 Template for the BT program in Electrical Engineering

Template for 3rd to 8th semester for BT program in Electrical Engineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	SCHEME-4 HSS-II (9)	DE-1 (9)**	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)
ESC201 (14)	EE210 (11)	EE320 (11)	DE-2 (9)**	OE-2 (9)	DE-3 (9)
EE200 (11)	EE250 (11)	EE330 (11)	EE340 (11)	OE-3 (9)	DE/UGP-2 (9)
E/SO: TA212§ (3)	ESO203 (13)	EE370 (11)	EE381 (12)	OE-4 (9)	OE-5 (9)
E/SO-1 (6): MSO202M	E/SO-3 (11) MSO201	EE380 Lab (12)	OE-1 (9)	DE/UGP-1 (9)	OE-6 (9)
E/SO-2 (6) MSO203M	E/SO: TA211§ (3)	EE390 (2)			
49-51	58-60	56	50	45	45

§ Subject to the decision od Senate on Section 5.2 of this report

**DE-1 and DE-2 (both) should be selected from Basket-A (Basket A: EE311, EE321, EE360, EE301)

List of courses		
Course No:	Title	Remarks
EE200 (3-1-0-0) [11]	Signal Systems and Networks	Same as EE200A
EE210 (3-1-0-0) [11]	Analog Electronics	Revised EE210A [11]
EE250 (3-1-0-0) [11]	Control Systems Analysis	Same as EE250A
EE320 (3-1-0-0) [11]	Principles of Communication	Same as EE320A
EE330 (3-1-0-0) [11]	Power Systems	Revised EE330A [11]
EE340 (3-1-0-0) [11]	Electromagnetic Theory	Same as EE340A
EE370 (3-1-0-0) [11]	Digital Electronics	Revised EE370A [11]
EE380 (0-3-6-0) [12]	Electrical Engineering Laboratory I	Same as EE380A
EE381 (0-3-6-0) [12]	Electrical Engineering Laboratory II	Revised EE381A [12]
EE390 (0-0-2-0) [2]	Electrical Engineering Communication Skills	Same as EE390A
EE311 (3-0-0-0) [9]	Semiconductor Devices	Revised EE311A [9]
EE321 (3-0-0-0) [9]	Communication Systems	Same as EE321A
EE360 (3-0-0-0) [9]	Power Electronics	Revised EE360A [9]
EE301 (3-0-0-0) [9]	Digital Signal Processing	Same as EE301A

Credit Table for BT Program in Electrical Engineering		
Course type	Recommended Credit range	Credit requirement for graduation
Institute Core (IC)	112	112
E/SO	18-45	42
Department requirements	144-179	148 (103 DC + 45 DE)
Open electives (OE)	51-57	54
SCHEME	54-58	54-58
Total for 4-year BT/BS	391-420	410-414

12.2 Template for BTH program in Electrical Engineering

Template for 3rd to 8th semester for BTH program in Electrical Engineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	SCHEME-4 HSS-II (9)	DE-1 (9)**	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)
ESC201 (14)	EE210 (11)	EE320 (11)	DE-2 (9)**	OE-2 (9)	DE-3 (9)
EE200 (11)	EE250 (11)	EE330 (11)	EE340 (11)	OE-3 (9)	UGP-2 (9)
E/SO: TA202 (3)	ESO203 (13)	EE370 (11)	EE381 (12)	OE-4 (9)	OE-5 (9)
E/SO-1 (6): MSO202M	E/SO-3 (11) MSO201	EE380 Lab (12)	OE-1 (9)	UGP-1 (9)	OE-6 (9)
E/SO-2 (6) MSO203M	E/SO: TA201 (3)	EE390 (2)	DEH-1 (9)	DEH-2 (9)	DEH-3 (9)
49-51	58-60	56	59	54	54

- **CPI Criteria for BTH: ≥ 8.5**

Remarks

- DEH courses should be level 6 or 7 EE courses
- **DE-1 and DE-2 (both) should be selected from Basket-A (Basket A: EE311, EE321, EE360, EE301)

12.3 Template for BTM program in Electrical Engineering

Template for 3rd to 8th semester for BTM program in Electrical Engineering					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	SCHEME-4 HSS-II (9)	DE-1 (9)**	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)
ESC201 (14)	EE210 (11)	EE320 (11)	DE-2 (9)**	OE-2 (9)	MTB-3 (9)
EE200 (11)	EE250 (11)	EE330 (11)	EE340 (11)	OE-3 (9)	MTB-4 (9)
E/SO: TA202 (3)	ESO203 (13)	EE370 (11)	EE381 (12)	MTB-1 (9)	MTB-5 (9)
E/SO-1 (6): MSO202M	E/SO-3 (11) MSO201	EE380 Lab (12)	OE-1 (9)#	MTB-2 (9)	MTB-6 (9)
E/SO-2 (6) MSO203M	E/SO: TA201 (3)	EE390 (2)			
49-51	58-60	56	50	45	45

Remark:

- **DE-1 and DE-2 (both) should be selected from Basket-A (Basket A: EE311, EE321, EE360, EE301)
- MTB courses must be taken from the management course basket.
- # Students planning to convert to BTM-MT program should take OE-1 from the management

12.4 Template for five-year dual degree program in Electrical Engineering

Template for 3rd to 10th semester for five-year BT-MT program in Electrical Engineering								
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8	Summer	Semester 9	Semester 10
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	SCHEME-4 HSS-II (9)	DE-1 (9)**	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)	M.Tech Thesis (9) EE699	M.Tech Thesis (27) EE699	M.Tech Thesis (36) EE699
ESC201 (14)	EE210 (11)	EE320 (11)	DE-2 (9)**	OE-2 (9)	OE-4 (9)		PG-6 (9)	
EE200 (11)	EE250 (11)	EE330 (11)	EE340 (11)	OE-3 (9)	OE-5 (9)			
E/SO: TA212 (3)	ESO203 (13)	EE370 (11)	EE381 (12)	DE/UGP-1 (9)	PG-3 (9)			
E/SO-1 (6): MSO202M	E/SO-3 (11) MSO201	EE380 Lab (12)	OE-1 (9)	DE PG-1 (9)	PG-4 (9)			
E/SO-2 (6) MSO203M	E/SO: TA211 (3)	EE390 (2)		DE PG-2 (9)	PG-5 (9)			
49-51	58-60	56	50	54	54	9	36	36

Remarks:

- **DE-1 and DE-2 (both) should be selected from Basket-A (Basket A: EE311, EE321, EE360, EE301)
- Minimum Credit Requirement in MTech Part for Graduation: PG component: 54 Credits; Thesis Component: 72 Credits
- PG-3, 4, 5 & 6 are to be taken with the permission of thesis supervisor.
- Total minimum BT-MT dual degree (Category A) credit requirement will be 509

Template for 3rd to 10th semester for five-year BTH-MT program in Electrical Engineering								
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8	Summer	Semester 9	Semester 10
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	SCHEME-4 HSS-II (9)	DE-1 (9)**	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)	M.Tech Thesis (9) EE699	M.Tech Thesis (27) EE699	M.Tech Thesis (36) EE699
ESC201 (14)	EE210 (11)	EE320 (11)	DE-2 (9)**	OE-2 (9)	DE-3 (9)		PG-6 (9)	
EE200 (11)	EE250 (11)	EE330 (11)	EE340 (11)	OE-3 (9)	UGP-2 (9)			
E/SO: TA212 (3)	ESO203 (13)	EE370 (11)	EE381 (12)	UGP-1 (9)	DEH-3 (9)			
E/SO-1 (6): MSO202M	E/SO-3 (11) MSO201	EE380 Lab (12)	OE-1 (9)	DEH-2 (9)	PG-3 (9)			
E/SO-2 (6) MSO203M		EE390 (2)	DEH-1 (9)	DE PG-1 (9)	PG-4 (9)			
	E/SO: TA211 (3)			DE PG-2 (9)	PG-5 (9)			
49-51	58-60	56	59	63	63	9	36	36

Remarks:

- **DE-1 and DE-2 (both) should be selected from Basket-A (Basket A: EE311, EE321, EE360, EE301)
- DEH should be from level 6 or 7 EE Courses
- Minimum Credit Requirement in MTech Part for Graduation: PG component: 54 Credits; Thesis Component: 72 Credits
- PG-3, 4, 5 & 6 are to be taken with the permission of thesis supervisor.
- Total minimum BTH-MT dual degree (Category A) credit requirement will be 536 with graduating CPI ≥ 8.5 in BTH part

Template for 3rd to 10th semester for five-year BTM-MT program in Electrical Engineering								
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8	Summer	Semester 9	Semester 10
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	SCHEME-4 HSS-II (9)	DE-1 (9)**	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)	M.Tech Thesis (9) EE699	M.Tech Thesis (27) EE699	M.Tech Thesis (36) EE699
ESC201 (14)	EE210 (11)	EE320 (11)	DE-2 (9)**	MTB-2 (9)	MTB-5 (9)		PG-6 (9)	
EE200 (11)	EE250 (11)	EE330 (11)	EE340 (11)	MTB-3 (9)	MTB-6 (9)			
E/SO: TA212 (3)	ESO203 (13)	EE370 (11)	EE381 (12)	MTB-4 (9)	PG-3 (9)			
E/SO-1 (6): MSO202M	E/SO-3 (11) MSO201	EE380 Lab (12)	MTB-1 (9)	DE PG-1 (9)	PG-4 (9)			
E/SO-2 (6) MSO203M	E/SO: TA211 (3)	EE390 (2)		DE PG-2 (9)	PG-5 (9)			
49-51	58-60	56	50	54	54	9	36	36

Remarks:

- **DE-1 and DE-2 (both) should be selected from Basket-A (Basket A: EE311, EE321, EE360, EE301)
- Minimum Credit Requirement in MTech Part for Graduation: PG component: 54 Credits; Thesis Component: 72 Credits
- PG-3, 4, 5 & 6 are to be taken with the permission of thesis supervisor.
- Total minimum BTM-MT dual degree (Category A) credit requirement will be 509

12.5 Template for double major: second major in Electrical Engineering

Template for double major in EE	
Odd Semester	Even Semester
Pre-requisites	
ESO203 (13)	MSO201 (11)
MSO202M (6)	
MSO203M (6)	
Mandatory EE courses	
EE200 (11)	EE210/EE250 (11)
EE320 (11)	Any ONE combination from Basket-B (33-41)
EE330 (11)	EE DE PG (9) (Optional)
EE370 (11)	
EE380 (12)/EE480 (10)	
EE DE PG (9)/UGP-1 (9) (Optional)	
54-65	44-61

BASKET-B
1. Three PG courses + one course from Basket-A
2. Two PG courses + two courses from Basket-A
3. One PG course + three courses from Basket-A
4. One PG course + two courses from Basket-A + UGP-2
5. Two PG courses + one course from Basket-A + UGP-2
BASKET-A
EE321 (9)
EE301 (9)
EE340 (9)
EE311 (9)
EE360 (9)
EE381 (12)/EE481 (6)

Total mandatory Credits for Second Major in Electrical Engineering: 98 Credits

Remarks: Up to 27 OE credits may be waived from the parent department BT/BS graduation requirements when they are used to fulfil requirements for the double major.

