Department of Mechanical and Energy Engineering

Program of Mechanical Engineering for International Students

(2023)

I. Introduction

This academic program is designed to provide broad disciplinary subject training for the development of mechanical engineering. Department of Mechanical and Energy Engineering (MEE) of Southern University of Science and Technology (SUSTech) aims at becoming a world-leading center for engineering education and research. At the advanced stage of this program, three major directions are coherently blended into this program to open specialization options for students: (1) Advanced manufacturing and innovative design; (2) Equipment automation, robotics and artificial intelligence; and (3) Renewable energy engineering. More specifically, our research focuses include advanced and intelligent manufacturing methods, such as advanced forming, additive manufacturing, precision machining, multi-scale robotic mechanisms, control and automation, soft materials, and different battery engineering solutions. We cater for educating two streams of engineering talents: (1) the academic stream of talents who have strong theoretical foundation in research, interdisciplinary perspective and experience, and good humanistic understanding; (2) the engineering innovation stream talents with sharp insight into engineering problems, and strong leadership for solving them.

Academic subject areas: Mechanical Engineering; Program code: 080201

II. Objectives and Learning Outcomes

1. Objectives

The program integrates theoretical and technological education within mechanical engineering domain, and provides students with a set of solid scientific, and practically innovative courses as well as hand-on training in the field. The program aims to develop students into future leaders in the discipline with: (1) balanced training in broad fundamentals of mechanical engineering as well as yet selectively-specialized knowledge of interdisciplinary engineering; (2) outstanding ability in

engineering practice, independent thinking, integrated application of engineering knowledge; and (3) innovation capability, humanistic understanding, and a global vision.

2. Learning Outcomes

a) Master basic science theories, including mathematics, physics, mechanics, materials, electronics and computer science, management science, etc.

b) Understand and be able to apply well-established knowledge of mechanical engineering, including theories, the frontier technologies and development of the industry, scientific research methods, engineering design and manufacturing methods. Students should also appreciate the latest inter-disciplinary development of other related fields.

c) Be able to apply innovative thinking to understand, define, model, analyze and solve problems independently.

d) Develop an international vision and skills of cross-cultural communication and collaboration.

e) Acquire effective communication and leadership skills in multi-disciplinary teams.

f) Develop rigorous and realistic attitude towards science and research, effective engagement in pursuing excellence and commitment to serve humanity.

g) Have humanistic and social science literacy, and exercise social responsibility and professional engineering ethics.

h) Develop the ability of independent learning and the awareness of lifelong learning.

III. Study Length, Degree, and Graduation Requirements

1. Study length: 4 years.

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

3. The minimum credit requirement for graduation: 156 credits. The specific requirements are as follows.

<table>
<tr><th colspan="2">Module</th><th>Category</th><th>Minimum Credit Requirement</th></tr>
<tr><td rowspan="14">General Education Courses</td><td>Chinese Language and Culture Module</td><td>Chinese Language and Culture</td><td>16</td></tr>
<tr><td rowspan="2">Arts and Physical Education Module</td><td>Physical Education</td><td>4</td></tr>
<tr><td>Arts</td><td>2</td></tr>
<tr><td rowspan="3">Competence Development Module</td><td>Computer Programming</td><td>3</td></tr>
<tr><td>Writing</td><td>2</td></tr>
<tr><td>Foreign Languages</td><td>14</td></tr>
<tr><td rowspan="3">Humanities and Social Sciences Module</td><td>Humanities</td><td rowspan="2">6</td></tr>
<tr><td>Social Sciences</td></tr>
<tr><td>Chinese Studies</td><td>2</td></tr>
<tr><td rowspan="4">Mathematics and Natural Sciences Module</td><td>Mathematics</td><td>12</td></tr>
<tr><td>Physics</td><td>10</td></tr>
<tr><td>Chemistry</td><td>3</td></tr>
<tr><td>Geoscience + Life science</td><td>3</td></tr>
<tr><td>GE to Majors Bridging Module</td><td>Introduction to Majors</td><td>2</td></tr>
<tr><td rowspan="4">Major Courses</td><td rowspan="3">Major Required Courses</td><td>Major Foundational Courses</td><td>28</td></tr>
<tr><td>Major Core Courses</td><td>22</td></tr>
<tr><td>Practice-based Learning (Undergraduate Thesis, Internships, Research projects, etc.)</td><td>12</td></tr>
<tr><td>Major Elective Courses</td><td>Major Elective Courses</td><td>15</td></tr>
<tr><td colspan="3">Total</td><td>156</td></tr>
<tr><td colspan="4">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.</td></tr>
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IV. Course Requirements for the Mathematics and Natural Sciences Module and Computer Programming

