

Programme Template

1. Name of the Programme and Code	Engineering and Computational Mechanics
2. Degree (UG/PG)	UG
3. Minimum Duration of the Programme (Specify for FT and PT, if applicable)	8 semesters
4. Maximum Duration of the Programme (Specify for FT and PT, if applicable)	12 semesters
5. Capacity (Max. Student Strength) of the Programme	40
6. Number of Regular Faculty Members Involved as Teaching Faculty in the Programme	32 (All AM faculty members)
7. Minimum Credit Requirements for the Degree	151

8. Articulate the Program Learning Outcomes (PLO)

[For example see: [Objectives vs. Outcomes](#) and [Student Outcomes](#)]

PLO1. The ability to solve engineering problems using fundamental principles of mechanics through analytical, computational and experimental techniques.

PLO2. The ability to solve complex engineering problems and provide design solutions using visualization, computational, experimental tools, data analysis and/or data-driven techniques.

PLO3. The ability to effectively formulate and solve problems relevant to industry in a sustainable manner

PLO4. The ability to communicate and function effectively in a team, collaborate with team-members to establish goals, plan tasks, and meet objectives.

PLO5. The ability to demonstrate ethical and professional responsibilities as an engineer.

9. Map PLOs with Institute Learning Outcomes (ILOs) of the Degree

[Indicate '1' for weak, '2' for good, and '3' for excellent relation. Leave the cell blank to indicate no relation]

	PLO1	PLO2	PLO3	PLO4	PLO5
ILOi	2	3	2	3	1
ILOii	1	2	1	3	3
ILOiii	3	3	2	1	1
ILOiv	3	3	3	2	2

10. Number of Programme Core Credits

Department Core-49 + Stream Core-9 = 58

11. Number of Programme Elective Credits

18

12. Number of Open Credits

9

13. Number of Project Core Credits

3

14. Details of Creative Expression and Ethical Reasoning (CEER) Component in the Programme [Mandatory only for UG]

Number of Credits Assigned	3
Courses Involved and Credits Accounted [e.g., <i>If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)</i>]	AML2070 Experimental Methods 1 ER credit AML4010 Basics of Product Design 1 CE credit APD4000 B.Tech. Project I 0.5 CE+0.5 ER credit

15. Details of Emerging Trends (ETT) Component in the Programme [Mandatory Only for UG]

Number of Credits Assigned	3
Courses Involved and Credits Accounted [e.g., <i>If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)</i>]	AML3050 Machine Learning in Mechanics 3 ETT credits

16. Details of Environment and Sustainability (E&S) Component in the Programme [Mandatory only for UG]

Number of Credits Assigned	2
Courses Involved and Credits Accounted [e.g., <i>If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)</i>]	DDL1111 Design Thinking for Sustainability 2 ES credit