12.6 Minors in Electrical Engineering

Minors				
Minor in Microelectronics/ Digital Systems	Minor in Power	Minor in Communications & Signal Processing	Minor in Controls	Minor in RF & Photonics
EE200 [11]	EE200 [11]	EE200 [11]	EE200 [11]	EE200 [11]
EE210 [11]	EE330 [11]	EE320 [11]	EE250 [11]	EE340 [11]
EE311 [09]/ EE370 [11]	EE360 [09]	EE321 [09]/ EE301 [09]	EE650A [09]	EE612A [09]/ EE642A [09]/ EE648A [09]
31/33	31	31	31	31

13.0 Templates for programs in Material Science and Engineering (MSE)

13.1 Template for BT program in Material Science and Engineering

Template for 3rd to 8th semester for BT program in Material Science and Engineering					
Sem-3	**Sem-4**	**Sem-5**	**Sem-6**	**Sem-7**	**Sem-8**
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)		SCHEME HSS-II (9)	SCHEME HSS-II (9)	SCHEME HSS-II (9)
ESO202 (11)	ESC201 (14)	MSE301 (9)	ESO Basket (6-11) [+]	DE-3 (9)	OE-3 (9)
ESO225 (8)	MSE202(11)	MSE302 (9)	MSE 306 (9)	DE-4 (9)	OE-4 (9)
MSE201 (11)	MSE203 (11)	MSE303 (9)	DE-1 (9)	OE-1 (9)	OE-5 (9)
MSE204 (9)	MSE205 (8)	MSE304 (9)	DE-2 (9)	OE-2 (9)	OE-6 (6-9)
		MSE305 (9)			
TA211 (3)[§]		MSE351 (3)	MSE353 (3)		
TA212 (3) [§]	MSE251 (3)	MSE352 (3)	MSE354 (6)		
54-56	**56-58**	**51**	**51-56**	**45**	**42-45**

[§] Subject to the decision od Senate on Section 5.2 of this report

Remarks

- UGP-1 (MSE396) (4 credits) and UGP-4 (MSE498) are optional (over and above the minimum credit requirements)
- UGP-2 (MSE496) (9 credits) can be taken in lieu of one DE course
- UGP-3 (MSE497) (9 credits) can be taken in lieu of one OE course
- [+]ESO Basket: ESO207/ MSO201/ HSO201/ MSO203 (One course required)

List of courses		
Course No:	Course Title	Remarks
MSE201 (3-1-0-0) [11]	Thermodynamics and Phase Equilibria	Revised MSE201A [11]
MSE202 (3-1-0-0) [11]	Rate Processes	Same as MSE202A
MSE203 (3-1-0-0) [11]	Structure and Characterization of Materials	Revised MSE203A [9]
MSE204 (3-0-0-0) [9]	Computational Methods in Materials Science and Engineering	New course
MSE205 (2-1-0-0) [8]	Physics of Materials	New course
MSE301 (3-0-0-0) [9]	Phase Transformations	Revised MSE301A [6]
MSE302 (3-0-0-0) [9]	Mechanical Behaviour of Materials	Revised MSE302A [9]
MSE303 (3-0-0-0) [9]	Electronic and Magnetic Properties of Materials	Revised MSE303A [9]
MSE304 (3-0-0-0) [9]	Principles of Metal Extraction and Refining	Revised MSE304A [6]
MSE305 (3-0-0-0) [9]	Materials Processing	Revised MSE305 [6]
MSE306 (3-0-0-0) [9]	Ironmaking and Steelmaking	New course
MSE251 (0-0-3-0)]3]	Physical Metallurgy and Materials Characterization Laboratory	New course
MSE351 (0-0-3-0) [3]	Mechanical and Electronic Properties of Materials Laboratory	New course

MSE352 (0-0-3-0) [3]	Process Metallurgy and Manufacturing Laboratory	New course
MSE353 (0-0-3-0) [3]	Instrumentation for Materials Engineering Laboratory	New course
MSE354 (0-0-6-0) [6]	Capstone Project Laboratory	New course
MSE396	UGP-1	Check old number
MSE496	UGP-2	Check old number
MSE497 [9]	UGP-3	Same as MSE497A
MSE498	UGP-4	Check old number

Credit Table for BT Program in Material Science and Engineering		
Course type	Recommended Credit range	MSE template
Institute Core (IC)	112	112
E/SO	18-45	31-36
Department requirements	144-179	158 (122 DC + 36 DE)
Open electives (OE)	51-57	51-54
SCHEME	54-58	54-58
Total for 4-year BT/BS	391-420	406-418

13.2 Template for BTH Program Material Science and Engineering

Template for 3rd to 8th semester for BTH program in Material Science and Engineering					
Sem-3	**Sem-4**	**Sem-5**	**Sem-6**	**Sem-7**	**Sem-8**
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)		SCHEME HSS-II (9)	SCHEME HSS-II (9)	SCHEME HSS-II (9)
ESO202 (11)	ESC201 (14)	MSE301 (9)	ESO Basket (6-11) +	UGP-2* (9)	UGP-3* (9)
ESO225 (8)	MSE202(11)	MSE302 (9)	MSE 306 (9)	OE-1 (9)	OE-4 (9)
MSE201 (11)	MSE203 (11)	MSE303 (9)	DE-1 (9)	OE-2 (9)	OE-5 (9)
MSE204 (9)	MSE205 (8)	MSE304 (9)	DE-2 (9)	OE-3 (6-9)	OE-6 (9)
		MSE305 (9)		DEH-1 (9)	DEH-3 (9)
				DEH-2 (9)	
TA211 (3)		MSE351 (3)	MSE353 (3)		
TA212 (3)	MSE251 (3)	MSE352 (3)	MSE354 (6)		
54-56	**56-58**	**51**	**51-56**	**60-63**	**54**

— CPI criteria for BTH: 8.0

Remarks

- DEH-1/2/3 should be 600 level or above DEs for BTH program
- UGP-2 (MSE496) (9 credits) and UGP-3 (MSE497) (9 credits) are mandatory for BTH program
- UGP-1 (MSE396) (4 credits) and UGP-4 (MSE498) are optional (over and above the minimum credit requirements)

– [+] ESO Basket: ESO207/ MSO201/ HSO201/ MSO203 (One course required)

13.3 Template for the BTM program in Material Science and Engineering

Template for 3rd to 8th semester for BTM program in Material Science and Engineering					
Sem-3	**Sem-4**	**Sem-5**	**Sem-6**	**Sem-7**	**Sem-8**
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)		SCHEME HSS-II (9)	SCHEME HSS-II (9)	SCHEME HSS-II (9)
ESO202 (11)	ESC201 (14)	MSE301 (9)	ESO Basket (6-11) [+]	MTB-1 (9)	OE-3 (9)
ESO225 (8)	MSE202(11)	MSE302 (9)	MSE 306 (9)	MTB-2 (9)	MTB-4 (9)
MSE201 (11)	MSE203 (11)	MSE303 (9)	DE-1 (9)	MTB-3 (9)	MTB-5 (9)
MSE204 (9)	MSE205 (8)	MSE304 (9)	OE-1 (6-9)	OE-2 (9)	MTB-6 (9)
		MSE305 (9)			
TA211 (3)		MSE351 (3)	MSE353 (3)		
TA212 (3)	MSE251 (3)	MSE352 (3)	MSE354 (6)		
54-56	**56-58**	**51**	**48-56**	**45**	**45**

- MTB-1 to MTB-6 are courses from Management track basket worth 54 credits
- UGP-1 (MSE396) (4 credits) and UGP-4 (MSE498) are optional (over and above the minimum credit requirements)
- UGP-2 (MSE496) (9 credits) can be taken in lieu of one DE course
- UGP-3 (MSE497) (9 credits) can be taken in lieu of one OE course
- [+] ESO Basket: ESO207/ MSO201/ HSO201/ MSO203 (One course required)

13.4 Template for five-year dual degree program in Material Science and Engineering

BT-MT (Category-A) (from the same department)				
7th	**8th**	**Summer**	**9th**	**10th**
OE PG-1 (9)	OE PG-3 (9)	MTech Thesis/ DE PG-1/2 (18) (optional)	MTech Thesis (36)	MTech Thesis (36)
OE PE-2 (9)	OE PG-4 (9)		^MSE690 (0)	^MSE691 (0)
DE PG-1 (9)*	DE PG-2 (9)*			
27 credits	27 credits	18 credits	36 credits	36 credits

- *Students from within Department can use up to 2 DE UG courses for PG part i.e. they can get up to 18 credits of waiver in their PG part in lieu of 2 DE courses taken in their UG part.
- ^MSE690 and MSE691 are compulsory for all students

BT-MT (Category-B) (from other departments)				
7th	**8th**	**Summer**	**9th**	**10th**
OE PG-1 (9)	OE PG-3 (9)	MTech Thesis (18)	MTech Thesis (27)	MTech Thesis (27)
OE PG-2 (9)	OE PG-4 (9)		PG-1 (09)	PG-2 (09)
			^MSE690 (0)	^MSE691 (0)
27 credits	27 credits	18 credits	36 credits	36 credits

- ^MSE690 and MSE691 are compulsory for all students

13.5 Template for double major: second major in Material Science and Engineering

Odd Semester	**Even Semester**
Pre-Requisite	
ESO225 (8)	
TA201 (3); TA202 (3)	
Department Core Requirements	
MSE201 (11)	MSE202 (11)
MSE204 (9)	MSE203 (11)
MSE301 (9)	MSE205 (8)
MSE302 (9)	MSE306 (9)
MSE303 (9)	MSE251 (3)
MSE304 (9)	MSE353 (3)
MSE305 (9)	MSE354 (6)
MSE351 (3)	
MSE352 (3)	
71	51

- Total Mandatory credits for second major: 122
- Pre-Requisites: ESO225 (8 credits); TA201, TA202 (3 +3 credits)

13.6 Minors in Material Science and Engineering

Can be given in any of the three streams if student completes 18 or more credits in a particular stream (Stream names to be revised later, and courses in individual streams would be revised and communicated later)

- Devices and Bio-Engineering Stream
- Structure-Characterization Stream
- Metals Processing Stream

