PROSPECTUS
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INTRODUCTION

The Joint Graduate School of Energy and Environment (JGSEE) is an autonomous graduate school instituted under the jurisdiction of the Council of the King Mongkut's University of Technology Thonburi. It was established in 1998 with the support of the Energy Conservation Promotion Fund, Ministry of Energy, and the Higher Education Development Project (HEDP) of the Commission on Higher Education (CHE), Ministry of Education. The School aims to strengthen postgraduate education and research in the field of energy and environment for supporting Thailand's economic competitiveness.

The School is the implementation unit of a consortium involving:
- King Mongkut's University of Technology Thonburi (KMUTT) as the lead institution,
- King Mongkut's University of Technology North Bangkok (KMUTNB),
- Chiang Mai University (CMU),
- Prince of Songkhla University (PSU) and
- Sirindhorn International Institute of Technology of Thammasart University (SIIT- TU), as partners.

JGSEE's vision is to be an internationally recognized premier centre in graduate education and research in the fields of energy and environmental technologies.

The mission of JGSEE is to provide high quality graduate education and training, conduct high quality research and provide technical services, with a view to meeting societal needs for the development and deployment of efficient, economical and sustainable energy services while protecting the environment.

The purpose of this handbook is to provide students with as much information as possible in order to facilitate the orderly progression of their studies. However, not all information can be contained or fully explained in a book of this size. Therefore students are encouraged to contact relevant School officers or staff to clarify any aspects that may be in doubt.

ACADEMIC PROGRAMS

JGSEE offers the following international graduate programs:

Doctoral Programs
- Sustainable Energy Systems
- Environment, Climate Change and Sustainability

Master Programs (MEng and MSc)
- Sustainable Energy Systems
- Environmental Technology and Management

The normal duration of the Masters programs is 2 academic years with a maximum duration of no more than 5 academic years. The normal duration of the Doctoral programs is 3 academic years with a maximum duration of no more than 6 academic years from the Master level, or a normal duration of 3.5 academic years with a maximum duration of no more than 8 academic years if the Doctoral program is taken directly after the Bachelor level.

All students are required to enroll for their first semester of study at JGSEE on KMUTT campus; the remaining semesters may be spent at any one of the partner institutions in the consortium. In the latter case, the students may have their credits earned at JGSEE transferred to a corresponding program of the partner institution.

	Number of credits required for each program are listed below.	Number of Credit Required					
	Degree	Compulsory	Specific Compulsory	Elective	Thesis	Internship	Total
1.	Doctor of Philosophy (Sustainable Energy Systems) Plan A from Master level Plan B from Bachelor level	 11 11	-	 6 15	 38 49	-	 55 75
2.	Doctor of Philosophy (Environment, Climate Change and Sustainability) Plan A from Master level Plan B from Bachelor level	 11 11	-	 6 15	 38 49	-	 55 75
3.	Master of Engineering /Master of Science (Plan 1 Thesis 20 credits) (Sustainable Energy Systems)	11	6	3	20	-	-
4.	Master of Engineering/Master of Science (Plan 1 Thesis 12 credits)	11	6	3	12	8	40
5.	Master of Engineering/Master of Science (Plan 1 Thesis 20 credits) (Environmental Technology & Management)	11	6	3	20	-	40
6.	Master of Engineering/Master of Science (Plan 1 Thesis 12 credits) (Environmental Technology & Management)	11	6	3	12	8	40

The Objectives

The overall objectives of curriculums under Energy Division

1. To provide high-level engineers, scientists and researchers with integrated knowledge of energy technology and management, analytical skill, good English communication and work professionally.
2. To promote environmental awareness of energy use and production to modern engineers, scientists and researchers.
3. To create new knowledge of energy technology and management as well as solution related to environmental problems in manufacturing and service sectors

The overall objectives of curriculums under Environment Division

The overall objective of curriculums in Environmental Technology and Environmental Technology and Management is nurture future engineers and scientists in the field of environmental science and technology with the following capabilities:

