Graduate Major in Mechanical Engineering

【Master's Degree Program】

1. Outline

This major aims at fostering of human resources who possess systematic expertise constituting basic academic principles of mechanical engineering and creative abilities to resolve problems from societal viewpoint using these academic principles, and at its ultimate end, contribute to the evolutions of advanced science and technology and resolutions of broad societal problems.

2. Competencies Developed

This major aims to develop the following competencies to:

- Think and understand an essence that underlies a problem.
- Resolve problems using broad engineering knowledge and skills related to the field of mechanical engineering.
- Explore forefront of science and technology.
- Fulfill R&D activities with international perspective and strong scene of ethics.
- Explain and convey one’s ideas and results to others logically.
- Present logical discussions and compile them in written documents.

3. Learning Goals

To have those who enroll in this major acquire the competences above, this major provides them with the following learnings:

A) Specialized subjects in the field of mechanical engineering
B) Subjects of the peripheral and related fields
C) Broad abilities regarding thinking and resolving problems
D) Skills of logical communication
E) International perspective and sense of ethics

4. IGP Completion Requirements

The following requirements must be met to complete the Master's Degree Program of this major.

1. A total of 30 credits or more acquired from 400- and 500-level courses.
2. Meet the completion requirements indicated in Table M1 below.
3. Pass the master's thesis review and defense.

Table M1. Graduate Major in Mechanical Engineering Completion Requirements

Course category		<Required courses> Required credits	<Electives> Minimum credits required	Minimum credits required	Associated learning goals	Comments
Liberal arts and basic science courses	Humanities and social science courses		•2 credits from 400-level •1 credit from 500-level	5 credits	B, C	
	Career development courses		2 credits		C, D	
	Other courses					
Core courses	Research seminars	Seminar in Mechanical Engineering S1 Seminar in Mechanical Engineering F1 Seminar in Mechanical Engineering S2 Seminar in Mechanical Engineering F2 A total of 8 credits, 2 credits each from the above courses.		18 credits	C, D, E	
	Research-related courses		10 credits		C, D, E	
	Major courses				A, B, C, D, E	
	Major courses and Research-related courses <u>outside</u> the Graduate Major in Mechanical Engineering standard curriculum					
Total required credits		A minimum of 30 credits in addition to meeting the above conditions				
Note		• Japanese Language and Culture Courses offered to International Students can be recognized as Humanities and Social Science Courses of the corresponding course level. • As for Liberal Arts and Basic Science Courses, please refer to the relevant pages.				

5. IGP Courses

Table M2. Core Courses of the Graduate Major in Mechanical Engineering

Course category		Course number	Course			Credits	Competencies	Learning goals	Comments
Research seminars	400 level	MEC.Z491.R	◎		Seminar in Mechanical Engineering S1	0-2-0	2,3,5	C, D	
		MEC.Z492.R	◎		Seminar in Mechanical Engineering F1	0-2-0	2,3,5	C, D	
	500 level	MEC.Z591.R	◎		Seminar in Mechanical Engineering S2	0-2-0	2,3,5	C, D	
		MEC.Z592.R	◎		Seminar in Mechanical Engineering F2	0-2-0	2,3,5	C, D	
Research-related courses	500 level	MEC.S531.L			Overseas Research Project M1c	0-0-1	1,2,4,5	E	
		MEC.S532.L			Overseas Research Project M2c	0-0-2	1,2,4,5	E	
		MEC.S533.L			Overseas Research Project M3c	0-0-3	1,2,4,5	E	
		MEC.S534.L			Overseas Research Project M4c	0-0-4	1,2,4,5	E	
Major courses	400 level	MEC.C432.L			Structural Integrity Assessment	1-0-0	3, 5	A, B	
		MEC.E431.L		□	Thermodynamics of Nonequilibrium Systems	1-0-0	3	A	
		MEC.E432.L		□	Properties of Solid Materials	1-0-0	3	A	
		MEC.E433.L		□	Advanced Thermal-Fluids Measurement	1-0-0	3,5	A	
		MEC.F431.L		□	Computational Thermo-Fluid Dynamics	1-0-0	3	A	
		MEC.H431.L			Advanced Mechanical Elements	1-0-0	3,5	A	
		MEC.E451.L		□	Advanced Course of Radiation Transfer	1-0-0	3,5	A	【Energy Science and Engineering】(ENR.K440)
		MEC.E452.L	O	□	Advanced Course of Combustion Physics	1-0-0	3,5	A	【Energy Science and Engineering】(ENR.K450)
		MEC.F451.L	O	□	Advanced Course of Turbulent Flow and Control	1-0-0	3,5	A	【Energy Science and Engineering】(ENR.K430)