14.0 Templates for programs in Mechanical Engineering (ME)

14.1 Template for BT Program in Mechanical Engineering

Template for 3rd to 8th semester for BT Program in Mechanical Engineering					
Semester 3	**Semester 4**	**Semester 5**	**Semester 6**	**Semester 7**	**Semester 8**
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	SCHEME HSS-II (9)	--	SCHEME HSS-II (9)	SCHEME HSS-II (9)
ESC201 (14)	ME231 (8)	ME333 (3)	ME334 (4)	OE-1 (9)	OE-5 (9)
MSO202M (6)	ME222 (6)	ME301 (9)	ME302 (9)	OE-2 (9)	OE-6 (9)
MSO203M (6)	ME252 (9)	ME341 (9)	ME354 (9)	OE-3 (9)	DE-2 (9)
ESO201 (11)	ESO202 (11)	ME321 (9)	ME331 (9)	OE-4 (6)	DE-3/UGP-2 (9)
ME209 (9)	ME261 (7)	ME361 (7)	ME371 (9)	DE-1/UGP-1 (9)	
		ME381 (7)	ME351 (8)		
			MEXXX (9) - One course from Basket*		
55-57	**50-52**	**53**	**57**	**51**	**45**

* DC Basket (MEXXX): 3 to 4 electives courses will be designated every even semester

List of courses		
Course Number	Name of the course	Remarks
ME209 (3-0-0-0) [9]	Dynamics	New course
ME231 (2-1-0-0) [8]	Fluid Mechanics	Revised ME231A [10]
ME301 (3-0-0-0) [9]	Energy Systems I	Revised ME301A [6]
ME341 (3-0-0-0) [9]	Heat Transfer	Revised ME341A [10]
ME302 (3-0-0-0) [9]	Energy Systems II	Revised ME401A [10]
ME331 (3-0-0-0) [9]	Advanced Fluid Mechanics	New course
ME261 (2-0-1-0) [7]	Primary Manufacturing Processes	New course
ME361 (2-0-1-0) [7]	Secondary Manufacturing Processes	Revised ME361A [10]
ME371 (3-0-0-0) [9]	Manufacturing Systems	Revised ME461A [9]
ME381 (2-0-1-0) [7]	Robotics	New course
ME222 (2-0-0-0) [6]	Nature and Properties of Materials	Revised ME222 [7]
ME252 (3-0-0-0) [9]	Theory of Mechanisms and Machines	Revised ME352 [7]
ME321 (3-0-0-0) [9]	Introduction to Elasticity	Revised ME321A [7]
ME354 (3-0-0-0) [9]	Vibration and Control	Revised ME354 [10]
ME351 (2-1-0-0) [8]	Design of Machine Elements	Revised ME351A [8]
ME333 (0-0-3-0) [3]	Experiments in Mechanical Engineering-I	New Course
ME334 (0-0-4-0) [4]	Experiments in Mechanical Engineering-II	New Course
ME496 [9]	Undergraduate Project - I	
ME498 [9]	Undergraduate Project- II	

Credit Table for BT Program in Mechanical Engineering		
Course type	Allowable Credit range	Credit in the department template
Institute Core (IC)	112	112
E/SO	18-45	34
Department requirements	144-179	167 (140 DC + 27 DE)
Open electives (OE)	51-57	51
SCHEME	54-58	54-58
Total for 4-year BT/BS	391-420	**418-422***

* **Exceeds the credit range recommended by UGARC**

14.2 Template for BTH Program in Mechanical Engineering

Template for 3rd to 8th semester for BTH Program in Mechanical Engineering					
Semester 3	**Semester 4**	**Semester 5**	**Semester 6**	**Semester 7**	**Semester 8**
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	SCHEME HSS-II (9)	--	SCHEME HSS-II (9)	SCHEME HSS-II (9)
ESC201 (14)	ME231 (8)	ME333 (3)	ME334 (4)	OE-1 (9)	OE-5 (9)
MSO202M (6)	ME222 (6)	ME301 (9)	ME302 (9)	OE-2 (9)	OE-6 (9)
MSO203M (6)	ME252 (9)	ME341 (9)	ME354 (9)	OE-3 (9)	DE-1 (9)
ESO201 (11)	ESO202 (11)	ME321 (9)	ME331 (9)	OE-4 (6)	UGP-2 (9)
ME209 (9)	ME261 (7)	ME361 (7)	ME371 (9)	UGP-1 (9)	DEH-2 (9)
		ME381 (7)	ME351 (8)	DEH-1 (9)	DEH-3 (9)
			MEXXX (9) - One course from Basket*		
55-57	**50-52**	**53**	**57**	**60**	**63**

- DEH: 27 credits of DEs at the level of 6 or 7 must be taken
- **CPI criteria for BTH: 8.0**

14.3 Template for BTM program in Mechanical Engineering

Template for 3rd to 8th semester for BTM Program in Mechanical Engineering					
Semester 3	**Semester 4**	**Semester 5**	**Semester 6**	**Semester 7**	**Semester 8**
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	SCHEME HSS-II (9)	--	SCHEME HSS-II (9)	SCHEME HSS-II (9)
ESC201 (14)	ME231 (8)	ME333 (3)	ME334 (4)	OE-1 (9)	OE-3 (9)
MSO202M (6)	ME222 (6)	ME301 (9)	ME302 (9)	OE-2 (6)	MTB-4 (9)
MSO203M (6)	ME252 (9)	ME341 (9)	ME354 (9)	MTB-1 (9)	MTB-5 (9)
ESO201 (11)	ESO202 (11)	ME321 (9)	ME331 (9)	MTB-2 (9)	MTB-6 (9)
ME209 (9)	ME261 (7)	ME361 (7)	ME371 (9)	MTB-3 (9)	
		ME381 (7)	ME351 (8)		
			MEXXX (9) - One course from Basket*		
55-57	**50-52**	**53**	**57**	**51**	**45**

- 54 credits of MTB courses should be taken from the Management Track Basket

14.4 Template for five-year dual degree program in Mechanical Engineering

Template for dual degree program in Mechanical Engineering (PG Part-Category A)			
7th	8th	9th	10th
DE PG-1 [09]	DE PG-4[09]	M.TECH. THESIS [36]	M.TECH. THESIS [36]
DE PG-2 [09]	DE PG-5[09]	-	-
DE PG-3 [09] OE PG-1 [09]	DE PG-6 [09]/ OE PG-1 [09]		

MINIMUM CREDIT REQUIREMENT IN M.TECH PART FOR GRADUATION

- PG Component : 54 Credits
- Thesis Component : 72 Credits

Template for dual degree program in Mechanical Engineering (PG Part-Category B)				
Sl. No.	Specialization	Compulsory Courses	Elective Credits	Thesis Credits
1.	SOLID MECHANICS AND DESIGN (SMD)	ME621 [9] ME625 [9] ME681 [9]	DE PG-1[09] DE PG-2[09] DE PG-3[09]	M.TECH THESIS [72]
2.	FLUID & THERMAL SCIENCES (FTS)	ME631 [9] ME641 [9] ME642 [9] ME681 [9]	DE PG-1[09] DE PG-2[09]	M.TECH THESIS [72
3.	MANUFACTURING SCIENCES (MFS)	ME661 [9] ME662 [9] ME663 [9] ME681 [9]	DE PG-1[09] DE PG-2[09]	M.TECH THESIS [72]

MINIMUM CREDIT REQUIREMENT IN M.TECH PART FOR GRADUATION

- PG Component : 54 (27 Compulsory +27 Electives) Credits for SMD
- PG Component : 54 (36 Compulsory +18 Electives) Credits for FTS and MFS
- Thesis Component : 72 Credits

14.5 Template for double major: second major in Mechanical Engineering

Template for double major	
Odd Semester	Even Semester
Pre-Requisites	
ESO201A [11] / ESO202A [11]	ESO201A [11] / ESO202A [11]
11	11
ME Mandatory Courses	
ME209 [09]&	ME231 [09]*
ME341 [09]&&	ME252 [09]
ME321 [09]&&&	ME261 [07]**
ME361 [07]	ME302 [09]
	ME354 [09]
	ME331 [09]***
	ME371 [09]
34	61

TOTAL MANDATORY CREDITS FOR SECOND MAJOR IN MECHANICAL ENGINEERING: 95

REMARKS:

1) * Equivalent courses for ME231 are ESO204 or CE261
2) ** Equivalent course for ME261 is MSE305
3) *** Equivalent courses for ME331 are CHE311 or (AE211+AE312)
4) & Equivalent course for ME209 is AE209
5) && Equivalent course for ME341 is CHE312
6) &&& Equivalent course for ME321 is (AE333+AE334)
7) Up to 36 OE credits may be waived from the parent department's BT/BS graduation requirements when they are used to fulfil requirements for the double major.

14.6 Minors in Mechanical Engineering

Minors	
MANUFACTUIRNG SCIENCES	COMPUTATIONAL TECHNIQUES IN MECHANICAL ENIGNEERING
Any THREE from the following	Any THREE from the following
ME661 [09] (Prerequisite TA202)	ME623 [09] (Prerequisite ESO202, MSO203M)
ME662 [09] (Prerequisite TA202)	ME630 [09] (Prerequisite ESO201, ESO204, MSO203M)
ME663 [09] (Prerequisite ESO202, MSO203M)	ME685 [09] (Prerequisite- No backlog in core courses)
ME664 [09] (Prerequisite TA202, ESO204 or an equivalent course in Heat Transfer)	ME751 [09] (Prerequisite TA101)
ME665 [09] (Prerequisite TA202)	ME676 [09] (Nonlinear Finite Element Method in Solid Mechanics)
ME774 [09] (Prerequisite ESO202, MSO203B)	ME653 [09] (Atomistic Simulations in Engineering)
ME751 [09] (Prerequisite TA101)	-
ME761 [09] (Prerequisite TA202)	
27	27

15.0 Templates for programs in Chemistry (CHM)

15.1 Template for BS program in Chemistry

Template for 3rd to 8th semester for BS program in Chemistry					
Semester 3	**Semester 4**	**Semester 5**	**Semester 6**	**Semester 7**	**Semester 8**
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)	CHM303 (9)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)
CHM201 (9)	ESC201 (14)	CHM305 (6)	CHM322 (9)	DE-2 (9)	UGP-4 (9) (CHM492)/DE-4 (9)
CHM221 (9)	CHM202 (9)	CHM321 (9)	CHM342 (9)	UGP-3 (9) (CHM491)/DE-3 (9)	OE-3 (9)
CHM241 (9)	CHM222 (9)	CHM345 (9)	CHM344 (6)	OE-1 (9)	OE-4 (9)
E/SO (≥ 9) Or Two E/SO (≥ 6)*	CHM242 (9)	CHM361 (6)	CHM402 (9)	OE-2 (9)	OE-5 (9)
		UGP-1 (4) (CHM391)	CHM324 (6)		OE-6 (9)
		E/SO (≥ 9)	UGP-2 (9) (CHM392)/DE-1 (9)		
45-50	50-52	52	57	45	54

Footnote:

*If students are taking ESOs with credit ≥ 6, then it can be taken over two semesters.