1. To contribute to the body of knowledge and solutions of challenging energy related environmental problems in industry or at governmental level through research and innovations.
2. To understand global environmental challenges and energy related implications on the environment based on basic knowledge in energy and environmental science.
3. To apply their knowledge and skills to address a broad range of technical and societal challenges with adequate critical thinking, creativity and leadership.
4. To interact and operate professionally in international forums/community, and effectively communicate and share their experience and knowledge, as well as develop professional networks.
5. To continue improving themselves through lifelong learning to keep abreast of rapid technological changes or disruption in relation to the Environment and global challenges of the near- and long-term future.

1) Doctor of Philosophy Program (Sustainable Energy Systems)

Structure

Plan A from Master level	
Total program credits	55 credits
Program Component	
A. Compulsory Courses	11 credits
B. Elective Courses	6 credits
C. Dissertation	38 credits
D. English Course	non-credit
Plan B from Bachelor level	
Total program credits	75 credits
Program Component	
A. Compulsory Courses	11 credits
B. Elective Courses	15 credits
C. Dissertation	49 credits
D. English Course	non-credit

A. Compulsory courses

All students take 4 subjects with total		11 credits
JEE 701	Research Communication	2 (0-6-6)
JEE 613	Research Methodology	3 (3-0-9)
JEE 649	Entrepreneurship and Innovation in Energy and Environment	3 (3-0-9)
JEE 683	Energy, Environment and Sustainability	3 (3-0-9)

B. Elective courses

Students with master's degree background take 2 subjects with a total of 6 credits
Students with bachelor's degree background take 6 subjects with a total of 15 credits

	Common	
JEE 603	Special Study I	3 (3-0-9)
JEE 604	Special Study II	3 (0-0-9)
JEE 605	Special Study III	3 (0-9-9)
JEE 606	Mathematical Techniques	3 (3-0-9)
JEE 607	Optimization Techniques	3 (3-0-9)
	Energy and Environmental Policy	
JEE 621	Energy Economics, Market and Policies	3 (3-0-9)
JEE 622	Energy Planning for Sustainable Development	3 (3-0-9)
JEE 623	Policies for Energy Market Transformation	3 (3-0-9)
JEE 624	Energy Modeling and Analysis	3 (3-0-9)
JEE 628	Foundations of Decision Analysis	3 (3-0-9)
JEE 631	Strategic Planning and Project Management	3 (3-0-9)
	Energy Efficiency	
JEE 633	Energy Management in Industry	3 (3-0-9)
JEE 634	Climate Influence on Buildings and End-use Requirements	3 (3-0-9)
JEE 635	Data-driven Energy Efficiency and Management	3 (3-0-9)
JEE 637	Daylighting Applications	3 (3-0-9)
JEE 638	Advanced Topics in Building Energy Technology	3 (3-0-9)

	Energy Technology	
JEE 642	Fuels and Combustion	3 (3-0-9)
JEE 644	Power Plant Engineering	3 (3-0-9)
JEE 652	Natural Gas Utilization Technologies	3 (3-0-9)
JEE 657	Fuel Cell and Hydrogen Technology	3 (3-0-9)
JEE 659	Energy from Biomass	3 (3-0-9)
	Energy System Integration	
JEE 653	Energy Systems Integration and Smart Power Systems	3 (3-0-9)
JEE 654	Renewable Energy Systems	3 (3-0-9)
JEE 655	Sustainable Hydrogen and Electrical Energy Storage	3 (3-0-9)
	Climate Change and Sustainability	
JEE 661	Tropical Climates and Boundary Layer Science	3 (3-0-9)
JEE 664	Atmospheric and Air Quality Modeling	3 (3-0-9)
JEE 667	Environmental Pollution Control Technology	3 (3-0-9)
JEE 671	Life Cycle Assessment	3 (3-0-9)
JEE 673	Waste and Climate Change	3 (3-0-9)
JEE 674	Waste to Energy and Its Sustainable Mitigation	3 (3-0-9)
JEE 681	Environmental Chemistry and Toxicology	3 (3-0-9)
JEE 682	Environmental and Health Risk Assessment	3 (3-0-9)
JEE 684	GIS and Remote Sensing	3 (3-0-9)
JEE 685	Climate change: Physical Science Basis	3 (3-0-9)
JEE 687	Biogeochemistry	3 (3-0-9)
JEE 688	Data Science for Environmental and Energy Studies	3 (3-0-9)
JEE 691	Climate Change Analysis for Policy and Planning	3 (3-0-9)
JEE 696	Greenhouse Gas Measurement, Mitigation and Monitoring Technology	3 (3-0-9)