Course Category	Course Code	Course Name	Credits	Terms	Prerequisite	Dept.
Mathematics	MA101a/ MA117	Mathematical Analysis I /Calculus I	5/4	1 Fall	None	MATH
	MA102a/ MA127	Mathematical Analysis II /Calculus II	5/4	1 Spring	Mathematical Analysis I / Calculus I	MATH
	MA113	Linear Algebra	4	1 Spring & Fall	None	MATH
Physics	PHY101/ PHY105	General Physics I / College Physics I	5/4	1 Fall	None	PHY
	PHY102/ PHY106	General Physics II / College Physics II	5/4	1 Spring	General Physics I / College Physics I	PHY
	PHY104B	Experiments of Fundamental Physics	2	1-2 Spring & Fall	None	PHY
Chemistry	CH103/ CH105	General Chemistry / Chemistry: The Central Science	4/3	1-2 Spring & Fall	None	CHEM
Geoscience + Life science	BIO102B/ BIO103/E OE100	Principles of Biology / Introduction to Life Science/ Introduction to Earth Sciences	3	1-2 Spring & Fall	None	BIO, ESS, OCE, ESE
Computer Programming	CS109/ CS110/ CS111/ CS112/ CS113	Introduction to Computer Programming/ Introduction to Java Programming/ Introduction to C programming/ Introduction to Python Programming Python/ Introduction to Matlab Programming	3	1-2 Spring & Fall	None	CSE
Note: "/"means equivalent courses to be selected by students.						

V. Prerequisites for Major Declaration

<table>
<tr><th>Major Declaration Time</th><th>Course Code</th><th>Course Name</th><th>Prerequisite</th></tr>
<tr><td rowspan="6">Declare major at the end of the first academic year</td><td>MA101a/ MA117</td><td>Mathematical Analysis I /Calculus I</td><td>None</td></tr>
<tr><td>MA102a/ MA127</td><td>Mathematical Analysis II /Calculus II</td><td>Mathematical Analysis I / Calculus I</td></tr>
<tr><td>PHY101/ PHY105</td><td>General Physics I /College Physics I</td><td>None</td></tr>
<tr><td>PHY102/ PHY106</td><td>General Physics II /College Physics II</td><td>General Physics I / College Physics I</td></tr>
<tr><td colspan="3">Note:
The above courses are required to be completed. In addition, at least one of the following Course Category should be passed:
1. Mathematics: MA113 Linear Algebra.
2. Physics: PHY104B Experiments of Fundamental Physics.
3. Chemistry: CH103/CH105 General Chemistry / Chemistry: The Central Science.
4. Geoscience + Life science: BIO102B/BIO103/EOE100 Principles of Biology / Introduction to Life Science/ Introduction to Earth Sciences .
5. Computer Programming: CS109/CS110/CS111/CS112/CS113 Introduction to Computer Programming/ Introduction to Java Programming/ Introduction to C programming/ Introduction to Python Programming Python/ Introduction to Matlab Programming.
（ “/”means equivalent courses to be selected by students. ）</td></tr>
<tr><td rowspan="6">Declare major at the end of the second academic year</td><td>MA101a/ MA117</td><td>Mathematical Analysis I /Calculus I</td><td>None</td></tr>
<tr><td>MA102a/ MA127</td><td>Mathematical Analysis II /Calculus II</td><td>Mathematical Analysis I / Calculus I</td></tr>
<tr><td>PHY101/ PHY105</td><td>General Physics I /College Physics I</td><td>None</td></tr>
<tr><td>PHY102/ PHY106</td><td>General Physics II /College Physics II</td><td>General Physics I / College Physics I</td></tr>
<tr><td>MA113</td><td>Linear Algebra</td><td>None</td></tr>
<tr><td colspan="3">Note:
The above courses are required to be completed. In addition, at least one of the following Course Category should be passed:
1. Physics: PHY104B Experiments of Fundamental Physics.
2. Chemistry: CH103/CH105 General Chemistry / Chemistry: The Central Science.
3. Geoscience + Life science: BIO102B/BIO103/EOE100 Principles of Biology / Introduction to Life Science/ Introduction to Earth Sciences .
4. Computer Programming: CS109/CS110/CS111/CS112/CS113 Introduction to Computer Programming/ Introduction to Java Programming/ Introduction to C programming/ Introduction to Python Programming Python/ Introduction to Matlab Programming.
(“/”means equivalent courses to be selected by students.)</td></tr>
<tr><td colspan="4">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</td></tr>
</table>

