Department of Mechanics and Aerospace Engineering

Program of Theoretical and Applied Mechanics for International Students (2023)

I. Introduction

Theoretical and Applied Mechanics (TAM) is a basic while highly practical scientific discipline with long history, rapid development, and widespread applications. Its strong technical implications make TAM the foundation for many industries and various engineering areas such as aerospace engineering, ocean engineering, manufacturing, civil engineering, and astromechanics. Therefore, students with TAM training often become leaders with a holistic view of technology.

Academic subject areas: Mechanics

Program code: 080101

II. Objectives and Learning Outcomes

1. Objectives

Students majored in TAM will be equipped with necessary theory, knowledge and skills to become senior specialists for research, education, R&D and management in mechanics and related areas.

2. Learning Outcomes

(1) Morality and humanity. With patriotism and professionalism, a firm attitude of pursuing excellence, a sound personality, a sense of social responsibility and rich humanities and sciences accomplishment.

(2) Basic knowledge. Master the basic theoretical knowledge and skills of engineering such as mathematics, mechanics, physics, electronics, machinery and so on.

(3) Core knowledge

3.1 Master the knowledge of the core courses in basic disciplines such as mathematics, mechanics, physics, and information technology, and at the same time have strong computer and foreign language application capabilities.

3.2 Master the core knowledge of mechanics as the engineering foundation and the basic knowledge of mechanics or one other engineering (e.g. aviation, aerospace, machinery, automobiles, energy, environment, etc.)

3.3 Have the basic laboratory and design skills in mechanics and engineering.

(4) Understand the frontier of the subject. Understand the development, theoretical frontier and application prospect of the mechanics and some major projects.

(5) Master the basic methods of literature retrieval and data query, and have the ability to engage in scientific research and practical work.

(6) Management ability and teamwork ability. Good organizational and management skills, good communication skills, as well as environmental adaptation, team work ability.

(7) International vision. Has the international vision and certain international exchange and cooperation ability.

(8) Lifelong learning. Have the consciousness of lifelong learning and self-learning ability, innovative consciousness and grasp the basic innovative methods.III. Study Length, Degree, and Graduation Requirements

III. Study Length, Degree, and Graduation Requirements

1. Study length: 4 years. The academic credit system of SUSTech allows flexible study years, but not less than 3 years or more than 6 years

2. Degree conferred: Students who complete and meet the degree requirements of the undergraduate program will be awarded a bachelor's degree in Bachelor of Science

3. The minimum credit requirement for graduation: 155 credits. The specific requirements are as follows.

Module		**Category**	**Minimum Credit Requirement**
General Education Courses	Chinese Language and Culture Module	Chinese Language and Culture	16
	Arts and Physical Education Module	Physical Education	4
		Arts	2
	Competence Development Module	Computer Programming	3
		Writing	2
		Foreign Languages	14

	Humanities and Social Sciences Module	Humanities	6
		Social Sciences	
		Chinese Studies	2
	Mathematics and Natural Sciences Module	Mathematics	12
		Physics	10
		Chemistry	3
		Geoscience + Life Science	3
	GE to Majors Bridging Module	Introduction to Majors	2
Major Courses	Major Required Courses	Major Foundational Courses	17
		Major Core Courses	20
		Practice-based Learning (Undergraduate Thesis, Internships, Research projects, etc.)	21
	Major Elective Courses	Major Elective Courses	18
Total			155
Note: please see the General Education Requirement for more details on Chinese Language and Culture Module, Arts and Physical Education Module, Competence Development Module（Foreign Languages & Writing）, Humanities and Social Sciences Module, and GE to Majors Bridging Module.			

IV. Course Requirements for the Mathematics and Natural Sciences Module and Computer Programming

Course Category	Course Code	Course Name	Credits	Terms	Prerequisite	Dept.
Mathematics	MA117	Calculus I	4	1Fall	None	MA
	MA127	Calculus II	4	1Spring	Calculus I	MA
	MA113	Linear Algebra	4	1Spring /Fall	None	MA
Physics	PHY105	College Physics I	4	1Spring /Fall	None	PHY
	PHY106	College Physics II	4	1Spring /Fall	General Physics I	PHY
	PHY104B	Experiments of Fundamental Physics	2	1Spring /Fall	None	PHY
Chemistry	CH105	Chemistry: the Central Science	3	1Spring /Fall	None	CH
Geoscience + Life Science	BIO102B	Introduction to Life Science	3	1Spring /Fall	None	BIO
Computer Programming	CS109	Introduction to Computer Programming	3	1Spring /Fall	None	CS

Note:

1. For Mathematics Category, students can take Mathematical Analysis I and II as alternatives to Calculus I and II; Advanced Linear Algebra I as an alternative to Linear Algebra.
2. For Physics Category, students can take General Physics I and II as alternatives to College Physics I and II.
3. For Chemistry Category, students can take General Chemistry as an alternative to Chemistry: the Central Science.
4. For Biology Category, students can take Principles of Biology as an alternative to Introduction to Life Science.
5. For Computer Programming Category, students can choose any one of the five computer programming courses.
6. The above alternative courses are also applicable to "Prerequisites for Major Declaration".