		MEC.H434.L			Advanced Course of Actuator Engineering	1-0-0	3,5	A, B	
		MEC.L431.L			Human Brain Functions and Their Measurements	1-0-0	2,3	B	
		MEC.L432.L			Human-Centered Design	1-0-0	1,2,3,4,5	B	
		MEC.M433.L			Space Systems Analysis A	1-0-0	3	B	
		MEC.R431.L			Off-campus Project M1c	0-0-1	2,4,5	C, D	
		MEC.R432.L			Off-campus Project M2c	0-0-2	2,4,5	C, D	
		MEC.R433.L			Off-campus Project M3c	0-0-3	2,4,5	C, D	
		MEC.R434.L			Off-campus Project M4c	0-0-4	2,4,5	C, D	
		MEC.U431.L			Automotive Structural System Engineering A	3-0-0	3	A	
		MEC.U432.L			Automotive Comfort Mechanics Engineering A	3-0-0	3	A	
		MEC.U433.L			Advanced Production Engineering A	3-0-0	3	A	
		MEC.U434.L			Advanced Internal Combustion Engine Engineering and Future Power Train A	3-0-0	3	A	
		MEC.U435.L			Basics of Automotive Design A	3-0-0	3	A	
		MEC.U436.L			Combustion Engineering	3-0-0	3	A	
		MEC.U441.L			Automotive Structural System Engineering B	1-1-0	3,5	A, C	
		MEC.U442.L			Automotive Comfort Mechanics Engineering B	1-1-0	3,5	A, C	
		MEC.U443.L			Advanced Production Engineering B	1-1-0	3,5	A, C	
		MEC.U444.L			Advanced Internal Combustion Engine Engineering and Future Power Train B	1-1-0	3,5	A, C	
		MEC.U445.L			Basics of Automotive Design B	1-1-0	3,5	A, C	
		MEC.U447.L			Advanced Material Science and Engineering B	1-1-0	3,5	A, C	
	500 level	MEC.C531.L			Mechanics of High Temperature Materials	1-0-0	3,5	A,B	
		MEC.D532.L			Silent Engineering	1-0-0	3,5	A	

		MEC.E531.L		□	Plasma Physics	1-0-0	3,5	B	
		MEC.E552.L		□	Leading Edge Energy Technology	1-0-0	1,3	B	【Energy Science and Engineering】(ENR.K580)
		MEC.F531.L		□	Flying Object Engineering	1-0-0	3,5	B	
		MEC.M531.L			Space Systems Analysis B	1-0-0	3	B	

Note：

・◎：Required course, ○：Restricted elective, O：odd academic years, E：even academic years

・□：Course is recognized as an Academy for Co-creative Education of Environment and Energy Science, Leading Graduate School (ACEEES) course.

• Competencies: 1 = Intercultural skills; 2 = Communication skills; 3 = Specialist skills; 4 = Critical thinking skills; 5 = Practical and/or problem-solving skills

・【 】Course offered under another graduate major.