JEE 703	Selected Topics I	3 (3-0-9)
JEE 713	Selected Topics II	3 (3-0-9)
XXX	Elective (As recommended by advisor)	3 (3-0-9)

C. Dissertation

JEE 702	Dissertation for Ph.D. (Sustainable Energy Systems) For students with master's degree background	38 credits
JEE 704	Dissertation for Ph.D. (Sustainable Energy Systems) For students with bachelor's degree background	49 credits

D. English courses

LNG 601	Foundation English for International Programs	non-credit
LNG 602	Thesis Writing	non-credit

Note:

- Students who do not comply with the English language proficiency criteria must take the mandatory course, LNG 601 Foundation English for International Programs
- LNG 602 Thesis writing is compulsory for all students
- Both LNG 601 and LNG 602 are the non-credit courses

Study Plan

Plan A from Master level

Year 1 / Semester 1		Credit(s) (Theory-Practice-Self-study)
JEE 701	Research Communication	2 (0-6-6)
JEE 613	Research Methodology	3 (3-0-9)
JEE 649	Entrepreneurship and Innovation in Energy and Environment	3 (3-0-9)
JEE 683	Energy, Environment and Sustainability	3 (3-0-9)
Total		11 (9-6-33)

Year 1 / Semester 2		Credit(s) (Theory-Practice-Self-study)
XXX	Elective (As recommended by advisor)	3 (3-0-9)
XXX	Elective (As recommended by advisor)	3 (3-0-9)
JEE 702	Dissertation for Ph.D.	6 (0-0-18)
Total		12 (6-0-36)

Year 2 / Semester 1		Credit(s) (Theory-Practice-Self-study)
JEE 702	Dissertation for Ph.D.	9 (0-0-27)
Total		9 (0-0-27)

Year 2 / Semester 2		Credit(s) (Theory-Practice-Self-study)
JEE 702	Dissertation for Ph.D.	9 (0-0-27)
Total		9 (0-0-27)

Year 3 / Semester 1		Credit(s) (Theory-Practice-Self-study)
JEE 702	Dissertation for Ph.D.	9 (0-0-27)
Total		9 (0-0-27)

Year 3 / Semester 2		Credit(s) (Theory-Practice-Self-study)
JEE 702	Dissertation for Ph.D.	5 (0-0-15)
Total		5 (0-0-15)

Plan B from Bachelor level

Year 1 / Semester 1		Credit(s) (Theory-Practice-Self-study)
JEE 701	Research Communication	2 (0-6-6)
JEE 613	Research Methodology	3 (3-0-9)
JEE 649	Entrepreneurship and Innovation in Energy and Environment	3 (3-0-9)
JEE 683	Energy, Environment and Sustainability	3 (3-0-9)
Total		11 (9-6-33)

Year 1 / Semester 2		Credit(s) (Theory-Practice-Self-study)
XXX	Elective (As recommended by advisor)	3 (3-0-9)
XXX	Elective (As recommended by advisor)	3 (3-0-9)
XXX	Elective (As recommended by advisor)	3 (3-0-9)
XXX	Elective (As recommended by advisor)	3 (3-0-9)
Total		12 (12-0-36)