V. Prerequisites for Major Declaration

Major Declaration Time	Course Code	Course Name	Prerequisite
Declare major at the end of the first academic year	MA117	Calculus I	None
	MA127	Calculus II	Calculus I
	MA113	Linear Algebra	None
	PHY105	College Physics I	None
	PHY106	College Physics II	College Physics I
Declare major at the end of the second academic year	MA117	Calculus I	None
	MA127	Calculus II	Calculus I
	MA113	Linear Algebra	None
	PHY105	College Physics I	None
	PHY106	College Physics II	College Physics I

Note:

1. If the number of students entering a major at the end of the first academic year in the department is greater than or equal to the total number of the teaching-research faculty (PI)*2*60%, all majors in the department may implement the prerequisites for major declaration at the end of the second academic year.
2. If the number of students entering a major at the end of the first academic year in the department is less than the total number of the teaching-research faculty (PI)*2*60%, all majors in the department do not implement the prerequisites for major declaration at the end of the second academic year.
3. Suppose the number of students applying for a major at the end of the first academic year exceeds four times the total number of the teaching-research faculty (PI), then the department may select students according to predetermined rules. In principle, the rules set by the department shall examine the students' suitability for the major and not based on weighted GPA (Specific rules shall be set by the department and announced in advance).
4. For departments that do not implement prerequisites for major declaration at end of the second academic year, if the cumulative number of students applying for a major at the end of the second academic year and the number of students who have entered a major at the end of the first academic year exceeds four times the total number of the teaching-research faculty (PI), the department may select students according to predetermined rules. In principle, the rules set by the department shall examine the students' suitability for the major and not based on weighted GPA (Specific rules shall be set by the department and announced in advance).

VI: Major Course Arrangement

Table 1: Major Required Courses

Program of Theoretical and Applied Mechanics

Course Category	Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
Major Foundational Courses	ME102	CAD and Engineering Drawing	3	1.5	1Spring	None	ME
	MAE209	Foundations of Engineering Mathematics	4		2Fall	MA127 PHY106 MA113	MAE
	MAE203	Theoretical Mechanics I	3		2Fall	MA127、MA109 or MAE209	MAE
	MA212	Probability and Statistics	3		2Fall	MA127	MA
	MA201b	Ordinary Differential Equations B	4		2Fall	MA127	MA
	Total		17	1.5			
Major Core Courses	MAE202	Mechanics of Materials	3		2Spring	MAE203	MAE
	MAE204	Theoretical Mechanics II	3		2Spring	MA113 MA127（or MAE209）	MAE
	MAE303	Fluid Mechanics	4		3Fall	MA127 PHY106	MAE
	MAE304	Elasticity	4		3Spring	MAE203 MAE202 MAE209	MAE
	MAE302-16	Fluid Mechanics Lab	3	3	3Spring	MAE303	MAE
	MAE401-16	Solid Mechanics Lab	3	3	3Fall	MAE202	MAE
	Total		20	6			
Practice-based Courses	MAE499	Research and Innovation Project	2	2	4Fall	None	MAE
	ME103	Awareness Practice of Manufacturing Engineering	3	2	1-4Fall	None	ME
	MAE477	Cognitive Internship	2	2	2Summer	None	MAE
	MAE478	Practical Internship (Research and Production)	2	2	3Summer	None	MAE
	MAE488	Degree Thesis (or Design)	12	12	4Spring	None	MAE
	Total		21	20			

Total	58	27.5	

Note:
Note 1: "Theoretical Mechanics II MAE204" can be replaced by "Analytical Mechanics PHY205".
Note 2: "Fundamentals of Engineering Mathematics MAE209" can be replaced by "Linear Algebra in Detail MA109" and "Mathematical Physics Equations PHY203".
Note 3: Science and technology innovation projects are carried out in any semester after the beginning of the second academic year, so they are not included in the specific weekly credit hour allocation table.
Note 4: The industrial internship is not fixed to a specific semester and therefore is not included in the specific weekly credit hour allocation table.
Note 5: Students who have completed Comprehensive Design I (COE491) and Comprehensive Design II (COE492) are not required to take the graduation design (or thesis) (MAE490).