• The character preceding the three digits in the course number denotes the course's subdiscipline (i.e., "D" represents the subdiscipline code in the course number ABC.D400.R): C (Mechanics of Materials), D (Mechanical Dynamics), E (Thermodynamics), F (Fluid Dynamics), H (Design and Drawing, Information Processing, Courses for Developing Creativity), L (Bioengineering), M (Space Engineering), R (Off-campus Project), S (Overseas Research Project), U (TAIST). Z (Research Seminars)

6. IGP Courses That Can be Recognized as Humanities and Social Science Courses

None

7. IGP Courses That Can be Recognized as Career Development Courses

As a general rule, students who would like their Career Development Courses to contribute to completion requirements of their master's degree program need to satisfy all of the specified Graduate Attributes ("GA"), including the attainment of at least two course credits, listed in Table MA-1 of the "Guide to Graduate Education and International Graduate Program (Liberal Arts and Basic Science Courses) - Career Development Courses". The status of the GA will be evaluated at the time of degree completion.

In addition to Career Development Courses, there are Major Courses that can also be recognized as such — shown below in Table M3 — which may go toward fulfilling the GA requirements.

However, note that when the corresponding Major Courses are recognized and accredited as Career Development Courses, their credits cannot be counted a second time (as Major Courses) towards degree completion requirements.

Table M3. Courses of the Graduate Major in Mechanical Engineering that can be recognized as Career Development Courses

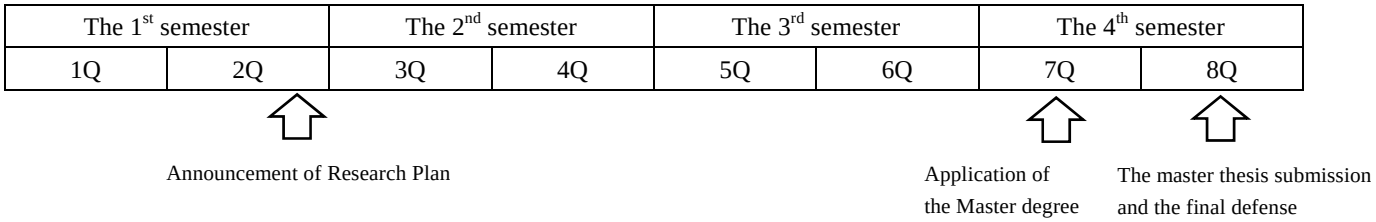
Course category	Course number	Course			Credits	GA*	Learning goals	Comments
can be recognized as Career Development Courses	MEC.R431.L			Off Campus Project M1c	0-0-1	C1M	C, D	
	MEC.R432.L			Off Campus Project M2c	0-0-2	C1M	C, D	
	MEC.R433.L			Off Campus Project M3c	0-0-3	C1M	C, D	
	MEC.R434.L			Off Campus Project M4c	0-0-4	C1M	C, D	
	MEC.S531.L			Overseas Research Project M1c	0-0-1	C1M	E	
	MEC.S532.L			Overseas Research Project M2c	0-0-2	C1M	E	
	MEC.S533.L			Overseas Research Project M3c	0-0-3	C1M	E	
	MEC.S534.L			Overseas Research Project M4c	0-0-4	C1M	E	

To satisfy the Career Development requirement, credits may be acquired from courses listed above as well as from those listed under Career Development Courses (see the Liberal Arts and Basic Science Courses Guide).

＊GA：Graduate Attribute

8. Research Related to the Completion of Master Theses

A student aims at learning of the ability that is listed in the "Learning Goals" by accomplishing the research activities of Master Thesis. A model schedule for a student who is graduating at the 8th quarter is shown below.



*** Announcement of Research Plan**

A student conducts "Announcement of Research Plan" in the 2nd quarter so as to clearly understand the background and objectives of his/her research project, and makes use of these to his/her carrier formation.

* Judgement criterion of the final defense of Master Thesis

Master degree thesis has to be an own thesis including original discussion, and to contain new knowledge of the mechanical engineering from academic aspect, or to contain useful knowledge contributing to the development of technologies relating to the mechanical engineering.