Year 2 / Semester 1		Credit(s) (Theory-Practice-Self-study)
XXX	Elective (As recommended by advisor)	3 (3-0-9)
JEE 704	Dissertation for Ph.D.	9 (0-0-27)
Total		12 (6-0-36)

Year 2 / Semester 2		Credit(s) (Theory-Practice-Self-study)
JEE 704	Dissertation for Ph.D.	10 (0-0-30)
Total		10 (0-0-30)

Year 3 / Semester 1		Credit(s) (Theory-Practice-Self-study)
JEE 704	Dissertation for Ph.D.	10 (0-0-30)
Total		10 (0-0-30)

Year 3 / Semester 2		Credit(s) (Theory-Practice-Self-study)
JEE 704	Dissertation for Ph.D.	10 (0-0-30)
Total		10 (0-0-30)

Year 4 / Semester 1		Credit(s) (Theory-Practice-Self-study)
JEE 704	Dissertation for Ph.D.	10 (0-0-30)
Total		10 (0-0-30)

2) Doctor of Philosophy Program (Environment, Climate Change and Sustainability)

Structure

Plan A from Master level

Total program credits	55 credits
Program Component	
A. Compulsory Courses	8 credits
B. Cross-discipline	3 credits
C. Elective Courses	6 credits
D. Dissertation	38 credits
E. English Course	non-credit

Plan B from Bachelor level

Total program credits	75 credits
Program Component	
A. Compulsory Courses	8 credits
B. Cross-discipline	3 credits
C. Elective Courses	15 credits
D. Dissertation	49 credits
E. English Course	non-credit

A. Compulsory Courses

All students take 3 subjects with total		8 credits
JEE 711	Research Communication	2 (0-6-6)
JEE 613	Research Methodology	3 (3-0-9)
JEE 649	Entrepreneurship and Innovation in Energy and Environment	3 (3-0-9)

B. Cross-discipline

Students must take 1 subjects with total 3 credits

JEE 683 Energy, Environment and Sustainability 33 (3-0-9)

C. Elective courses

Students with master's degree background take 2 subjects with a total of 6 credits
Students with bachelor's degree background take 6 subjects with a total of 15 credits

The selection of electives is based on the research area of specialty and doctoral thesis topic.

Common

JEE 603	Special Study I	3 (3-0-9)
JEE 604	Special Study II	3 (0-0-9)
JEE 605	Special Study III	3 (0-9-9)
JEE 606	Mathematical Techniques	3 (3-0-9)
JEE 607	Optimization Techniques	3 (3-0-9)

Energy and Environmental Policy

JEE 621	Energy Economics, Market and Policies	3 (3-0-9)
JEE 622	Energy Planning for Sustainable Development	3 (3-0-9)
JEE 623	Policies for Energy Market Transformation	3 (3-0-9)
JEE 624	Energy Modeling and Analysis	3 (3-0-9)
JEE 628	Foundations of Decision Analysis	3 (3-0-9)
JEE 631	Strategic Planning and Project Management	3 (3-0-9)

	Energy Efficiency	
JEE 633	Energy Management in Industry	3 (3-0-9)
JEE 634	Climate Influence on Buildings and End-use Requirements	3 (3-0-9)
JEE 635	Data-driven Energy Efficiency and Management	3 (3-0-9)
JEE 637	Daylighting Applications	3 (3-0-9)
JEE 638	Advanced Topics in Building Energy Technology	3 (3-0-9)
	Energy Technology	
JEE 642	Fuels and Combustion	3 (3-0-9)
JEE 644	Power Plant Engineering	3 (3-0-9)
JEE 652	Natural Gas Utilization Technologies	3 (3-0-9)
JEE 657	Fuel Cell and Hydrogen Technology	3 (3-0-9)
JEE 659	Energy from Biomass	3 (3-0-9)
	Energy System Integration	
JEE 653	Energy Systems Integration and Smart Power Systems	3 (3-0-9)
JEE 654	Renewable Energy Systems	3 (3-0-9)
JEE 655	Sustainable Hydrogen and Electrical Energy Storage	3 (3-0-9)
	Climate system modeling	
JEE 661	Tropical Climates and Boundary Layer Science	3 (3-0-9)
JEE 664	Atmospheric and Air Quality Modeling	3 (3-0-9)

