CURRICULUM

OF

B. TECH., B. TECH. WITH HONORS, B. TECH. + M. TECH. DUAL DEGREE AND MINOR PROGRAMS

IN

AEROSPACE ENGINEERING, IIT BOMBAY

FOR

BATCH OF 2022

(Updated 28th July, 2025)

1. Preamble

The B. Tech. programme of the department of aerospace engineering aims to provide generic engineering training, along with some specialism pertinent to aerospace engineering at the undergraduate level. The B. Tech. + M. Tech. Dual Degree programme (called Dual Degree programme from here onwards) provides additional higher level training at the Masters level. The programmes are designed to achieve the above stated objectives, through a set of generic (or common) courses in basic sciences and general engineering, specific core courses in aerospace sciences and a basket of elective courses to provide next level of training for highly motivated and committed B. Tech. and Dual Degree students. In addition, emphasis is laid on the HASMED component comprising of compulsory as well as optional courses from the disciplines of Humanities, Arts, Social Sciences, Management, Entrepreneurship and Design. The programme also has sufficient flexibility for students to explore various disciplines as per individual interests and requirements.

Sections below provide the details of the curriculum, including its semester-wise structure, elective sets and detailed course contents.

2. Programme Structure & Credit Requirements

The prescribed B. Tech. programme in Aerospace Engineering consists of 264 credits. The option of B. Tech. Honors programme is also available by taking an additional 24 credits. The Dual Degree programme requires students to earn 96 credits of Master's degree requirement, apart from the prescribed B. Tech. programme as well as the Honors programme. Undergraduate students from other departments can take the Minor programme that consists of a set of five courses (30 credits); of these, one is a compulsory course to be taken first, and the remaining four can be chosen from a basket of courses that may change each semester.

The semester-wise breakdown of the credits for the B. Tech. and Dual Degree programmes are given in Table I, along with the Honors requirements. The first three years of the B. Tech. and Dual Degree programmes are common. However, the initiation of the Honors programme starting with the sixth semester is optional for students in the B. Tech. programme but mandatory for those in the Dual Degree programme. Recommendations on the progression of the Minor program also appear in Table I.

3. Options in Prescribed Programme

(a) **Departmental Electives**:

Students are required to take six optional courses, each of 6 credits, from a prescribed basket of departmental courses.

(i) **Theory Courses as Electives**: All the six courses may be taken from the set of theoretical elective courses offered by the Aerospace Department as listed in a separate document (called 'AE Electives'). Courses offered by other departments cannot be taken to meet this requirement. Students should consult faculty advisors/course instructors of the courses before registering for these courses.

(ii) **Supervised Learning**: Students can optionally substitute a maximum of two theoretical electives by a corresponding number of units of Supervised Learning (AE219 & AE419). In this case, each unit has to be registered as any other course, and is required to be performed under the supervision of a guide from the department, over the duration of a semester. In cases where a student takes two units of supervised learning, they must be in different semesters, and may or may not be under the same supervisor. Even when performed under the same supervisor, they may or may not be in continuation. In other words, the two units are to be viewed as operationally independent.

Each supervised learning unit may involve a literature survey (seminar), design / development / fabrication / testing of equipment / prototype, design project, research project, design / development of algorithms / software, collection / analysis of experimental data using sophisticated equipment / methods, or design of an experiment, and is expected to require 6-8 hours of effort per week.

Norms for registration and evaluation for both units of supervised learning will be specified by the supervisor. The availability of supervised learning units depends upon offerings by individual faculty members in their areas of interest. Faculty members may prescribe / expect additional abilities such as skill sets (mathematical / programming etc.) and/or demonstrated interest / motivation from students, in conjunction with the eligibility norms, depending upon the type and area of work involved in each of the supervised learning units.

(b) **STEM Electives**:

Students are required to take *at least* 12 credits[*], from the disciplines of Science, Technology, Engineering and Mathematics outside the Aerospace Engineering department.

(c) **HASMED Electives**:

Students are required to take *at least* 12 credits[*] worth of courses from the disciplines of Humanities, Arts, Social Sciences, Management, Entrepreneurship and Design.

(d) **Flexible Electives**:

Students are required to take *at least* 30 credits worth of courses (typically five courses of 6 credits each, as assumed in the subsequent curriculum charts) in a flexible manner. That is, these courses may be from the baskets of Department Electives, HASMED Electives and/or STEM Electives. Students may choose to take all these credits from the Departmental Electives basket or the HASMED Electives basket or the STEM Electives basket, or some combination thereof.