* Implementation manner of the final defense of Master Thesis

The judgement committee consists of 3 judges or more. After the preliminary peer review by the judges, the oral presentation is put into effect for the final examination and evaluation. In case of a student going to the doctoral degree program, the judgement is done by at least 5 judges.

【Doctoral Degree Program】

1. Outline

This major aims at fostering of human resources who possess leadership and capability to propose research projects for resolving societal problems from global perspectives, promote advanced research projects that lead to an innovation of mechanical engineering, and return the profit obtained from research activities to society with new values, based on the systematic expertise of mechanical engineering and broad knowledge of its surrounding academic fields.

2. Competencies Developed

This major aims to develop the following advanced-level competencies to:

- Think and understand an essence that underlies a problem.
- Propose and develop new mechanical engineering systems by organizing broad engineering knowledge and skills related to the field of mechanical engineering.
- Lead and pioneer forefront of science and technology.
- Enterprise and fulfill R&D projects as a leader.
- Fulfill R&D activities with international perspective and strong scene of ethics.
- Explain and convey one's ideas and results to others logically.
- Present logical discussions and compile them in written documents.

3. Learning Goals

To have those who enroll in this major acquire the competences above, this major provides them with the following learnings:

A) Specialized subjects in the field of mechanical engineering
B) Subjects of the peripheral and related fields
C) Broad abilities including abilities for being a leader and creatively proposing new ideas and projects.
D) Skills of logical communication
E) International perspective and sense of ethics

4. IGP Completion Requirements

The following requirements must be met to complete the Doctoral Degree Program of this major.

1. A total of 24 credits or more acquired from 600-level courses.
2. Meet the completion requirements indicated in Table D1 below.
3. Pass the Doctoral Dissertation review and defense.

Table D1. Graduate Major in Mechanical Engineering Completion Requirements

Course category		<Required courses> Required credits	<Electives> Minimum credits required	Minimum credits required	Associated learning goals	Comments
Liberal arts and basic science courses	Humanities and social science courses		2 credits	6 credits	B, C	
	Career development courses		4 credits		C, D	
	Other courses					
Core courses	Research seminars	Seminar in Mechanical Engineering S3 Seminar in Mechanical Engineering F3 Seminar in Mechanical Engineering S4 Seminar in Mechanical Engineering F4 Seminar in Mechanical Engineering S5 Seminar in Mechanical Engineering F5 A total of 12 credits, 2 credits each from the above courses.		14 credits	C, D, E	
	Research-related courses		2 credits		C, D, E	
	Major courses				A, B, C, D, E	
	Major courses and Research-related courses <u>outside</u> the Graduate Major in Mechanical Engineering standard curriculum					
Total required credits		A minimum of 24 credits in addition to meeting the above conditions				
Note		• Japanese Language and Culture Courses offered to International Students can be recognized as Humanities and Social Science Courses of the corresponding course level. • As for Liberal Arts and Basic Science Courses, please refer to the relevant pages.				