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 Mechanical Engineering

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	2 Spring &Fall		MEE
	ME103	Awareness Practice of Manufacturing Engineering	3	2	1/Summer, 1-2 Spring &Fall		MEE
	MAE203B	Engineering Mechanics I – Statics and Dynamics	3		2/Fall	MA113	MAE
	ME212	Mechanics of Materials M	3		2/Fall	MA127	MEE
	MA201b	Ordinary Differential Equations B	4	1	2/Fall	MA127	MATH
	ME271	Fundamentals of Thermodynamics and Heat Transfer	4		2/Fall	MA127	MEE
	EE104	Fundamentals of Electric Circuits	2		2/Spring	MA101B, MA113	EE
	ME261	Engineering Materials - Science, Processing and Design	3		2/Spring	PHY106, CH105/ CH103	MEE
	MAE207	Engineering Fluid Mechanics	3		2/Spring	MA127	MAE
	Total		**28**	**4.5**			
Major Core Courses	ME213	Principles of Machinery	3		2/Spring &Fall		MEE
	ME311	Mechanical Design	3		3/Fall		MEE
	ME316	Machinery and Mechanical Design Labs	2	2	3 Spring &Fall		MEE
	ME302	Fundamentals of Manufacturing	3		3/Fall	ME103	MEE
	ME307	Fundamentals of Control Engineering	3	0.5	3/Spring	EE104	MEE
	ME301	Dynamics and Vibration	3	1	3/Spring	MAE203B, MA201b	MEE
	ME357	Intelligent Manufacturing System Technology	3		3/Spring		MEE
	ME308	Advanced Manufacturing Practice	2	2	4/Fall	ME302	MEE
	Total		**22**	**5.5**			
Practice-based Courses	ME498	Senior Project*	12	12	4/Spring		MEE
	Total		**12**	**12**			
Total			**62**	**22**			

Note: *Students who have completed Comprehensive Design Ⅰ & Ⅱ are not required to take the Senior Project (ME498) .