17. Details of Research/Technical Communication Component in the Programme [Only for PG]

NA

Number of Credits Assigned	

18. Details of Professional Ethics Component in the Programme [Only for PG]

NA

Number of Credits Assigned	
Courses Involved and Credits Accounted	

	[e.g., If one module in AMLXXX with contact hours YY satisfies Z credits, then write AMLXXX (Z credits)]		
19. Details of External Connect Component in the Programme [Only for PG] NA			
Number of Credits Assigned			
20. List of prescribed courses in all baskets (BS, GE, DC/PC, DE/PE, ...)			
Basic Science courses	General Engineering Courses	Departmental Core courses	Departmental Elective Courses
MTLXXX Calculus (3-1-0)	COLXXX Introduction to Programming (2-0-2)	AML2070 Experimental Methods (3-0-2)	Vibration and Control (3-0-0-3)
CMLXXX Structural Insights into atoms and molecules (2-1-0)	AMLXXX Engineering Mechanics (3-1-0)	AML2000 Applied Mathematics for Engineers (3-0-0)	Chaos (3-1-0-4)
CMPXXX Chemistry Lab (0-0-4)	MCPXXX Introduction to Engineering Visualization (0.5-0-4)	AML2020 Fluid Mechanics (3-1-0)	Fluid Structure Interaction (3-0-0-3)
MTLXXX Linear Algebra & Differential Equation (3-1-0)	ELLXXX Introduction to Electrical Engineering (2-1-2)	AML2010 Solid Mechanics (3-1-0)	Application of FEM (2-0-2-3)
PHYXXX Introduction to Electrodynamics (2-1-0)	MCPXXX Manufacturing for Product Innovation (0.5-0-4)	AMP2050 Fluids and Solids Laboratory (0-0-4)	BTP II (0-0-12-6)
PYPXXX Physics Lab (0-0-4)	COLXXX Programming with data structures (3-0-2)	MLLXXX Introduction to Material Science & Engineering (3-0-2)	Computational Multibody Dynamics (3-0-0-3)
SBLXXX Biology for Engineering: Microbes & disease (2-0-0)	Student's choice* GE 4 credits Recommended: Signal and Systems	AML2060 Numerical Methods for Engineers (3-0-2)	Composites Mechanics and Structures (3-0-0-3)
SBLXXX Experimental Biology for Engineers (0-0-2)		AMD4000 (0-0-6)-BTP	Application of CFD (2-0-2-3)
Student's choice* BS 3 credits		AML1050 Engineering Thermodynamics (3-0-0)	Multiscale Modeling and Computation (3-0-0-3)
		AML3010 Dynamics of Mechanical Systems (3-1-0)	Introduction to Hydrodynamic Stability (3-0-0-3)
		AML3020 Heat Transfer	Aircraft structures (3-0-0-3)

		(3-0-0)		
		AML3050 Machine Learning in Mechanics (3-0-2)	Aero- Elasticity (3-0-0-3)	
		DDP1001 Design Thinking for Sustainability (2-0-0)	Introduction to Plates and Shells (3-0-0-3)	
		AML4010 Basics of Product Design (3-0-2)	Smart Materials and Structures (3-0-0-3)	
		AML3040 Biomechanics (3-0-0)	Impact Mechanics and Crash Worthiness (3-0-0-3)	
		Stream Core (SC) Track: Fluids 1. AML3080 Advanced Fluid Dynamics (3-0-0) 2. AML3070 Introduction to Computational Fluid Dynamics (3-0-2) 3. AML3901 Advanced Experiments in Fluids (1-0-2)	Parallel Processing in Computational Mechanics (3-0-2-4)	
		Stream Core (SC) Track: Solids 1. AML3030 Linear Elasticity (3-0-0) 2. AML3110 Introduction to Finite Element Method (3-0-2) 3. AML3902 Advanced Experiments in Solids (1-0-2)	Introduction to Soft robotics (3-0-0-3)	
			Introduction to digital twins (2-0-2-3)	
			Reliability Engineering (3-0-0-3)	
			AML3080 Advanced Fluid Dynamics (3-0-0)	
			AML3070 Introduction to Computational Fluid Dynamics (3-0-2)	
			AML3030 Linear Elasticity (3-0-0)	
			AML3110 Introduction to Finite Element Method (3-0-2)	
			MTLXXX Probability and Stochastic Processes (3-1-0)	