Environmental management and Waste utilization

JEE 667	Environmental Pollution Control Technology	3 (3-0-9)
JEE 671	Life Cycle Assessment	3 (3-0-9)
JEE 673	Waste and Climate Change	3 (3-0-9)
JEE 674	Waste to Energy and Its Sustainable Mitigation	3 (3-0-9)

Environmental system analysis and Data Science

JEE 681	Environmental Chemistry and Toxicology	3 (3-0-9)
JEE 682	Environmental and Health Risk Assessment	3 (3-0-9)
JEE 683	Energy, Environment and Sustainability	3 (3-0-9)
JEE 684	GIS and Remote Sensing	3 (3-0-9)
JEE 688	Data Science for Environmental and Energy Studies	3 (3-0-9)

Air quality and atmospheric chemistry

JEE 696	Greenhouse Gas Measurement, Mitigation and Monitoring Technology	3 (3-0-9)

Climate change and carbon

JEE 685	Climate change: Physical Science Basis	3 (3-0-9)
JEE 686	Greenhouse Gas inventory and Carbon Accounting	3 (3-0-9)
JEE 687	Biogeochemistry	3(3-0-9)
JEE 691	Climate Change Policy	3(3-0-9)
JEE 696	Greenhouse Gas Measurement, Mitigation and Monitoring Technology	3 (3-0-9)
JEE 699	Climate Change Policy for Sustainability	3 (3-0-9)

D. Dissertation

JEE 712	Dissertation for Ph.D. (Environment, Climate Change and Sustainability) for students with a master's degree background	38 credits
JEE 714	Dissertation for Ph.D. (Environment, Climate Change and Sustainability) for students with a bachelor's degree background	49 credits

E. English courses

LNG 601	Foundation English for International Programs	non-credit
LNG 602	Thesis Writing	non-credit

Note:

- Students who do not comply with the English language proficiency criteria must take the mandatory course, LNG 601 Foundation English for International Programs
- LNG 602 Thesis writing is compulsory for all students
- Both LNG 601 and LNG 602 are the non-credit courses

Study Plan

Plan A from Master level

Year 1 / Semester 1		Credit(s) (Theory-Practice-Self-study)
JEE 711	Research Communication	2 (0-6-6)
JEE 613	Research Methodology	3 (3-0-9)
JEE 649	Entrepreneurship and Innovation in Energy and Environment	3 (3-0-9)

JEE 683	Energy, Environment and Sustainability	3 (3-0-9)
Total		11 (9-6-33)

Year 1 / Semester 2		Credit(s) (Theory-Practice-Self-study)
XXX	Elective (As recommended by advisor)	3 (3-0-9)
XXX	Elective (As recommended by advisor)	3 (3-0-9)
JEE 712	Dissertation for Ph.D.	6 (0-0-18)
Total		12 (6-0-36)

Year 2 / Semester 1		Credit(s) (Theory-Practice-Self-study)
JEE 712	Dissertation for Ph.D.	9 (0-0-27)
Total		9 (0-0-27)

Year 2 / Semester 2		Credit(s) (Theory-Practice-Self-study)
JEE 712	Dissertation for Ph.D.	9 (0-0-27)
Total		9 (0-0-27)

Year 3 / Semester 1		Credit(s) (Theory-Practice-Self-study)
JEE 712	Dissertation for Ph.D.	9 (0-0-27)
Total		9 (0-0-27)

Year 3 / Semester 2		Credit(s) (Theory-Practice-Self-study)
JEE 712	Dissertation for Ph.D.	5 (0-0-15)
Total		5 (0-0-15)