Table 2: Major Elective Courses

Program of Mechanical Engineering

Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
ME112	Introduction to Matlab	2	1	1/Spring		MEE
ME211	Advanced Graphics and Computer Aided Design	2	1	2/Fall	ME102	MEE
MA212	Probability and Statistics	3	1	2/Fall	MA127	MATH
MEE5002	Fundamentals and practices of project management	3		2/Spring		MEE
PHY203-15	Mathematical Methods in Physics	4		2/Spring	PHY106, MA127, MA113	PHY
ME315	Mechanisms and Applications	3		3/Fall	MA127, MA113	MEE
ME322	Robotic Actuation System	3	1	3/Fall	MA127	MEE
ME331	Robot Modeling and Control	3		3/Fall	MAE203B	MEE
ME354	Manufacturing Process Simulation and Data Analysis	2	1	3/Fall	ME103	MEE
ME364	3D Printing of Functional Soft Materials: Fundamentals, Engineering and Applications	3		3/Fall	PHY105B, MA127	MEE
MEE5304	Frontiers in Hybrid Manufacturing Processes	3		3/Fall	ME302	MEE
SDM274	Artificial Intelligence and Machine Learning	3		3/Fall	MA127, MA113	SDIM
ME273	Introduction to Energy Science	3		2/Spring	PHY106, CH105/ CH103, ME271	MEE
ME310	Fundamentals of Measurement Technology	3		3/Spring	ME307	MEE
ME313	Product Design Practice	3	1	3/Spring	ME213/ ME311/ ME316/ ME331	MEE
ME314	Finite Element Theory and Its Engineering Applications	3		3/Spring	ME212, MA113	MEE
ME323	Principles of Machinery	3	0.5	3/Spring	EE104, EE205	MEE
ME332	Robot Operating System	3	1	3/Spring	CS109/ CS110/ CS111/ CS112/ CS113	MEE
ME333	Mechatronic Systems	3	1	3/Spring	ME331	MEE
ME336	Collaborative Robot Learning	3	1	3/Spring	ME331	MEE
ME361	Fundamentals of Additive Manufacturing of Metals	3		3/Spring	ME261	MEE
MEE5116	Advanced Kinematics and Dynamics of Mechanisms	3	1	4/Fall	ME331	MEE
MEE5210	Microstructure	3		3/Spring	PHY106,	MEE

	Characterization and Analysis				CH105/ CH103	
MEE5211	Fundamental and Applications of Advanced Composite Materials	3		3/Spring		MEE
ME405	Innovative Design Theory and Practice	3	1	4/Fall		MEE
ME462	Additive Manufacturing and Design	3		4/Fall		MEE
MEE5205	Failure Analysis and Fracture Mechanics of Engineering Materials	3		4/Spring	ME212	MEE
ME491	Practice	3	3	1-3 Spring &Fall& Summer, 4 Spring &Fall		MEE
Total		**82**	**14.5**			

Note:

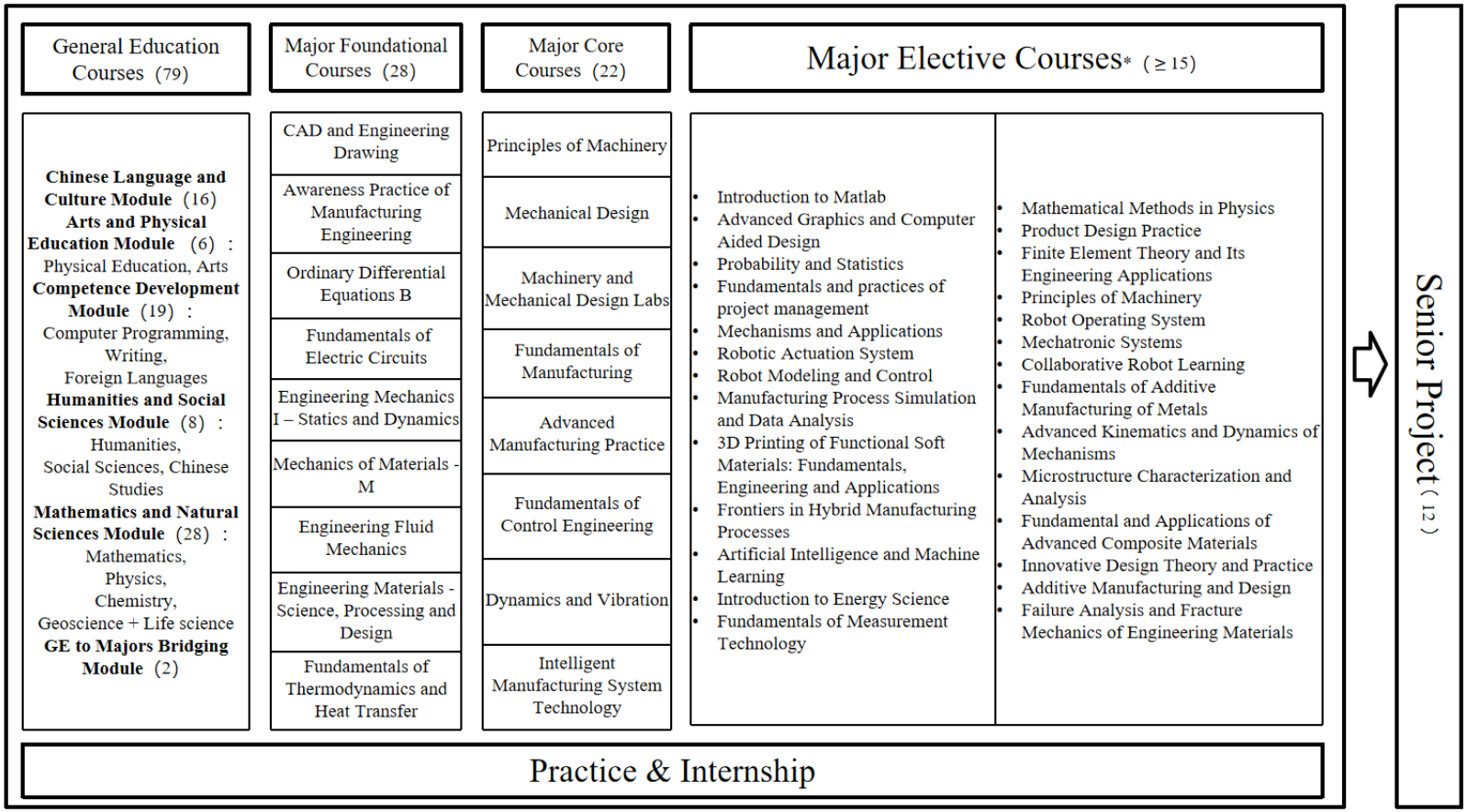
1. The minimum requirement for graduation in this module is 15 credits.
2. Major elective courses selected by a student during any specific semester may be changed according to the loading situation.
3. The number and contents of major elective courses offered by the department may be adjusted according to the development of curriculum construction.