21. Nominal Semester-wise Academic Plan

Semester	Color-coded Course List: BS , GE , DC & DE, HUL , OC							L	T	P	Credits	Contact Hours
I	MTLXXX Calculus (3-1-0)	MCPXXX Manufacturing for Product Innovation (0.5-0-3)	AML1000 Engineering Mechanics (3-1-0)	CMLXXX Structural Insights into atoms and molecules (2-1-0)	CMPXXX Chemistry Lab (0-0-4)	MCPXXX Introduction to Engineering Visualization (0.5-0-3)		9	3	10	17	22
II	MTLXXX Linear Algebra & Differential Equation (3-1-0)	AML1050 Engineering Thermodynamics (3-1-0)	COL1000 Intro-to-Programming 3-0-2	PHYXXX Introduction to Electrodynamics (2-1-0)	PYPXXX Physics Lab (0-0-4)			11	3	6	17	20
III	COLXXX Programming with data structures (3-0-2)	HUL1/SSW 3-0-0	AML2020 Fluid Mechanics (3-1-0)	AML2010 Solid Mechanics (3-1-0)	SBLXXX Biology for Engineering: Microbes & disease (2-0-0)	SBLXXX Experimental Biology for Engineers (0-0-2)	MLLXXX Introduction to Material Science & Engineering (3-0-2)	17	2	6	22	25
IV	Student's choice* BS 3 credits 3-0-0	AML2000 Applied Mathematics for Engineers (3-0-0)	AMP262 Fluids and Solids Laboratory (0-0-4)	ELLXXX Introduction to Electrical Engineering (2-1-2)	AML2060 Numerical Methods for Engineers (3-0-2)	DE1 (3-0-0)	AML2070 Experimental Methods (3-0-2)	17	1	10	23	28
V	AML3040 Biomechanics (3-0-0)	SC1 (3-0-0)	AML3050 Machine Learning in Mechanics (3-0-2)	DE2 (3-0-0)	HUL2/SSW (3-0-0)	AML3020 Heat Transfer (3-0-0)		18	0	2	19	20
VI	SC2 (3-0-2)	AML4010 Basics of Product Design (3-0-2)	DE3 (3-0-0)	Student's choice* GE 4 credits 3-1-0		AML3010 Dynamics of Mechanical Systems (3-1-0)	HUL3/SSW 3-0-0	18	2	4	22	24
VII	HUL4/SSW (3-0-0)	DE4 (3-0-0)		AMD4000 (0-0-6)	DDL1111 Design Thinking for Sustainability/ any other course listed in ES basket (1-0-2)	OC1 (3-0-0)	SC3 (1-0-2)	11	0	10	16	21
VIII	OC2 (3-0-0)	OC3 (3-0-0)	DE5 (3-0-0)	HUL5/SSW (3-0-0)	DE6 (3-0-0)			15	0	0	15	15

Total: 151 Credits

22. Average Contact Hours per Faculty <i>per Week</i>, for this Programme [(DC+DE)+GE load]	1.3125=1.797 (total) hours per faculty per week (=84 x 4/ (32 x 8)) From FAQ document: Add up all the contact hours for the programme in all the semesters (=84 for DC and DE), that is summation of L, T, P of all courses (DC+DE). Divide this by 8, which is the average per semester contact. Dividing this by the number of faculty (=32) in the department (not just those involved in teaching the program), and multiplying the result by 4 (two batches of students at any point in time), would give you the number to fill.
23. Average Credit Students per Faculty per Semester, for this Programme [(DC+DE)+GE load]	49.375+13.125= 62.5 (total) credits per faculty per semester (=79x40x4/(32x8)) (79 credits (DC+DE) per student over 8 semesters for 4 batches of 40 students each, spread over 32 faculty) For AML100: 210 students for one semesters. Dividing by 32 faculty and 2 semesters = 210x4/32/2
24. If the program is a revision of an existing program, please list the major changes made.	There are some revisions compared to the existing B.Tech. in Engineering and Computational Mechanics (AM1) Some courses have been removed based on feedback collected from students and teachers: ELL201 (Digital Electronics), AML205 (Basics of Computer-aided Design), MTL107 (Numerical Methods and Computations) Some Courses have been moved from the list of core courses to the list of departmental elective courses: AML410 (Multiscale Modeling and Computations), Some courses have been added based on feedback collected from students and teachers (Probability and Stochastic Processes added as a DE , Numerical Methods and Computation (it

	replaces MTL 107)) The credit structure of some courses have been changed: Thermodynamics, Heat Transfer, Machine Learning in Mechanics. Lecture/lab hours have been increased
25. Please elaborate on,	
1. how flexibility for the students has increased?	Two streams, Solids and Fluids, have been introduced. Students can choose 3 core courses from either of the two streams (SC1-SC3). They also can opt for courses from the other stream as Department Electives. Number of Department Elective Courses are increased to 6 from 4 from the previous curriculum.
2. how engagement and interaction with the student have increased?	Number of contact hours have been increased in the following courses: Thermodynamics (increase of lecture hours), Heat Transfer (increase of lecture hours), Machine Learning (increase of lab hours)
3. how hands-on learning is emphasized in the program?	• The course (Basics of Product Design is designed to help students learn and implement methods of designing products • The course Machine learning in Mechanics is designed to help students learn techniques of machine learning and how to apply them to problems related to mechanics. • We have replaced the course MTL107 by new course Numerical Methods and Computations with additional lab hours to help students hands-on programming experience to implement numerical techniques to solve algebraic and differential equations. Further there are several courses with significant lab component: Finite Element Method, Computational Fluid Dynamics, Advanced Experiments in Solids and Fluids, Machine Learning in Mechanics, Experiments in Solids and Fluids.