One UGP is compulsory. Students may choose one out of three nine credit UGPs

List of courses		
Course No:	Title	Remarks
CHM201 (3-0-0-0) [9]	Basic Organic Chemistry-I	Same as CHM201A
CHM221 (3-0-0-0) [9]	Basic Physical Chemistry-I	New Course
CHM241 (3-0-0-0) [9]	Basic Inorganic Chemistry-I	New Course
CHM202 (3-0-0-0) [9]	Basic Organic Chemistry-II	Same as CHM202A
CHM242 (3-0-0-0) [9]	Basic Inorganic Chemistry-II	Revised CHM242A [9]
CHM222 (3-0-0-0) [9]	Basic Physical Chemistry-II	Revised CHM222A [9]
CHM303 (3-0-0-0) [9]	Organic Chemistry-I	Same as CHM303A
CHM321 (3-0-0-0) [9]	Physical Chemistry-I	Same as CHM321A
CHM345 (3-0-0-0) [9]	Inorganic Chemistry-I	Same as CHM345A
CHM305 (0-0-6-0) [6]	Organic qualitative and quantitative analysis	Same as CHM305A
CHM361 (2-0-0-0) [6]	Chemistry Communication Skills	Revised CHM361A [2]
CHM322 (3-0-0-0) [9]	Physical Chemistry-II	Same as CHM322A
CHM342 (3-0-0-0) [9]	Inorganic Chemistry-II	Same as CHM342A
CHM402 (3-0-0-0) [9]	Organic Chemistry-II	Same as CHM402A
CHM344 (0-0-6-0) [6]	Inorganic Chemistry Laboratory Experiments	Same as CHM344A
CHM324 (0-0-6-0) [6]	Basic Physical Chemistry Laboratory	New course
CHM391 (4)	Under Graduate Project	Same as CHM391A

CHM392 (9)	Under Graduate Project	Same as CHM392A
CHM491 (9)	Under Graduate Project	Same as CHM491A
CHM492 (9)	Under Graduate Project	Same as CHM492A

Credit table for BS program in Chemistry		
Course type	Allowable Credit range	Credits in the department template
Institute Core (IC)	112	112
E/SO	18-45	18-21
Department requirements	144-179	172 (136 DC + 36 DE)
Open electives (OE)	51-57	54
SCHEME	54-58	54-58
Total for 4-year BT/BS	391-420	410-417

15.2 Template for BSH Program in Chemistry

Template for 3rd to 8th semester for BSH program in Chemistry					
Semester 3	**Semester 4**	**Semester 5**	**Semester 6**	**Semester 7**	**Semester 8**
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)	CHM303 (9)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)
CHM201 (9)	ESC201 (14)	CHM305 (6)	CHM322 (9)	DE-2 (9)	UGP-4 (9)** (CHM492)/DE-4 (9)
CHM221 (9)	CHM202 (9)	CHM321 (9)	CHM342 (9)	UGP-3 (9)** (CHM491)/DE-3 (9)	OE-3 (9)
CHM241 (9)	CHM222 (9)	CHM345 (9)	CHM344 (6)	OE-1 (9)	OE-4 (9)
E/SO (≥ 9) Or Two E/SO (≥ 6)*	CHM242 (9)	CHM361 (6)	CHM402 (9)	OE-2 (9)	OE-5 (9)
		UGP-1 (4) (CHM391)	CHM324 (6)		OE-6 (9)
		E/SO (≥ 9)	UGP-2 (9)** (CHM392)/DE-1 (9)		
			DEH-1 (9)	DEH-2 (9)	DEH-3 (9)
45-50	50-52	52	66	54	63

Footnote:

- *If students are taking ESOs with credit ≥ 6, then it can be taken over two semesters.
- ** Two UGPs are compulsory for BSH, and students may choose two out of the three nine credit UGPs.

— Honors course basket (list of courses)

- For BSH, student must do 27 credits of CHM6XXA courses except CHM609A, CHM629A, CHM649A, from the following basket as DEH

- CHM602A, CHM611A, CHM612A, CHM632A, CHM656A, CHM662A, CHM681A, CHM621A, CHM622A, CHM626A, CHM627A, CHM637A, CHM650A, CHM664A, CHM685A, CHM667A, CHM679A, CHM683A, CHM684A, CHM689A, CHM695A, CHM696A, CHM699A, CHM648A, CHM631A, CHM646A, CHM651A, CHM654A, CHM668A, CHM691A, CHM655, CHM682A, CHM645

— CPI criteria for BSH: 8.5

15.3 Template for BSM program in Chemistry

Template for 3rd to 8th semester for BSM program in Chemistry					
Semester 3	**Semester 4**	**Semester 5**	**Semester 6**	**Semester 7**	**Semester 8**
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)	CHM303 (9)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)
CHM201 (9)	ESC201 (14)	CHM305 (6)	CHM322 (9)		OE-3 (9)
CHM221 (9)	CHM202 (9)	CHM321 (9)	CHM342 (9)		
CHM241 (9)	CHM222 (9)	CHM345 (9)	CHM344 (6)	OE-1 (9)	MTB-3 (9)
E/SO (≥ 9) Or Two E/SO (≥ 6)*	CHM242 (9)	CHM361 (6)	CHM402 (9)	OE-2 (9)	MTB-4 (9)
		UGP-1 (4) (CHM391)	CHM324 (6)	MTB-1 (9)	MTB-5 (9)
		E/SO (≥ 9)	UGP-2 (9) (CHM392)/DE-1 (9)	MTB-2 (9)	MTB-6 (9)
45-50	50-52	52	57	45	54

Footnote: *If students are taking ESOs with credit ≥ 6, then it can be taken over two semesters.

15.4 Template for five-year dual degree program in Chemistry

Bachelors-Masters (five-year Dual-degree) program (Category A)			
UG Pre-requisites		PG Components	
Odd Semesters	Even Semesters	Semester 9	Semester 10
CHM503A (6)	CHM443 (6)	CHM611A (9)	MS Project (48)
CHM423 (6)		CHM621A (9)	
		CHM631A (9)	
		DE PG-1 (9)	
		DE PG-2 (9)	
		DE PG-3 (9)	
18	00	54	48

The student needs to finish three courses (CHM503A, CHM443A, CHM423A) as mentioned in the table in odd semester for converting to BS-MS.

— BTH/BSH and BTM/BSM students should be considered eligible for PG programs at par with the students from existing 4-year programs.

If all the necessary courses as per BS template (semester 3rd to semester 8th) are satisfied, then the department permits the BSH and BSM students to convert to BS-MS.

Bachelors-Masters (five-year Dual-degree) program (Category B).		
Mandatory UG Components	PG Components	
	Semester 9	Semester 10
CHM DE-1 (9)	MS Project-1 (24)	MS Project-2 (24)
CHM DE-2 (9)	CHM305 (6)	CHM344 (6)
CHM DE-3 (9)	CHM DE-6 (9)	CHM324 (6)
CHM DE-4 (9)	CHM DE-7 (9)	CHM DE-8 (9)
CHM DE-5 (9)		CHM DE-9 (9)
45	48	54

- Only course required to be taken during semester 3rd to semester 8th are marked in the column “Mandatory UG Components”. No additional pre-requisites are necessary.

15.5 Template for double major: second major in Chemistry

Odd semester courses	**Even semester courses**
CHM201 (9)	CHM202 (9)
CHM221 (9)	CHM222 (9)
CHM241 (9)	CHM242 (9)
CHM303 (9)	CHM324 (6)
CHM305 (6)	CHM342 (9)
CHM321 (9)	CHM344 (6)
51	48

15.6 Minors in Chemistry

Physical Chemistry	**Inorganic Chemistry**	**Organic Chemistry**
CHM221 (9)	CHM241 (9)	CHM201 (9)
CHM222 (9)	CHM242 (9)	CHM202 (9)
	CHM345 (9)	CHM303 (9)
Any two courses from the following: CHM321 (9) CHM322 (9) CHM621A (9) CHM622A (9) CHM626A (9) CHM636A (9) CHM637A (9) CHM650A (9) CHM664A (9) CHM685A (9) CHM689A (9) CHM695A (9) CHM696A (9) CHM697A (9)	Any one course from the following: CHM342 (9) CHM616A (9) CHM631A (9) CHM646A (9) CHM647A (9) CHM651A (9) CHM654A (9) CHM668A (9) CHM691A (9)	Any one course from the following: CHM402 (9) CHM481 (9) CHM602A (9) CHM611A (9) CHM612A (9) CHM662A (9)
36	36	36

16.0 Templates for programs in Earth Sciences (ES)

16.1 Template for BS Program in Earth Sciences

Template for 3rd to 8th semester BS Program in Earth Sciences					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2: EME (09-11)	SCHEME-3: HSS-I (11)	SCHEME HSS-II (09)	SCHEME HSS-II (09)	SCHEME: HSS-II (09)	ES402 (04): Field Geology - III
ESO201 (11): Thermodynamics	ESC201 (14)	ESO204 (11): Fluid Mechanics	ES304 (09): Fundamentals of Remote Sensing and GIS	ES401 (09): Exploration Geophysics	DE-3 (09)
ESO213 (09): Fundamental of Earth Sciences	ES204 (09): Fundamentals of Geophysics	ES301 (06): Fundamentals of Stratigraphy	ES305 (06): Geochemistry	DE-1 (09) / ES497: UGP-II (09)	DE-4 (09)
ES201 (11): Crystallography & Mineralogy	ES205 (09): Sedimentology	ES302 (09): Ore Geology	ES306 (06): Field Geology - II	DE-2 (09)	DE-5 (09) / ES498: UGP-III (09)
ES202 (09): Physical Hydrology	ES206 (11): Igneous & Metamorphic Petrology	ES303 (09): Structural Geology	ES496: UGP-I (0) (Extra credits)	OE-4 (09)	OE-5 (09)
ES203 (06): Geomorphology	ES207 (04): Field Geology - I	OE - 1 (09)	OE-2 (09)		OE-6 (09)
			OE-3 (09)		
55-57	56-58	53	48	45	49

Note: OEs and DEs can be swapped across semesters based on the availability of the desired courses, provided the total credits for the DEs and OEs remain the same as in the template.