Plan B from Bachelor level

Year 1 / Semester 1		Credit(s) (Theory-Practice-Self-study)
JEE 711	Research Communication	2 (0-6-6)
JEE 613	Research Methodology	3 (3-0-9)
JEE 649	Entrepreneurship and Innovation in Energy and Environment	3 (3-0-9)
JEE 683	Energy, Environment and Sustainability	3 (3-0-9)
Total		11 (9-6-33)

Year 1 / Semester 2		Credit(s) (Theory-Practice-Self-study)
XXX	Elective (As recommended by advisor)	3 (3-0-9)
XXX	Elective (As recommended by advisor)	3 (3-0-9)
XXX	Elective (As recommended by advisor)	3 (3-0-9)
XXX	Elective (As recommended by advisor)	3 (3-0-9)
Total		12 (12-0-36)

Year 2 / Semester 1		Credit(s) (Theory-Practice-Self-study)
XXX	Elective (As recommended by advisor)	3 (3-0-9)
JEE 714	Dissertation for Ph.D.	9 (0-0-27)
Total		12 (6-0-36)

Year 2 / Semester 2		Credit(s) (Theory-Practice-Self-study)
JEE 714	Dissertation for Ph.D.	10 (0-0-30)
Total		10 (0-0-30)

Year 3 / Semester 1		Credit(s) (Theory-Practice-Self-study)
JEE 714	Dissertation for Ph.D.	10 (0-0-30)
Total		10 (0-0-30)

Year 3 / Semester 2		Credit(s) (Theory-Practice-Self-study)
JEE 714	Dissertation for Ph.D.	10 (0-0-30)
Total		10 (0-0-30)

Year 4 / Semester 1		Credit(s) (Theory-Practice-Self-study)
JEE 714	Dissertation for Ph.D.	10 (0-0-30)
Total		10 (0-0-30)

3) Master of Engineering/Master of Science (Sustainable Energy Systems)

Program Structure

	Plan 1 (Thesis 20 credits)	Plan 1 (Thesis 12 credits)
A. Mandatory Courses	11 credits	11 credits
B. Specialization Track Courses	6 credits	6 credits
C. Elective Courses	3 credits	3 credits
D. Thesis	20 credits	12 credits
E. Internship	- credits	8 credits
F. English Courses(Conditions)	- credits	- credits
Total	40 credits	40 credits

Course Outline
Structure

A. Mandatory Courses	11 Credits
Plan 1 (Thesis 20 credits) and Plan 1 (Thesis 12 credits)	
JEE 601 Research Communication	2 crecits
JEE 613 Research Methodology	3 credits
JEE 649 Entrepreneurship and Innovation in Energy and Environment	3 credits
JEE 683 Energy, Environment and Sustainablility	3 credits
B. Specialization Track Courses (Choose 1 Track)	6 Crecits
Plan 1 (Thesis 20 credits) and Plan 1 (Thesis 12 credits)	
Track 1: Energy Systems Integration	
JEE 624 Energy Modeling and Analysis	3 credits
JEE 653 Enrgy Systems Integration and Smart Power Systems	3 credits
JEE 654 Renewable Energy Systems	3 credits
Track 2: Conventional and Renewable Energy Technology	
JEE 642 Fuels and Combustion	3 credits
JEE 644 Power Plant Engineering	3 credits
JEE 654 Renewable Energy Systems	3 credits
JEE 655 Sustainable Hydrogen and Electrical Energy Storage	3 credits
Track 3: Energy Efficiency	
JEE 634 Climate Influence on Buildings and End-use Requirements	3 credits
JEE 635 Data-Driven Energy Efficiency and Management	3 credits
JEE 637 Daylighting Applications	3 credits

Track 4: Energy Policy and Planning

JEE 621 Energy Economics, Markets and Policies	3 credits
JEE 622 Energy Planning for Sustainable Development	3 credits
JEE 623 Policies for Energy Market Transformation	3 credits
JEE 624 Energy Modeling and Analysis	3 credits

C. Elective Courses 3 Credits

(From following and including those listed under each specialization track)