5. IGP Courses

Table D2. Core Courses of the Graduate Major in Mechanical Engineering

Course category		Course number	Course			Credits	Competencies	Learning goals	Comments
Research seminars	600 level	MEC.Z691.R	◎		Seminar in Mechanical Engineering S3	0-2-0	2,3,4,5	C, D	
		MEC.Z692.R	◎		Seminar in Mechanical Engineering F3	0-2-0	2,3,4,5	C, D	
		MEC.Z693.R	◎		Seminar in Mechanical Engineering S4	0-2-0	2,3,4,5	C, D	
		MEC.Z694.R	◎		Seminar in Mechanical Engineering F4	0-2-0	2,3,4,5	C, D	
		MEC.Z695.R	◎		Seminar in Mechanical Engineering S5	0-2-0	2,3,4,5	C, D	
		MEC.Z696.R	◎		Seminar in Mechanical Engineering F5	0-2-0	2,3,4,5	C, D	
Research-related courses	600 level	MEC.S631.L			Overseas Research Project D1c	0-0-1	1,2,4,5	E	
		MEC.S632.L			Overseas Research Project D2c	0-0-2	1,2,4,5	E	
		MEC.S633.L			Overseas Research Project D3c	0-0-3	1,2,4,5	E	
		MEC.S634.L			Overseas Research Project D4c	0-0-4	1,2,4,5	E	
		MEC.S635.L			Overseas Research Project D5c	0-0-5	1,2,4,5	E	
		MEC.S636.L			Overseas Research Project D6c	0-0-6	1,2,4,5	E	
Major courses	600 level	MEC.N631.L			Special Lecture in Mechanical Engineering I	1-0-0	1,3	B	
		MEC.N632.L			Special Lecture in Mechanical Engineering II	1-0-0	1,3	B	
		MEC.N633.L			Special Lecture in Mechanical Engineering III	1-0-0	1,3	B	
		MEC.N634.L			Special Lecture in Mechanical Engineering IV	1-0-0	1,3	B	
		MEC.T631.L			Teaching Practice in Mechanical Engineering	0-0-2	2,3,5	D	
		MEC.R631.L			Off Campus Project D1c	0-0-1	2,4,5	C, D	
		MEC.R632.L			Off Campus Project D2c	0-0-2	2,4,5	C, D	
		MEC.R633.L			Off Campus Project D3c	0-0-3	2,4,5	C, D	

		MEC.R634.L			Off Campus Project D4c	0-0-4	2,4,5	C, D	
		MEC.R635.L			Off Campus Project D5c	0-0-5	2,4,5	C, D	
		MEC.R636.L			Off Campus Project D6c	0-0-6	2,4,5	C, D	

Note：

・◎：Required course, ○：Restricted elective, O：odd academic years, E：even academic years

・□：Course is recognized as an Academy for Co-creative Education of Environment and Energy Science, Leading Graduate School (ACEEES) course.

• Competencies: 1 = Intercultural skills; 2 = Communication skills; 3 = Specialist skills; 4 = Critical thinking skills; 5 = Practical and/or problem-solving skills

・【 】Course offered under another graduate major.

• The character preceding the three digits in the course number denotes the course's subdiscipline (i.e., "D" represents the subdiscipline code in the course number ABC.D400.R): N (Special Lecture in Mechanical Engineering), R(Off campus project), S (Overseas research project), T (Teaching practice). Z (Research Seminars).

6. IGP Courses That Can be Recognized as Humanities and Social Science Courses

None

7. IGP Courses That Can be Recognized as Career Development Courses

As a general rule, students who would like their Career Development Courses to contribute to completion requirements of their doctoral degree program need to satisfy all of the specified Graduate Attributes (“GA”), including the attainment of at least four course credits, listed in Table A-1 or A-2 of the “Guide to Graduate Education and International Graduate Program (Liberal Arts and Basic Science Courses) - Career Development Courses”. The status of the GA will be evaluated at the time of degree completion.

In addition to Career Development Courses, there are Major Courses that can also be recognized as such — shown below in Table D3 — which may go toward fulfilling the GA requirements.

However, note that when the corresponding Major Courses are recognized and accredited as Career Development Courses, their credits cannot be counted a second time (as Major Courses) towards degree completion requirements.

Table D3-1. Courses of the Graduate Major in Mechanical Engineering that can be recognized as Career Development Courses in the Academic Leader Program (ALP)