List of courses		
Course No:	Title	Remarks
ES201 (3-0-2-0) [11]	Crystallography & Mineralogy	Same as ES311A
ES202 (3-0-0-0) [9]	Physical Hydrology	New course
ES203 (2-0-0-0) [6]	Geomorphology	New course
ES204 (3-0-0-0) [9]	Fundamentals of Geophysics	Same as ES314A
ES205 (2-0-3-0) [9]	Sedimentology	New Course
ES206 (3-0-2-0) [11]	Igneous & Metamorphic Petrology	Same as ES315A
ES207 (0-0-4-0) [4]	Field Geology - I	Revised ES312A [3]
ES301 (2-0-0-0) [6]	Fundamentals of Stratigraphy	New Course
ES302 (2-0-3-0) [9]	Ore Geology	New Course
ES303 (2-0-3-0) [9]	Structural Geology	Same as ES411A
ES304 (2-0-3-0) [9]	Fundamentals of Remote Sensing and GIS	New course
ES305 (2-0-0-0) [6]	Geochemistry	Same as ES413A
ES306 (0-0-6-0) [6]	Field Geology - II	Same as ES414A
ES401 (3-0-0-0) [9]	Exploration Geophysics	Revised ES416A [8]
ES402 (0-0-4-0) [4]	Field Geology - III	Same as ES418A

Credit table for BS program in Earth Sciences		
Course type	Allowable Credit range	Credit in the department template
Institute Core (IC)	112	112
E/SO	18-45	31
Department requirements	144-179	162 (117 DC + 45 DE)
Open electives (OE)	51-57	54
SCHEME	54-58	54-58
Total for 4-year BT/BS	391-420	413-417

16.2 Template for BSH program in Earth Sciences

Template for 3rd to 8th semester BSH program in Earth Sciences					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2: EME (09-11)	SCHEME-3: HSS-I (9-11)	SCHEME HSS-II (09)	SCHEME HSS-II (09)	SCHEME: HSS-II (09)	ES402 (04): Field Geology - III
ESO201 (11): Thermodynamics	ESC201 (14)	ESO204 (11): Fluid Mechanics	ES304 (09): Fundamentals of Remote Sensing and GIS	ES401 (09): Exploration Geophysics	DE-3 (09)
ESO213 (09): Fundamental of Earth Sciences	ES204 (09): Fundamentals of Geophysics	ES301 (06): Fundamentals of Stratigraphy	ES305 (06): Geochemistry	ES497: UGP-II (09) Compulsory	ES498: UGP-III (09) Compulsory
ES201 (11): Crystallography & Mineralogy	ES205 (09): Sedimentology	ES302 (09): Ore Geology	ES306 (06): Field Geology - II	DE-2 (09)	DEH-2 (9)
ES202 (09): Physical Hydrology	ES206 (11): Igneous & Metamorphic Petrology	ES303 (09): Structural Geology	ES496: UGP-I (0) (Extra credits)	OE-4 (09)	DEH-3 (9)
ES203 (06): Geomorphology	ES207 (04): Field Geology - I	OE - 1 (09)	DE-1 (09)	DEH-1 (9)	OE-5 (09)
			OE-2 (09)		OE-6 (09)
			OE-3 (09)		
55-57	56-58	53	57	54	58

- **CPI Criteria for BSH: ≥ 8.5**
- Student should take 27 credits of DEH courses from the Honours Course Basket. Any ES course with course number ES6xx and/or ES7xx can be considered and included within the Honours Course Basket

16.3 Template for BSM program in Earth Sciences

Template for 3rd to 8th semester BSM program in Earth Sciences					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2: EME (09-11)	SCHEME-3: HSS-I (11)	SCHEME HSS-II (09)	SCHEME HSS-II (09)	SCHEME: HSS-II (09)	ES402 (04): Field Geology - III
ESO201 (11): Thermodynamics	ESC201 (14)	ESO204 (11): Fluid Mechanics	ES304 (09): Fundamentals of Remote Sensing and GIS	ES401 (09): Exploration Geophysics	DE-2 (09)
ESO213 (09): Fundamental of Earth Sciences	ES204 (09): Fundamentals of Geophysics	ES301 (06): Fundamentals of Stratigraphy	ES305 (06): Geochemistry	DE-1 (09)	MTB-4 (09)
ES201 (11): Crystallography & Mineralogy	ES205 (09): Sedimentology	ES302 (09): Ore Geology	ES306 (06): Field Geology - II	MTB-2 (09)	MTB-5 (09)
ES202 (09): Physical Hydrology	ES206 (11): Igneous & Metamorphic Petrology	ES303 (09): Structural Geology	MTB-1 (9)	MTB-3 (09)	MTB-6 (09)
ES203 (06): Geomorphology	ES207 (04): Field Geology - I	OE - 1 (09)	OE-2 (09)		OE-3 (09)
55-57	56-58	53	48	45	49

For BSM, 54 credits of courses should be completed from the management Track Basket (MTB)

16.4 Template for five-year dual-degree program in Earth Sciences

Template for 9th and 10th semester of dual-degree program in Earth Sciences (Category A)	
Semester 9	Semester 10
DEPG - 1 (09/11)	MS Project (36) (S/X)
DEPG - 2 (09/11)	
DEPG - 3 (09)	
DEPG - 4 (09)	
DEPG - 5 (09)	
MS Project (09) (S/X)	
54-58	36

- The Department of Earth Sciences will offer BS-MS (5-year Dual Degree Program) under Category A, only.
- The Department of Earth Sciences does not to offer dual-major or minors

17.0 Templates for programs in Economic Sciences (ECO)

17.1 Template for BS program in Economic Sciences

Template for 3rd to 8th semester for BS program in Economic Sciences					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	ECO371 (11): Game Theory	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)
ECO211 (11): Microeconomics I	ESC201 (14)	ECO351 (11): Econometrics II	ECO311 (11): Microeconomics II	DE-3 (9)	DE-6 (9)
ESO/SO-1: HSO201 (11): Applied Probability and Statistics	ECO231 (11): Macroeconomics I	ECO331 (11): Macroeconomics II	DE-2 (9)	DE-4 (9)	DE-7 (9)
ECO101 (11): Economy, Society and Public Policy	ECO251 (11): Econometrics I	ESO/SO-2: ESO207 (12)	OE-2 (9)	DE-5 (9)	OE-5 (9)
ECO271 (11): Optimization	OE–1 (9)	DE-1 (9)	OE-3 (9)	OE-4 (9)	OE-6 (9)
		UGP-1 (4) (extra credits)	UGP-2 (9) (extra credits)	UGP-3 (9) (extra credits)	UGP-4 (9) (extra credits)
53-55	54-56	54	47	45	45

Note: Students may exchange OEs and DEs across semesters, as long as the total credits for the DEs and OEs remain the same as in the template above.

List of courses		
Course No:	Title	Remarks
ECO101 (3-1-0-0) [11]	Economy, Society and Public Policy	New
ECO211 (3-1-0-0) [11]	Microeconomics I	New
ECO231 (3-1-0-0) [11]	Macroeconomics I	New
ECO251(3-1-0-0) [11]	Econometrics I	New
ECO271 (3-1-0-0) [11]	Optimization	New
ECO311 (3-1-0-0) [11]	Microeconomics II	New
ECO331 (3-1-0-0) [11]	Macroeconomics II	New
ECO351 (3-1-0-0) [11]	Econometrics II	New
ECO371 (3-1-0-0) [11]	Game Theory	New

Credit table for BS program in Economic Sciences		
Course type	Allowable Credit range	Credits in the department template
Institute Core (IC)	112	112
E/SO	18-45	23
Department requirements	144-179	162 (99 DC + 63 DE)
Open electives (OE)	51-57	54
SCHEME	54-58	54-58
Total for 4-year BT/BS	391-420	405-409

17.2 Template for the BSH program in Economic Sciences

Template for 3rd to 8th semester for BSH program in Economic Sciences					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	ECO371 (11): Game Theory	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)
ECO211 (11): Microeconomics I	ESC201 (14)	ECO351 (11): Econometrics II	ECO311 (11): Microeconomics II	DE-3 (9)	DE-5 (9)
ESO/SO-1: HSO201 (11): Applied Probability and Statistics	ECO231 (11): Macroeconomics I	ECO331 (11): Macroeconomics II	DE-2 (9)	DE-4 (9)	OE-5 (9)
ECO101 (11): Economy, Society and Public Policy	ECO251 (11): Econometrics I	ESO/SO-2: ESO207 (12)	OE-2 (9)	DEH-2 (9)	OE-6 (9)
ECO271 (11): Optimization	OE–1 (9)	DE-1 (9)	OE-3 (9)	OE-4 (9)	DEH-3 (9)
		UGP-1 (4) (extra credits)	DEH-1 (9)	UGP-2 (9)	UGP-3 (9)
53-55	54-56	54	56	54	54

Note: Students may exchange OEs and DEs across semesters, as long as the total credits for the DEs and OEs remain the same as in the template above.

- For BSH, students must take 27 credits ECO courses numbered 700 and above as DEH
- **CPI criteria for BSH: 8.5**

17.3 Template for BTM program in Economic Sciences

Template for 3rd to 8th semester for BSM program in Economic Sciences					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	ECO371 (11): Game Theory	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)	SCHEME* HSS-II (9)
ECO211 (11): Microeconomics I	ESC201 (14)	ECO351 (11): Econometrics II	ECO311 (11): Microeconomics II	DE-3 (9)	DE-4 (9)
ESO/SO-1: HSO201 (11): Applied Probability and Statistics	ECO231 (11): Macroeconomics I	ECO331 (11): Macroeconomics II	DE-2 (9)	MTB-2 (9)	MTB-5 (9)
ECO101 (11): Economy, Society and Public Policy	ECO251 (11): Econometrics I	ESO/SO-2: ESO207 (12)	OE-2 (9)	MTB-3 (9)	OE-3 (9)
ECO271 (11): Optimization	OE–1 (9)	DE-1 (9)	MTB-1 (9)	MTB-4 (9)	MTB-6 (9)
		UGP-1 (4) (extra credits)	UGP-2 (9) (extra credits)	UGP-3 (9) (extra credits)	UGP-4 (9) (extra credits)
53-55	54-56	54	47	45	45

17.4 Template for five-year dual-degree program in Economic Sciences

BS-MS PG (Category A) from same department	
9th Semester	10th Semester
ECO701A (9): Microeconomics	ECO702A (9): Macroeconomics
ECO704A (9): Econometrics	ECO703A (9): Quantitative Methods
DE-PG1 (9)	DE-PG3 (9)
DE-PG2 (9)	DE-PG4 (9)
MS Project (9)	MS Project (9)
45	45

BS-MS PG (Category B) from other departments			
UG Prerequisites			
Odd Semester	Even Semester	9th Semester	10th Semester
ECO211 (11): Microeconomics I	ECO231 (11): Macroeconomics I	ECO701A (9): Microeconomics	ECO702A (9): Macroeconomics
ECO271 (11): Optimization	ECO101 (11): Economy, Society and Public Policy	ECO704A (9): Econometrics	ECO703A (9): Quantitative Methods
ECO351 (11): Econometrics II	ECO251 (11): Econometrics I	DE-PG1 (9)	DE-PG3 (9)
HSO201 (11): Applied Probability and Statistics/MSO201 (11): Probability and Statistics	ECO311 (11): Microeconomics II	DE-PG2 (9)	DE-PG4 (9)
		MS Project (9)	MS Project (9)
44	44	45	45

17.5 Template for double major: second major in Economic Sciences

Double Major	
Odd Semester	Even Semester
ECO271 (11): Optimization	ECO211 (11): Microeconomics I
ECO371 (11): Game Theory	ECO231 (11): Macroeconomics I
ECO351 (11): Econometrics II	ECO251 (11): Econometrics I
ECO331 (11): Macroeconomics II	ECO311 (11): Microeconomics II
HSO201 (11): Applied Probability and Statistics/MSO201 (11): Probability and Statistics	ECO101 (11) – Economy, Society and Public Policy
55	55
Minimum Mandatory Credits for Second Major in Economics: 110 credits.	