4. Honors Programme in Aerospace Engineering

To obtain Honors in Aerospace Engineering, a student has to earn 24 credits in addition to the 264 credits for the prescribed B. Tech. programme. A student may obtain these 24 additional credits by choosing from the following two options.

a) B. Tech. Project (BTP):

[*] Individual courses can be of any credit (3, 4, 6, 8, etc.), as long the total credits add up to *at least* 12. The subsequent curriculum charts assume that two 6-credit courses are being taken, as a typical example.

A student may obtain 18 credits by choosing to do a B. Tech. Project (BTP) in two stages: Stage-I (6 credits) and Stage-II (12 credits); the remaining 6 credits have to be met by Honors Electives as detailed in the next part. Partial consideration of the BTP credits (e.g., only Stage-I) towards fulfilling the credit requirement for the Honors programme will not be permitted.

The two BTP stages should be completed in two different and consecutive semesters of the 3rd and/or 4th years of the B. Tech. programme under the supervision of faculty member(s) from the department, subject to availability of topics/supervisors. Faculty members from other departments may be co-opted as co-guides with the consent of the department guide.

Further, a student expecting to obtain 18 credits in the form of B. Tech. Project should demonstrate an academic rigor equivalent to, or greater than, that required to earn 18 credits through department electives. Stages I and II are expected to respectively involve weekly efforts of 6-8 and 13-15 hours, and should together represent a unified body of work performed under the supervision of the same guide(s). Stage II of the BTP will be available only upon successful completion of Stage I and only if continuation is permitted by the guide(s) depending upon the quality of work in Stage I.

In case continuation is not permitted due to inadequate quality as per requirements set by the guide(s), but the Stage I examination panel finds the work of passable grade, the student will earn the credit for BTP-I in the category of Additional Learning Course (ALC) but will have to take exit from BTP. In particular, credits due to BTP Stage I alone cannot be counted towards the Honors credit fulfillment in the absence of Stage II completion.

b) Electives:

A student may fulfill whole or part of the 24-credit Honors requirement by choosing courses from the set of theoretical elective courses offered by the Aerospace Department. This set is identical to the one allowed for Departmental Electives (part 3(a)(i)). In particular, courses offered by other departments cannot be taken to meet this requirement. Moreover, Supervised Learning (AE 219 and AE 419) cannot be counted towards fulfilling Honors requirements. Students should consult faculty advisors/course instructors of the courses before registering.

Possible scheduling options open to students for fulfilling the Honors requirements are charted at the end of Table I.

5. Dual Degree Programme

To obtain a B. Tech. + M. Tech. Dual Degree in Aerospace Engineering, a student has to complete a total of 384 credits as per the breakup given below.

(i) 264 credits towards the basic B. Tech. degree as prescribed in Table I, including the options as described in Sec. 2.

(ii) 24 credits as part of the compulsory Honors requirement as prescribed in Table I, by exercising options as described in Sec. 3. The additional condition is that the student must have started the Honors programme latest by semester VI.

(iii) 24 credits of elective courses (called PG electives here onwards) comprising four courses from the set of theoretical elective courses offered by the Aerospace Department and/or a limited set of courses from other departments, all of which are listed in the separate 'AE Electives' document. Possible scheduling options open to students for fulfilling this requirement are charted at the end of Table I.

(iv) 72 credits of M. Tech. dissertation work supervised by a faculty member of the Aerospace Department. Faculty members from other departments may be co-opted as co-supervisors with the consent of the department supervisor.

6. Minor in Aerospace Engineering

A student of the B. Tech. degree offered by departments other than the Aerospace Engineering Department may obtain a minor in Aerospace Engineering by earning 30 credits through a set of five courses as described below.

The minor programme starts from the third semester (2nd year Autumn Semester) onwards, with one course in each semester. Among the courses designated as the minor basket for Aerospace Engineering, Introduction to Aerospace Engineering (AE 153) is a compulsory course prescribed in the third semester. It is mandatory that the students complete the compulsory minor course AE 153 before taking up optional minor courses from the minor basket.

At the beginning of every semester, the department will declare the minor courses available for registration towards the Minor in Aerospace Engineering. The minor courses, other than AE 153, need not necessarily be offered in slot 5. With the partial removal of the slot-5 constraint, a large list of courses will be available for minor courses, which can be easily taken up depending on the suitability of the students opting for minors. Those students who complete the required number of courses from the minor basket, which includes AE 153 and four other courses from the approved list, can apply for retagging such courses as minor courses. The department will help the deserving students in this process.

Note that some of the courses in the minor basket may have prerequisite requirements and should be taken in consultation with the Minor Coordinator of the Department of Aerospace Engineering.

The semester-wise courses are described in the tables given subsequently. The electives' lists and detailed course contents appear in separate documents.