Table 3: Overview of Practice-based Learning

Program of Mechanical Engineering

Course Code	Course Name	Credits	Practice-based Learning Credits	Terms	Prerequisite	Dept.
ME102	CAD and Engineering Drawing	3	1.5	2 Spring &Fall		MEE
ME103	Awareness Practice of Manufacturing Engineering	3	2	1/Summer, 1-2 Spring &Fall		MEE
MA201b	Ordinary Differential Equations B	4	1	2/Fall	MA127	MATH
ME316	Machinery and Mechanical Design Labs	2	2	3 Spring &Fall		MEE
ME307	Fundamentals of Control Engineering	3	0.5	3/Spring	EE104	MEE
ME301	Dynamics and Vibration	3	1	3/Spring	MAE203B, MA201b	MEE
ME308	Advanced Manufacturing Practice	2	2	4/Fall	ME302	MEE
ME112	Introduction to Matlab	2	1	1/Spring		MEE
ME211	Advanced Graphics and Computer Aided Design	2	1	2/Fall	ME102	MEE
MA212	Probability and Statistics	3	1	2/Fall	MA127	MATH
ME322	Robotic Actuation System	3	1	3/Fall	MA127	MEE
ME354	Manufacturing Process Simulation and Data Analysis	2	1	3/Fall	ME103	MEE
ME313	Product Design Practice	3	1	3/Spring	ME213/ ME311/ ME316/ ME331	MEE
ME323	Principles of Machinery	3	0.5	3/Spring	EE104, EE205	MEE
ME332	Robot Operating System	3	1	3/Spring	CS109/ CS110/ CS111/ CS112/ CS113	MEE
ME333	Mechatronic Systems	3	1	3/Spring	ME331	MEE
ME336	Collaborative Robot Learning	3	1	3/Spring	ME331	MEE
MEE5116	Advanced Kinematics and Dynamics of Mechanisms	3	1	4/Fall	ME331	MEE
ME405	Innovative Design Theory and Practice	3	1	4/Fall		MEE
ME491	Practice	3	3	1-3 Spring &Fall&Summer, 4 Spring &Fall		MEE
ME498	Senior Project	12	12	4/Spring		MEE
Total		**68**	**36.5**			

Curriculum Structure of Mechanical Engineering



Note*: Here only list some of the major elective courses. The full list is detailed in the program of Mechanical Engineering for International Students.