17.6 Minors in Economic Sciences

Students pursuing UG programs of other departments/programs will also have option for a minor in Economics. Courses required to obtain a minor would be:

i. Applied Probability and Statistics (HSO201) OR Probability and Statistics (MSO201) OR {Introduction to Probability Theory (MSO205) and Theory of Statistics (MTH211)}

ii. ECO211: Microeconomics I

iii. ECO231: Macroeconomics I

iv. ECO251: Econometrics I

Note**:** Students should also have taken ECO101: Economy, Society and Public Policy as part of the SCHEME basket or as an Open Elective.

18.0 Templates for programs in Mathematics and Scientific Computing (MSC)

18.1 Template for BS program in Mathematics and Scientific Computing

Template for 3rd to 8th semester for BS program in Mathematics and Scientific Computing					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)	SCHEME-4 HSS-II (9)	MTH305 (11)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)
MTH201 (11)	ESC201 (14)	MTH421 (11)	MTH424 (11)	DE-4 (9)	DE-6 (9)
MTH302 (11)	MTH204 (11)	MTH403 (11)	MTH430 (10)	DE-5 (9)	OE-4 (9)
E/SO-1: MSO205 (11)	MTH301 (11)	E/SO-3: ESO207 (12)	DE-2 (9)	OE-1 (9)	OE-5 (9)
E/SO-2 (9-11)	MTH308 (10)	DE-1 (9)	DE-3 (9)	OE-2 (9)	OE-6 (9)
				OE-3 (9)	
51-55	55-57	52	50	54	45

Note: UGPs are NOT mandatory. However, depending on the consent of supervisor(s), a student may take up to 3 UGPs of 09 credits each against DE/OE (UGP will be counted as OE if taken outside the department as consented by the DUGC) requirements. A student can also take a 4th UGP, that however will NOT be counted towards fulfilling the graduation requirements.

List of courses		
Course No:	Title	Remarks
MTH201 (3-1-0-0) [11]	Linear Algebra	Same as MTH201A
MTH302 (3-1-0-0) [11]	Set Theory and Mathematical Logic	Same as MTH302A
MTH204 (3-1-0-0) [11]	Abstract Algebra	Same as MTH204A
MTH301 (3-1-0-0) [11]	Analysis - I	Same as MTH301A
MTH308 (3-0-1-0) [10]	Numerical Analysis and Scientific Computing - I	Same as MTH308B
MTH421 (3-1-0-0) [11]	Ordinary Differential Equations	Same as MTH421A
MTH403 (3-1-0-0) [11]	Complex Analysis	Same as MTH403A
MTH305 (3-1-0-0) [11]	Several Variable Calculus and Differential Geometry	Same as MTH305A
MTH424 (3-1-0-0) [11]	Partial Differential Equations	Same as MTH424A
MTH430 (3-0-1-0) [10]	Numerical Analysis and Scientific Computing - II	Same as MTH430A

Credit table for BS program in Mathematics and Scientific Computing		
Course type	Allowable Credit range	Credits in the department template
Institute Core (IC)	112	112
E/SO	18-45	32-34
Department requirements	144-179	162 (108 DC + 54 DE)
Open electives (OE)	51-57	54
SCHEME	54-58	54-58
Total for 4-year BT/BS	391-420	414-420

18.2 Template for the BSH program in Mathematics and Scientific Computing

Template for 3rd to 8th semester for BSH program in Mathematics and Scientific Computing					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)	SCHEME-4 HSS-II (9)	MTH305 (11)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)
MTH201 (11)	ESC201 (14)	MTH421 (11)	MTH424 (11)	DE-4 (9)	UGP-2 (9)
MTH302 (11)	MTH204 (11)	MTH403 (11)	MTH430 (10)	OE-1 (9)	OE-4 (9)
E/SO-1: MSO205 (11)	MTH301 (11)	E/SO-3: ESO207 (12)	DE-2 (9)	OE-2 (9)	OE-5 (9)
E/SO-2 (9-11)	MTH308 (10)	DE-1 (9)	DE-3 (9)	OE-3 (9)	OE-6 (9)
				UGP-1 (9)	
			DEH-1 (9)	DEH-2 (9)	DEH-3 (9)
51-55	55-57	52	59	63	54

- **CPI criterion for BSH: 8.5**

Notes:

- A student may take additional UGP-3 of 09 credits against DE/OE (UGP will be counted as OE if taken outside the department as consented by the DUGC) requirements. A student can also take a 4th UGP that however will NOT be counted towards fulfilling the graduation requirements.
- For BSH, student has to do 27 credits of DEH courses from the Honors course basket given below.

Honors Course Basket

Course ID	Title
MTH 604A	Differential calculus on R^n
MTH 611A	Algebra II
MTH 612A	Introduction to commmutative algebra
MTH 613A	Rings and modules
MTH 614A	Introduction to Stochastic Calculus
MTH 621A	Fourier analysis
MTH 624A	Differential manifolds and Lie groups
MTH 628A	Topics in Topology
MTH 631A	Approximation theory
MTH 633A	An introduction to hyperbolic geometry
MTH 635A	Introduction to operator theory
MTH 640A	Several complex variables
MTH 641A	Introduction to Lie algebra and representation theory
MTH 642A	Model theory
MTH 644A	Complex function theory
MTH 648A	Differential geometry
MTH 649A	Algebraic topology I
MTH 655A	Parallel numerical methods
MTH 656A	Sobolev spaces and applications
MTH 657A	Graphs and matrices
MTH 658A	Nonlinear dynamical systems
MTH 662A	Chevalley groups and algebraic groups
MTH 663A	Analytical techniques for PDEs
MTH 665A	Asymptotic statistics
MTH 666A	Category theory
MTH 667A	Introduction to algebaric geometry and algebraic groups
MTH 668A	Analytic number theory

MTH 669A	Ergodic theory and applications to metric number theory
MTH 671A	Introduction to arithmetic geometry
MTH 673A	Robust statistical methods
MTH 675A	Geometry of differential forms
MTH 676A	Econometrics
MTH 678A	Techniques in combinatorics
MTH 679A	Spatio-temporal models in mathematical biology
MTH 681A	Statistical decision theory
MTH 682A	Order statistics
MTH 684A	Statistical simulation, data analysis & model building
MTH 686A	Nonlinear regression
MTH 688A	Topics in arithmetic
MTH 689A	Linear and nonlinear models
MTH 690A	Probabilistic theory of pattern recognition
MTH 695A	Empirical processes
MTH 701A	Modal logic
MTH 707A	Markov chain Monte Carlo
MTH 712A	A first course in algebraic number theory
MTH 713A	Differential topology
MTH 716A	Introduction to geometric analysis
MTH 717A	ANN/ML approach for differential equations
MTH 719A	Introduction to homogenization
MTH 720A	Numerical Solutions of Integral Equations
MTH 721A	Computational mathematical finance
MTH 722A	Introduction to homotopy theory
MTH 731A	Introduction to Coxeter groups
MTH 732A	Representation theory of finite groups
MTH 734A	Banach algebras, C*-algebras and spectral theory
MTH 759A	Algebraic topology II
MTH 761A	Vector bundles & characteristic classes
MTH 770A	Numerical techniques for nonlinear dynamical systems
MTH 781A	Statistical pattern recognition
MTH 784A	Statistical reliability theory

18.3 Template for BSM program in Mathematics and Scientific Computing

Template for 3rd to 8th semester for BSM program in Mathematics and Scientific Computing					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)	SCHEME-4 HSS-II (9)	MTH305 (11)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)
MTH201 (11)	ESC201 (14)	MTH421 (11)	MTH424 (11)	OE-1 (9)	OE-3 (9)
MTH302 (11)	MTH204 (11)	MTH403 (11)	MTH430 (10)	OE-2 (9)	MTB-4 (9)
E/SO-1: MSO205 (11)	MTH301 (11)	E/SO-3: ESO207 (12)	DE-2 (9)	MTB-1 (9)	MTB-5 (9)
E/SO-2 (9-11)	MTH308 (10)	DE-1 (9)	DE-3 (9)	MTB-2 (9)	MTB-6 (9)
				MTB-3 (9)	
51-55	55-57	52	50	54	45

18.4 Template for five-year dual-degree program Mathematics and Scientific Computing

BS-MS PG Part – Category A (from the same program)			
COURSES			
Semester 9		Semester 10	
MS Project (PGP-1, PGP-2)	18	MS Project (PGP-3, PGP-4)	18
DE PG - 1	09	DE PG - 3	09
DE PG - 2	09	DE PG - 4	09
OE PG – 1/DE PG-5	09	OE PG – 2/DE PG-6	09
Total	45		45

Minimum credits in MS part for graduation: 90

BS-MS PG Part – Category B (from other programs)					
UG pre-requisites		PG Requirements			
Odd Semester	Even Semester	IX Semester		X Semester	
MTH201 (11)	MTH204 (11)	MS Project (PGP-1, PGP-2)	18	MS Project (PGP-3, PGP-4)	18
MTH302 (11)	MTH301 (11)	DE PG - 1	09	DE PG - 3	09
MTH305 (11)	MTH308 (10)	DE PG - 2	09	DE PG - 4	09
MTH403 (11)	MTH421 (11)	OE PG – 1/DE PG-5	09	OE PG – 2/DE PG-6	09
MTH424 (11)	MTH430 (10)				
55	53		45		45

18.5 Template for double major: second major in Mathematics and Scientific Computing

Double Major	
Odd Semester	Even Semester
Pre-Requisites	
ESO 207 (12)	MSO201 (11) or MSO 205 (11) – Introduction to Probability Theory (Odd Semester)
Mandatory MTH Courses	
MTH201 (11)	MTH204 (11)
MTH302 (11)	MTH301 (11)
MTH305 (11)	MTH308 (10)
MTH403 (11)	MTH421 (11)
MTH424 (11)	MTH430 (10)
55	53