Table I – Semester-wise Schedule of Courses - B. Tech., Honors, Minor and Dual Degree Programmes in Aerospace Engineering

AEROSPACE ENGINEERING *Table I – Course Curriculum for B. Tech., Honors, Minor and Dual Degree Programmes*												
Semester I							**Semester II**					
Course Code	Course Name	Credit Structure					Course Code	Course Name	Credit Structure			
		L	T	P	C				L	T	P	C
AE 103	A Historical Perspective of Aerospace Engineering	**3**	**0**	**0**	**6**		AE 152	Introduction to Aerospace Engineering	**3**	**0**	**0**	**6**
CS 101	Computer Programming and Utilization*				**6**		BB 101	Biology*				**6**
MA 109	Calculus I				**4**		MA 106	Linear Algebra				**4**
MA 111	Calculus II				**4**		MA 108	Differential Equations				**4**
CH 105	Organic & Inorganic Chemistry				**4**		PH 111	Introduction to Classical Physics				**4**
CH 107	Physical Chemistry				**4**		PH 112	Introduction to Quantum Physics				**4**
HSS/IDC/ ENT	Introduction to HASMED*				**8**		MS 101	Makerspace*				**8**
PH 117	Physics Lab*				**3**		CH 117	Chemistry Lab*				**3**
NC 101/ NO 101/ NS 101	National Cadet Corps (NCC)/ National Sports Organization (NSO)/ National Service Scheme (NSS)				**P/NP**		NC 102/ NO 102/ NS 102	National Cadet Corps (NCC)/ National Sports Organization (NSO)/ National Service Scheme (NSS)				**P/NP**
GC 101	Gender Sensitization				**P/NP**							
	Total				**39**			**Total**				**39**

*These courses may be interchanged between the two semesters due to operational reasons and the actual distribution will depend upon the timetable and the division allotted. The above distribution is indicative and the online registration system will show the actual distribution for each batch.

AEROSPACE ENGINEERING *Table I – Course Curriculum for B. Tech., Honors, Minor and Dual Degree Programmes*												
Semester III							**Semester IV**					
Course Code	Course Name	Credit Structure					Course Code	Course Name	Credit Structure			
		L	T	P	C				L	T	P	C
AE 223	Thermodynamics and Propulsion	**3**	**0**	**0**	**6**		AE 238	Aerospace Structural Mechanics	**3**	**0**	**0**	**6**
AE 227	Solid Mechanics	**3**	**0**	**0**	**6**		AE 244	Low Speed Aerodynamics	**3**	**0**	**0**	**6**
AE 308	Control Theory	**3**	**0**	**0**	**6**		AE 248	AI and Data Science	**3**	**0**	**0**	**6**
AE 229	Introduction to Aerodynamics and Propulsion Laboratory	**0**	**0**	**3**	**3**		AE 233	Control System Laboratory	**0**	**0**	**3**	**3**
AE 231	Introduction to Aerospace Structures and Control Laboratory	**0**	**0**	**3**	**3**		AE 246	Aircraft Structures Laboratory	**0**	**0**	**3**	**3**
EC 101	Economics	**3**	**0**	**0**	**6**		DE 250	Design Thinking	**3**	**0**	**0**	**6**
ES 200 HS 200	Environmental Studies: Science & Engg Environmental Studies	**1.5** **1.5**	**0** **0**	**0** **0**	**3** **3**							
	Total				**36**			**Total**				**30**
COURSES FOR MINOR REQUIREMENT							COURSES FOR MINOR REQUIREMENT[+]					
AE 153	Introduction to Aerospace Engineering	**3**	**0**	**0**	**6**			Max credit towards Minor				**6**

[+]To be chosen from the Minor basket available at the beginning of the semester

AEROSPACE ENGINEERING *Table I – Course Curriculum for B. Tech., Honors, Minor and Dual Degree Programmes*											
Semester V							**Semester VI**				
Course Code	Course Name	Credit Structure					Course Code	Course Name	Credit Structure		
		L	T	P	C				L	T	P	C
AE 339	High Speed Aerodynamics	**3**	**0**	**0**	**6**		AE 332	Aircraft Design	**3**	**0**	**0**	**6**
AE 341	Flight Mechanics of Aircrafts & Spacecrafts	**3**	**0**	**0**	**6**			Department Elective – I				**6**
AE 344	Aero Propulsion	**3**	**0**	**0**	**6**			Department Elective – II				**6**
AE 343	Aerodynamics Laboratory	**0**	**0**	**3**	**3**			HASMED Elective – II				**6**
AE 345	Aircraft Propulsion Laboratory	**0**	**0**	**3**	**3**			STEM Elective – I				**6**
	HASMED Elective – I				**6**							
	Total				**30**			**Total**				**30**
COURSES FOR HONORS REQUIREMENT¶							COURSES FOR HONORS REQUIREMENT¶					
	Honors Elective[$]				**6**			Honors Elective(s)[$]				**6/12**
AE 493	BTP-I[$$]				**6**		AE 493/ AE 494	BTP-I[$$]/ BTP-II[$$]				**6/ 12**
Max credit towards Honors					**6**		Max credit towards Honors					**12**
COURSES FOR MINOR REQUIREMENT[+]							COURSES FOR MINOR REQUIREMENT[+]					
	Max credit towards Minor				**6**			Max credit towards Minor				**6**