Table 2: Major Elective Courses

Program of Theoretical and Applied Mechanics

Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
EE104	Fundamentals of Electric Circuits	2		1Spring	MA127	EE
MAE206	Introduction to Aeronautics and Mechanics	1		2Fall	None	MAE
MAE498	Research and Innovation Projects of Mechanics and Aerospace Engineering	2	2	2-4Fall	None	MAE
MAE305	Engineering Thermodynamics	3		2Fall	MA127	MAE
CS203B	Data Structures and Algorithm Analysis B	3	1	2Fall	CS102A	CS
PHY221	Open Physics Laboratory II	1	1	2Fall	None	PHY
PHY201-15	Physics Laboratory II	2	2	2Fall	PHY103B	PHY
PHY207-15	Electrodynamics I	3		2Fall	PHY203-15	PHY
MAE208	Lectures on selected Engineering Software	2	2	2Spring /Fall	None	MAE
MAE210	Engineering Materials	3		2Spring	None	MAE
PHY202	Physics Laboratory III	2	2	2Spring	PHY103B	PHY
MAE323	Mordern Numerical Methods	3	1	2Spring	MA127 MA113	MAE
MA233	Introduction to MATLAB	4	1	2Spring	MA113	MA
MAE211	Overseas Practice	2	2	2Summer	None	MAE
MAE405	Aerodynamics	3		3Fall	MAE207 or MAE303	MAE
MAE309	General Principles of Transport Phenomena	3		3Fall	MA127	MAE
MAE312	Aircraft Flight Dynamics	3		3Fall	MA127	MAE
MAE307	Aircraft Structural Strength	3		3Fall	MAE202	MAE
MAE313	Aero Engine Structural Strength	3	1	3Fall	None	MAE
MA303	Partial Differential Equations	3		3Fall	MA201b	MA
ME311	Mechanical Design	3		3Fall	None	ME
ME331	Robot Modeling and Control	3		3Fall	MAE203B	ME
ME307	Fundamentals of Control Engineering	3	1	3Fall	EE104	ME
MAE5028	Fundamentals of	3		3Fall	MAE305	MAE

	Combustion					
MAE5017	Aircraft Flight Dynamics	3		3Fall	MAE209 MAE303	MAE
CS205	C/C++ Program Design	3	1	3Spring /Fall	None	CS
MAE318	Theory of Vibration	3		3Spring	MAE203B MA201b	MAE
MAE403	Computational Fluid Dynamics	3		3Spring	MAE207 or MAE303	MAE
MAE310	Computational Solid Mechanics	3		3Spring	MAE202	MAE
MAE320	Mechanism of Flight	3		3Spring	MAE405	MAE
MAE308	Heat Transfer	3		3Spring	MA127	MAE
MAE5027	Interfacial Phenomena	3		3Spring	PHY106	MAE
MAE7002	General Theory of Aeroengine Engineering	3		3Spring	None	MAE
MAE407	Jet and Propulsion	3		3Spring	MAE305 or PHY204	MAE
MAE7001	Multiphase Flow	3		3Spring	MAE207	MAE
MAE5021	Fracture Mechanics	3		3Spring	MAE202	MAE
ME310	Fundamentals of Measurement Technology	3		3Spring	ME307 EE205	ME
MAE417	Aircraft Design Group Practice	3	2	4Fall	MAE405 MAE307 MAE407	MAE
MAE5020	Mechanics of Composite Materials	3		4Fall	MA127	MAE
MAE419	Aerodynamic analysis and design of aircraft	2		4Fall	MAE403	MAE
MAE311	Principles of Turbomachinery	3		4Fall	MAE305 MAE405	MAE
Total		113	17			

Note
Note 1: The above courses should be taken for a minimum of 18 credits; the elective courses of the Department of Mechanics and Aerospace Engineering should be taken for a minimum of 12 credits.
Note 2: "Computational Fluid Dynamics MAE403" and "Computational Solid Mechanics MAE310" at least one of them.
Note 3:Choose at least one of the following directions to complete the requirements.
Engineering numerical simulation direction: "Computational Fluid Dynamics", "Computational Solid Mechanics", "C/C++ Program Design", "Mordern Numerical Methods", "Lectures on selected Engineering Software", "Introduction to MATLAB", at least 9 credits
New material mechanics: "Engineering Materials", "Computational Solid Mechanics", "Mechanics of Composite Materials", "Fracture Mechanics", "Theory of Vibration"," Mechanics of Soft Materials", at least 9 elective credits
Note 4: "Engineering Thermodynamics MAE305" can be replaced by "Thermodynamics and Statistical Physics I PHY204".

Table 3: Overview of Practice-based Learning

Program of Theoretical and Applied Mechanics

Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
ME102	CAD and Engineering Drawing	3	1.5	1Spring	None	ME
MAE211	Overseas Practice	2	2	2Summer	None	MAE

MAE302-16	Fluid Mechanics Lab	3	3	3Spring	MAE303	MAE
MAE401-16	Solid Mechanics Lab	3	3	3Fall	MAE202	MAE
MAE499	Research and Innovation Project	2	2	4Fall	None	MAE
ME103	Awareness Practice of Manufacturing Engineering	3	2	1-4Fall	None	ME
MAE477	Cognitive Internship	2	2	2Summer	None	MAE
MAE478	Practical Internship (Research and Production)	2	2	3Summer	None	MAE
MAE488	Degree Thesis (or Design)	12	12	4Spring	None	MAE
Total		32	29.5			

Curriculum Structure of Theoretical and Applied Mechanics