19.0 Templates for programs in Statistics and Data Sciences (SDS)

19.1 Template for the BS program in Statistics and Data Sciences

Template for 3rd to 8th semester BS program in Statistics and Data Sciences					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	MTH442 (10)	SCHEME-4 HSS-II (9)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)
ESC201 (14)	MTH211 (11)	MTH441 (10)	MTH422 (10)	DE-1 (9)	DE-4 (9)
MTH301 (11)	MTH210 (10)	E/SO-3: ESO207 (12)	MTH314 (10)	DE-2 (9)	DE-5 (9)
ESO/SO-1: MSO205 (11)	MTH212M (06) Modular 1st half)	E/SO-4 MSO202M (6)	MTH312 (5)	DE-3 (9)	OE-5 (9)
MTH207M (6) (Modular 2nd half)	MTH209 (5)		MTH443 (10)	OE-3 (9)	OE-6 (9)
MTH208 (05)	ESO/SO-2 (9)	OE-1 (09)	OE-2 (09)	OE-4 (9)	
56-58	50-52	47	53	54	45

- **Note 1:** UGPs are NOT mandatory. However, depending on the consent of supervisor(s), a student may take up to 3 UGPs of 09 credits each against DE/OE (UGP will be counted as OE if taken outside the department as consented by the DUGC) requirements. A student can also take a 4th UGP, that however will NOT be counted towards fulfilling the graduation requirements.
- **Note 2:** *(As per the existing Senate approved program)* Up to 45 credits of internships in lieu of open electives can be taken. This can be done through the courses MTH321 Internship I, MTH322 Internship II, MTH323 Internship III, MTH324 Internship IV, MTH325 Internship V, of 9 credits each. One would have an option to earn 45 credits of OE through internship courses by spending a full semester in an industry or may do online internships (under one or more OEs) from industry, spread across different semesters. The process for enrolling in the internship courses is as follows: the student identifies a viable internship opportunity in the general realm of statistics and data science and identifies a supervisor in the MTH department. The student, in consultation with the host industry/organization submits a proposal to the Department Undergraduate Committee (DUGC) with the approval of the industry liaison and the departmental supervisor, upon which it will be evaluated for approval and requisite number of credits (in multiples of 9) will be decided. The grading scheme for the internship courses will be S/X.

List of courses		
Course No:	Name	Remarks
MTH301 (3-1-0-0) [11]	Analysis-I	Same as MTH301A
MTH207M (3-1-0-0) [6]	Matrix Algebra and Linear Estimation (Module - II)	New
MTH208 (0-0-3-2) [5]	Data Science Lab 1	New
MTH209 (1-0-2-0) [5]	Data Science Lab 2	New
MTH210 (3-0-1-0) [10]	Statistical Computing	New
MTH211 (3-1-0-0) [11]	Theory of Statistics	New
MTH212M (3-1-0-0) [6]	Elementary Stochastic Processes I	New

MTH441 (3-0-1-0) [10]	Linear Regression and ANOVA	New
MTH442 (3-0-1-0) [10]	Time Series Analysis	New
MTH312 (1-0-2-0) [5]	Data Science Lab 3	New
MTH314 (3-0-1-0) [10]	Multivariate Analysis	New
MTH443 (3-0-1-0) [10]	Statistical & AI Techniques in Data Mining	New
MTH422 (3-0-1-0) [10]	An Introduction to Bayesian Analysis	New
MTH321 (0-0-0-9) [9]	Internship I	New
MTH322 (0-0-0-9) [9]	Internship II	New
MTH323 (0-0-0-9) [9]	Internship IIII	New
MTH324 (0-0-0-9) [9]	Internship IV	New
MTH325 (0-0-0-9) [9]	Internship V	New

Credit table for BS program in Statistics and Data Sciences		
Course type	Allowable Credit range	Credits in the department template
Institute Core (IC)	112	112
E/SO	18-45	38
Department requirements	144-179	154 (109 DC + 45 DE)
Open electives (OE)	51-57	54
SCHEME	54-58	54-58
Total for 4-year BT/BS	391-420	412-416

19.2 Template for the BSH program in Statistics and Data Sciences

Template for 3rd to 8th semester BSH program in Statistics and Data Sciences					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	MTH442 (10)	SCHEME-4 HSS-II (9)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)
ESC201 (14)	MTH211 (11)	MTH441 (10)	MTH422 (10)	DE-1 (9)	DE-2 (9)
MTH301 (11)	MTH210 (10)	E/SO-3: ESO207 (12)	MTH314 (10)	OE-3 (9)	DE-3 (9)
ESO/SO-1: MSO205 (11)	MTH212M (06) Modular 1st half)	E/SO-4 MSO202M (6)	MTH312 (5)	OE-4 (9)	OE-6 (9)
MTH207M (6) (Modular 2nd half)	MTH209 (5)		MTH443 (10)	OE-5 (9)	UGP-2 (9)
MTH208 (05)	ESO/SO-2 (9)	OE-1 (09)	OE-2 (09)	UGP-1 (9)	
			DEH-1 (9)	DEH-2 (9)	DEH-3 (9)
56-58	50-52	47	62	63	54

- **CPI Criterion for BSH: 8.5**
- **Note 1:** A student may take additional UGP3 of 09 credits against DE/OE (UGP will be counted as OE if taken outside the department as consented by the DUGC) requirements. A student can also take a 4th UGP that however will NOT be counted towards fulfilling the graduation requirements.
- **Note 2:** *(As per the existing Senate approved program)* Up to 45 credits of internships in lieu of open electives can be taken. This can be done through the courses MTH321 Internship I, MTH322 Internship II, MTH323 Internship III, MTH324 Internship IV, MTH325 Internship V, of 9 credits each. One would have an option to earn 45 credits of OE through internship courses by

spending a full semester in an industry or may do online internships (under one or more OEs) from industry, spread across different semesters. The process for enrolling in the internship courses is as follows: the student identifies a viable internship opportunity in the general realm of statistics and data science and identifies a supervisor in the MTH department. The student, in consultation with the host industry/organization submits a proposal to the Department Undergraduate Committee (DUGC) with the approval of the industry liaison and the departmental supervisor, upon which it will be evaluated for approval and requisite number of credits (in multiples of 9) will be decided. The grading scheme for the internship courses will be S/X.

- For BSH, student has to do 27 credits of DEH courses from the Honors course basket given below.

Honors Course Basket (SDS-BSH)

- MTH614A - Introduction to Stochastic Calculus
- MTH 657A – Graph Theory
- MTH665A – Asymptotic Statistics
- MTH 673A - Robust Statistical Methods
- MTH 676A - Econometrics
- MTH 681A - Statistical Decision Theory
- MTH 682A - Order Statistics
- MTH684A – Statistical Simulation, Data Analysis & Model Building
- MTH 686A - Nonlinear Regression
- MTH 689A - Linear & Nonlinear Models
- MTH690A- Probabilistic Theory of Pattern Recognition
- MTH 695A - Empirical Processes
- MTH 707A - Markov Chain Monte Carlo
- MTH 717A - ANN/ML Approach for Differential Equations
- MTH 781A - Statistical Pattern Recognition
- MTH 784A - Statistical Reliability Theory

19.3 Template for BSM program in Statistics and Data Sciences

Template for 3rd to 8th semester BSM program in Statistics and Data Sciences					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 HSS-I (9-11)	SCHEME-3 EME (9-11)	MTH442 (10)	SCHEME-4 HSS-II (9)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)
ESC201 (14)	MTH211 (11)	MTH441 (10)	MTH422 (10)	DE-1 (9)	DE-2 (9)
MTH301 (11)	MTH210 (10)	E/SO-3: ESO207 (12)	MTH314 (10)	OE-2 (9)	OE-3 (9)
ESO/SO-1: MSO205 (11)	MTH212M (06) Modular 1st half)	E/SO-4 MSO202M (6)	MTH312 (5)	MTB-2 (9)	MTB-5 (9)
MTH207M (6) (Modular 2nd half)	MTH209 (5)		MTH443 (10)	MTB-3 (9)	MTB-6 (9)
MTH208 (05)	ESO/SO-2 (9)	OE-1 (09)	MTB-1 (9)	MTB-4 (9)	
56-58	50-52	47	53	54	45

19.4 Template for five-year dual-degree program in Statistics and Data Sciences

BS-MS PG Part – Category A (from the same program)					
COURSES					
IX Semester			X Semester		
MS Project – (PGP 1, PGP 2)		18	MS Project - (PGP 3, PGP 4)		18
DE PG - I		09	DE PG-II		09
OE PG - I		09	OE PG-III		09
OE PG - II		09	OE PG - IV		09
Total		45			45

Minimum credit requirement in MS part for graduation: 90

BS-MS PG Part – Category B (from other programs)					
UG Pre-Requisites					
Odd Semester			Even Semester		
MTH301 – Analysis I		11	MTH211 – Theory of Statistics		11
			MTH210 – Statistical Computing		10
MTH207M – (Modular) Matrix Algebra and Linear Estimation (module II)		06	MTH212M – (Modular) Elementary Stochastic Processes-I		06
MTH442- Time Series Analysis		10	MTH422-An Introduction to Bayesian Analysis		10
MTH441 – Linear Regression and ANOVA		10	MTH314 – Multivariate Analysis		10
MTH208 - Data Science Lab I		05	MTH443-Statistical & AI Techniques in Data Mining		10
			MTH209 – Data Science Lab II		05
			MTH312 – Data Science Lab III		05
Total		42			67
PG Requirement					
Odd Semester			Even Semester		
MS Project – (PGP 1, PGP 2)		18	MS Project - (PGP 3, PGP 4)		18
DE PG - I		09	DE PG-II		09
OE PG - I		09	OE PG-III		09
OE PG - II		09	OE PG - IV		09
Total		45			45

19.5 Minors in in Statistics and Data Sciences

Statistics and Data Science

1. MSO 205 - Introduction to Probability Theory **or** MSO201 **or** HSO 201 **or** CS 203

2. MTH 211 - Theory of Statistics

3. MTH 441 - Linear Regression and ANOVA

4. MTH 208 – Data Science Lab I

The incoming strength would be limited to 20% of the sanctioned strength of the program as per section 10.6.4 of UG manual.

20.0 Templates for programs in Physics (PHY)

20.1 Template for BS program in Physics

Template for 3rd to 8th semester for BS program in Physics					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)	SCHEME-4 HSS-II (9)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)	
PHY224 (12)	ESC201 (14)	PHY315 (9)	PHY412 (11)	PHY461 (8)	DE-5/UGP-3 (9)
E/SO-1 (12) (MSO202M§, MSO203M§)	PSO201 (8)	PHY421 (11)	DE-2 (9-12) (PHY617§- old PHY473A)	DE-3 (9)	DE-6 (9)
OE-1 (9)	PHY210M (6)	PHY431 (11)	PHY552 (11)	DE-4/UGP-2 (9)	DE-7 (9)
PHY401 (11)	PHY226M (6)	DE-1 (9)	OE-2 (9)	OE-3 (9)	OE-5 (9)
	E/SO-2 (9-11) (MSO201§)	PHY600A (3)	UGP-1 (4) (Optional)	OE-4 (9)	OE-6 (9)
53-55	52-56	52	49-52	53	45

§ These courses are suggested; however, students can take other courses in the E/SO basket also such that total credits including PSO201 is at least 29.