[$]Supervised Learning cannot be counted towards fulfilling Honors requirement
[$$]BTP-I cannot be counted towards fulfilling Honors requirement in the event of failing to successfully complete BTP–II
¶Students in the Dual Degree programme must start the Honors programme latest by semester VI
[+]To be chosen from Minor basket available at the beginning of respective semester

AEROSPACE ENGINEERING ***Table I – Course Curriculum for B. Tech., Honors, Minor and Dual Degree Programmes***												
Semester VII						**Semester VIII**						
Course Code	Course Name	Credit Structure				Course Code	Course Name	Credit Structure			
		L	T	P	C			L	T	P	C
	Department Elective – III				**6**		Department Elective – V				**6**
	Department Elective – IV				**6**		Department Elective – VI				**6**
	STEM Elective – II				**6**		Flexible Elective – III				**6**
	Flexible Elective – I				**6**		Flexible Elective – IV				**6**
	Flexible Elective – II				**6**		Flexible Elective – V				**6**
	Total				**30**		**Total**				**30**
COURSES FOR HONORS REQUIREMENT						COURSES FOR HONORS REQUIREMENT					
	Honors Elective(s)[$]				**6/12**		Honors Elective(s)[$]				**6/12**
AE 493/ AE 494	BTP-I[$$]/ BTP-II[$$]				**6/ 12**	AE 494	BTP-II[$$]				**12**
Max credit towards Honors					**12**	Max credit towards Honors					**12**
COURSES FOR MINOR REQUIREMENT[+]						COURSES FOR MINOR REQUIREMENT[+]					
Max credit towards Minor					**6**	Max credit towards Minor					**6**
COURSES FOR MASTERS REQUIREMENT[¶¶]						COURSES FOR MASTERS REQUIREMENT[¶¶]					
	PG Elective – I				**6**		PG Elective(s) I and/or II				**6/12**
Max credit towards Masters					**6**	Max credit towards Masters					**12**

[$]Supervised Learning cannot be counted towards fulfilling Honors requirement

[$$]BTP-I cannot be counted towards fulfilling Honors requirement in the event of failing to successfully complete BTP–II

[¶¶]Dual Degree students must take two PG electives towards the Masters requirement in their 4th year, but both can be taken in semester VIII

[+]To be chosen from Minor basket available at the beginning of respective semester

AEROSPACE ENGINEERING *Table I – Course Curriculum for B. Tech., Honors, Minor and Dual Degree Programmes*												
Semester IX							**Semester X**					
Course Code	Course Name	Credit Structure					Course Code	Course Name	Credit Structure			
		L	T	P	C				L	T	P	C
COURSES FOR MASTERS REQUIREMENT							COURSES FOR MASTERS REQUIREMENT					
AE 593	Dual Degree Project - I				**36**		AE 594	Dual Degree Project - II				**36**
	PG Elective – III				**6**			PG Elective – IV				**6**
	Total				**42**			**Total**				**42**

The two charts below detail the options open to students for fulfilling the Honors and Masters Requirements respectively:

Possible Routes to Earn B. Tech. Honors*

Option	BTP - I	BTP - II	Elective
1	Semester V	Semester VI	One in semester VII or VIII
2	Semester VI	Semester VII	One in semester V, VI or VIII
3	Semester VII	Semester VIII	One in semester V, VI or VII
4	–	–	One each in every semester from V^{th} to $VIII^{th}$
5	–	–	Two each in any two of semesters from V^{th} to $VIII^{th}$
6	–	–	One in semester V, one in any other semester from VI^{th} to $VIII^{th}$, and two in any remaining semester from VI^{th} to $VIII^{th}$
7	–	–	One in any two semesters from VI^{th} to $VIII^{th}$, and two in the other semester in this range

*Students in the Dual Degree programme must start the Honors programme latest by semester VI

Possible Number of PG Electives Towards Masters Requirement

Option	Semester VII	Semester VIII	Semester IX	Semester X
1	1	1	1	1
2	0	2	1	1

Document History

2025-07-28: Flexibility in possible credits of elective course is now made explicit.
2024-02-27: Typo in Stem Elective number in Sem VII rectified.
2023-08-14: Course code for Design Thinking inserted
2023-07-24: First version