Course category	Course number	Course			Credits	GA*	Learning goals	Comments
can be recognized as Career Development Courses	MEC.T631.L			Teaching Practice in Mechanical Engineering	0-0-2	A2D, A3D	D	
	MEC.R631.L			Off Campus Project D1c	0-0-1	A2D, A3D	C, D	
	MEC.R632.L			Off Campus Project D2c	0-0-2	A2D, A3D	C, D	
	MEC.R633.L			Off Campus Project D3c	0-0-3	A2D, A3D	C, D	
	MEC.R634.L			Off Campus Project D4c	0-0-4	A2D, A3D	C, D	
	MEC.R635.L			Off Campus Project D5c	0-0-5	A2D, A3D	C, D	
	MEC.R636.L			Off Campus Project D6c	0-0-6	A2D, A3D	C, D	
	MEC.S631.L			Overseas Research Project D1c	0-0-1	A2D, A3D	E	
	MEC.S632.L			Overseas Research Project D2c	0-0-2	A2D, A3D	E	
	MEC.S633.L			Overseas Research Project D3c	0-0-3	A2D, A3D	E	
	MEC.S634.L			Overseas Research Project D4c	0-0-4	A2D, A3D	E	
	MEC.S635.L			Overseas Research Project D5c	0-0-5	A2D, A3D	E	
	MEC.S636.L			Overseas Research Project D6c	0-0-6	A2D, A3D	E	

To satisfy the Career Development requirement, credits may be acquired from courses listed above as well as from those listed under Career Development Courses (see the Liberal Arts and Basic Science Courses Guide).

＊GA：Graduate Attribute

Table D3-2. Courses of the Graduate Major in Mechanical Engineering that can be recognized as Career Development Courses in the Productive Leader Program (PLP)

Course category	Course number	Course			Credits	GA*	Learning goals	Comments
can be recognized as Career Development Courses	MEC.R631.L			Off Campus Project D1c	0-0-1	P2D, P3D	C, D	
	MEC.R632.L			Off Campus Project D2c	0-0-2	P2D, P3D	C, D	
	MEC.R633.L			Off Campus Project D3c	0-0-3	P2D, P3D	C, D	
	MEC.R634.L			Off Campus Project D4c	0-0-4	P2D, P3D	C, D	
	MEC.R635.L			Off Campus Project D5c	0-0-5	P2D, P3D	C, D	
	MEC.R636.L			Off Campus Project D6c	0-0-6	P2D, P3D	C, D	
	MEC.S631.L			Overseas Research Project D1c	0-0-1	P2D, P3D	E	
	MEC.S632.L			Overseas Research Project D2c	0-0-2	P2D, P3D	E	
	MEC.S633.L			Overseas Research Project D3c	0-0-3	P2D, P3D	E	
	MEC.S634.L			Overseas Research Project D4c	0-0-4	P2D, P3D	E	
	MEC.S635.L			Overseas Research Project D5c	0-0-5	P2D P3D	E	
	MEC.S636.L			Overseas Research Project D6c	0-0-6	P2D, P3D	E	

To satisfy the Career Development requirement, credits may be acquired from courses listed above as well as from those listed under Career Development Courses (see the Liberal Arts and Basic Science Courses Guide).

＊GA：Graduate Attribute

8. Research Related to the Completion of Doctoral Theses

A student aims at learning of the ability that is listed in the "Learning Goals" by accomplishing the research activities of Doctoral Thesis. A model schedule for a student who is graduating at the 12th quarter is shown below.

The 1st semester		The 2nd semester		The 3rd semester		The 4th semester		The 5th semester		The 6th semester	
1Q	2Q	3Q	4Q	5Q	6Q	7Q	8Q	9Q	10Q	11Q	12Q

1. Application of the Doctoral degree
2. The doctoral thesis submission and the final defense
3. The final examination and evaluation

* Judgement criterion of the final defense of Doctoral Thesis

Doctoral degree thesis has to be an own thesis that has novelty, originality, and sufficient academic value in the mechanical engineering and relating fields. In addition, main part of the thesis has to have been published in a scientific journal which is in the international standard, or to reach to the similar level to the publication.

* Implementation manner of the final defense of Doctoral Thesis

The judgement committee consists of 5 judges or more, and it is recommended to actively include the external judges from other research institute or company. After the application of the Doctoral degree, the thesis submission and the oral presentation is put into effect. The judgement of appropriateness for the Doctoral degree giving is done after the final examination and evaluation.