List of revised courses		
Course No:	Name	Old course numbers
PHY224 (3-0-3-0) [12]	Optics	PHY224A
PHY401 (3-1-0-0) [11]	Classical Mechanics-I	PHY401A
PHY210M (3-1-0-0) [6]	Thermal Physics	PHY210A
PHY226M (3-1-0-0) [6]	Relativity	PHY226B
PHY315 (1-0-6-0) [9]	Modern Physics Laboratory	PHY315A
PHY421 (3-1-0-0) [11]	Mathematical Methods-I	PHY421A
PHY431 (3-1-0-0) [11]	Quantum Mechanics-I	PHY431A
PHY600A (0-1-1-0) [3]	Introduction to Profession and Communication Skills for Physicists	PHY399A/ PHY400A
PHY412 (3-1-0-0) [11]	Statistical Mechanics	PHY412A
PHY552 (3-1-0-0) [11]	Classical Electrodynamics-I	PHY552A
PHY461 (0-0-8-0) [8]	Experimental Physics-I	PHY461A
PHY611A (3-0-0-2) [11]	Introduction to Nuclear and Particle Physics	PHY526A [11]
PHY612A (3-0-0-2) [11]	Atomic, Molecular and Optical Physics	PHY524A [11]
PHY614A (3-0-0-0) [9]	Classical Electrodynamics II	PHY553A [11]
PHY617A (3-0-3-0) [12]	Computational Physics	PHY473A [11]
PHY623A (3-0-0-2) [11]	Condensed Matter Physics	PHY543A [11]
PHY625A (3-0-0-2) [11]	Mathematical Methods II	PHY422A [11]
PHY626A (3-0-0-2) [11]	Quantum Mechanics II	PHY432A [11]
PHY628A (3-0-0-2) [11]	Physics of Soft Matter and Fluids	New course

Credit table for BS program in Physics		
Course type	Allowable Credit range	Credits in the department template
Institute Core (IC)	112	112
E/SO	18-45	29
Department requirements	144-179	162-164 (99 DC + 63-65 DE)
Open electives (OE)	51-57	54
SCHEME	54-58	54-58
Total for 4-year BT/BS	391-420	411-417

20.2 Template for BSH program in Physics

Template for 3rd to 8th semester for BSH program in Physics					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)	SCHEME-4 HSS-II (9)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)	
PHY224 (12)	ESC201 (14)	PHY315 (9)	PHY412 (11)	PHY461 (8)	UGP-3 (9)
E/SO-1 (12) (MSO202M§, MSO203M§)	PSO201 (8)	PHY421 (11)	DE-2 (9-12) (PHY617§- old PHY473A)	DE-3 (9)	DE-4 (9)
OE-1 (9)	PHY210M (6)	PHY431 (11)	PHY552 (11)	UGP-2 (9)	DE-5 (9)
PHY401 (11)	PHY226M (6)	DE-1 (9)	OE-2 (9)	OE-3 (9)	OE-5 (9)
	E/SO-2 (9-11) (MSO201§)	PHY600A (3)		OE-4 (9)	OE-6 (9)
			DEH-1 (9-11)	DEH-2 (9-11)	DEH-3 (9-11)
53-55	52-56	52	58-64	62-64	54-56

§ These courses are suggested; however, students can take other courses in the E/SO basket also such that total credits including PSO201 is at least 29.

- DEH from the basket of: PHY626A(432A), PHY625A(422A), PHY612A(524A), PHY623A(543A), PHY628A, PHY681A (Old course numbers in bracket)
- **CPI criteria for BSH: 8.5**

20.3 Template for BSM program in Physics

Template for 3rd to 8th semester for BSM program in Physics					
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)	SCHEME-4 HSS-II (9)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)	
PHY224 (12)	ESC201 (14)	PHY315 (9)	PHY412 (11)	PHY461 (8)	DE-3 (9-11)
E/SO-1 (12) (MSO202M§, MSO203M§)	PSO201 (8)	PHY421 (11)	DE-1 (9-11)	DE-2 (9-11)	DE-4 (9-11)
OE-1 (9)	PHY210M (6)	PHY431 (11)	PHY552 (11)	OE-3 (9)	MTB-4 (9)
PHY401 (11)	PHY226M (6)	OE-2 (9)	MTB-1 (9)	MTB-2 (9)	MTB-5 (9)
	E/SO-2 (9-11) (MSO201§)	PHY600A (3)	UGP-1 (4) (Optional)	MTB-3 (9)	MTB-6 (9)
53-55	52-56	52	51	53	46

§ These courses are suggested; however, students can take other courses in the E/SO basket also such that total credits including PSO201 is at least 29.

20.4 Template for five-year dual-degree program

BS Template for 3rd to 8th semester							
Semester 3	Semester 4	Semester 5	Semester 6	Semester 7	Semester 8	Semester 9	Semester 10
SCHEME-2 EME (9-11)	SCHEME-3 HSS-I (9-11)	SCHEME-4 HSS-II (9)	SCHEME-5 HSS-II (9)	SCHEME-6 HSS-II (9)		DEPG-1 [9]	DEPG-2 [9]
PHY224 (12)	ESC201 (14)	PHY315 (9)	PHY412 (11)	PHY461 (8)	DE-5/ UGP-3 (9)	OEPG-1 [9]	OEPG-2 [9]
E/SO-1 (12) (MSO202M§, MSO203M§)	PSO201 (8)	PHY421 (11)	DE-2 (9-12) (PHY617§-old PHY473A)	DE-3 (9)	DE-6 (9)	PHY563 [11]	PHY566 [11]
OE-1 (9)	PHY210M (6)	PHY431 (11)	PHY552 (11)	DE-4 / UGP-2 (9)	DE-7 (9)	PHY565 [11]	PHY568 [11]
PHY401 (11)	PHY226M (6)	DE-1 (9)	OE-2 (9)	OE-3 (9)	OE-5 (9)		
	E/SO-2 (9-11) (MSO201§)	PHY600A (3)	UGP-1 (4) (Optional)	OE-4 (9)	OE-6 (9)		
53-55	52-56	54	49-52	53	45	40	40

§ These courses are suggested; however, students can take other courses in the E/SO basket also such that total credits including PSO201 is at least 29.

BS-MS: UG-requirements: (old course numbers in bracket)

1. Category A: PHY625A(422A)/PHY692A; PHY626A(432A); PHY462; 1 of the *DE
2. Category B: PSO201/PHY114; PHY210M (or an equivalent course)/ PHY226M; PHY401; PHY412; 1 of the *DE; PHY552; PHY421 (or an equivalent course); PHY625A(422A)/PHY692A; PHY431; PHY626A(432A); PHY461; PHY462.
3. *DE courses basket: PHY 612A(524A), PHY611A(526A), PHY623A(543A), PHY628A, PHY681A.

20.5 Template for the double major: second major in Physics

PSO201/PHY114; PHY210M (or an equivalent course)/ PHY226M; PHY401; PHY412; PHY552; PHY421 (or an equivalent course); PHY431; PHY461

20.6 Minors in Physics

1. Quantum Mechanics: PSO 201/PHY114, PHY210M, PHY226M, PHY431
2. Statistical Mechanics: PSO 201/PHY114, PHY210M, PHY226M, PHY412
3. Soft Matter: PHY210M, PHY205M, PHY412, PHY628
4. Gravity: PSO 201/PHY114, PHY210M, PHY226M, PHY407

21.0 Exit Options Degree (EOD)

21.1 UGARC2020 Recommendations

Some of the relevant points from UGARC2020 recommendations are exactly reproduced below for the sake of completeness of this report.

- *The name of the exit option degree (here EOD) would be finalized by the Senate or the implementation committee*
- *It has been clearly stated that the Exit Option (EOD) will only be initiated by the student and not by the ACG or any other body. Thus, the students cannot be coerced into taking the exit option*
- *Maximum Residency: The maximum residency will be fixed at 1.5 times the normal duration. Hence, for students admitted to BT/BS program, it would be 6 years (even after they take the alternative degree option). A student may not register beyond this time period with residential facility.*
- *Template for Exit Option Degree*

Course Group	*Credits*
Institute Core (IC)	*Minimum 60 credits (with at least one each in Maths, Physics, Chemistry and 2 labs)*
E/SO	*Minimum 18 credits*
SCHEME	*Minimum 36 credits (at least one course in English)*
Department Compulsory (DC)	*Minimum 60 credits (Suggested to complete all labs)*
DE+OE	*Balance*
Total	*300 credits*

- *In this degree, students would complete a large fraction of the original template. Students will complete minimum of 60 IC credits, min 60 DC credits. Along with this, students will be required to complete some E/SO and HSS credits. This will cover a minimum of 174 credits. Remaining credits can be completed by available DEs and OEs. This will give flexibility to students to design their program as per their interest. Since students would have completed most of 75% of the requirements of their original template, this degree can be equated with B.Sc in Engineering. However, any particular department need not be associated with this degree and the degree can be simply called BE (pass). This course template is tentative and shows various baskets of HSS, IC, ESO. Departments will broaden their course baskets and will offer courses mentioned in the respective baskets.*

21.2 Proposed credit table for EOD

The UGARC implementation committee proposes the following credit requirements for the different course baskets for EOD.

Course Group	*Credits acquired*	*Remarks*
Institute Core (IC)	*A*	*Minimum 60 credits (with at least one each in Maths, Physics, Chemistry and 2 labs)*
E/SO	*B*	*Minimum 18 credits*
SCHEME	*C*	*Minimum 36 credits (at least one course in English)*
Department Compulsory (DC)	*D*	*Minimum 60 credits (Suggested to complete all labs)*
DE+OE	*300-(A+B+C+D)*	*The student should acquire these credits through DEs and/or OEs*
Total	*300*	

21.3 Names proposed for EOD

The implementation committee deliberated on this topic and kept the following in consideration while proposing the name for EOD

- Degree should be honorable to the recipient
- Should be distinct from the regular BT/BS degree of IITK

Keeping these points in consideration, the following options are proposed

Option: 1

- For students admitted to any department offering BT program, the proposed name is

  Bachelors in General Engineering
- The degree certificate will mention the following.

  (Name of the candidate) was admitted to the regular four-year Bachelor of Technology program in (Mechanical) Engineering, however opted to graduate after acquiring a reduced number of credits. Please refer to the transcript for the details of the credits acquired by the candidate.
- For students admitted to any department offering BS program, the proposed name is

  Bachelors in General Sciences
- The degree certificate will mention the following.

  (Name of the candidate) was admitted to the regular four-year Bachelor of Science program in (Statistics and Data Sciences), however opted to graduate after acquiring a reduced number of credits. Please refer to the transcript for the details of the credits acquired by the candidate.