Plan 1 (Thesis 20 credits) and Plan 1 (Thesis 12 credits)

JEE 631 Strategic Planning and Project Management	3 credits
JEE 633 Energy Management in Industry	3 credits
JEE 638 Advanced Topics in Building Energy Technology	3 credits
JEE 652 Natural Gas Utilization Technologies	3 credits
JEE 657 Fuel Cell and Hydrogen Technology	3 credits
JEE 659 Energy from Biomass	3 credits
JEE 603 Special Study I	3 credits
JEE 604 Special Study II	3 credits
JEE 605 Special Study III	3 credits

Environmental Elective Courses (Offered by the Environment Division)

JEE 661 Tropical Climates and Boundary Layer Science	3 credits
JEE 664 Atmospheric and Air Quality Modeling	3 credits
JEE 667 Environmental Pollution Control Technology	3 credits
JEE 671 Life Cycle Assessment	3 credits
JEE 673 Waste and Climate Change	3 credits
JEE 674 Waste to Energy and Its Sustainable Mitigation	3 credits
JEE 681 Environmental Chemistry and Ecotoxicology	3 credits

JEE 682 Environmental and Health Risk Assessment	3 credits
JEE 684 GIS and Remote Sensing	3 credits
JEE 685 Climate Change: Physical Science Basis	3 credits
JEE 688 Data Science for Environmental and Energy Studies	3 credits
JEE 691 Climate Change Policy	3 credits
JEE 696 Greenhouse Gas Measurement, Mitigation and Monitoring Technology	3 credits

D. Thesis

JEE 630 Thesis (Plan 1: 20 credits)	20 credits
JEE 610 Thesis (Plan 1: 12 credits)	12 credits

E. Internship (Only Plan 1 (Thesis 12 credits))

JEE 616 Internship	8 credits

F. English Courses (Conditions and Non-credit)

LNG 601 Foundation English for International Programs	-
LNG 602 Thesis Writing	-

Study Plan
Plan 1 (Thesis 20 credits)

Year 1 / Semester 1

JEE 601 Research Communication	2 credits
JEE 649 Entrepreneurship and Innovation in Energy and Environment	3 credits
JEE 683 Energy, Environment and Sustainability	3 credits
XXX Specialization Track / Elective (As Recommended by Advisor)	3 credits
XXX Specialization Track / Elective (As Recommended by Advisor)	3 credits
Total	14 credits

Year 1 / Semester 2

JEE 613	Research Methodology	3 credits
XXX	Specialization Track / Elective (As Recommended by Advisor)	3 credits
JEE 630	Thesis	6 credits
Total		12 credits

Year 2 / Semester 1

JEE 630	Thesis	8 credits
Total		8 credits

Year 2 / Semester 1

JEE 630	Thesis	6 credits
Total		6 credits

Plan 1 (Thesis 12 credits)

Year 1 / Semester 1

JEE 601	Research Communication	2 credits
JEE 649	Entrepreneurship and Innovation in Energy and Environment	3 credits
JEE 683	Energy, Environment and Sustainability	3 credits
XXX	Specialization Track / Elective (As Recommended by Advisor)	3 credits
XXX	Specialization Track / Elective (As Recommended by Advisor)	3 credits
Total		14 credits

Year 1 / Semester 2

JEE 613	Research Methodology	3 credits
XXX	Specialization Track / Elective (As Recommended by Advisor)	3 credits
JEE 610	Thesis	6 credits
Total		12 credits

Year 2 / Semester 1

JEE 616	Internship	8 credits
Total		8 credits

Year 2 / Semester 1

JEE 610	Thesis	6 credits
Total		6 credits

4) Master of Engineering/Master of Science (Environmental Technology & Management)

Program Structure

	Plan 1 (Thesis 20 credits)	Plan 1 (Thesis 12 credits)
A. Foundation Courses	11 credits	11 credits
B. Specialization Compulsory Courses	6 credits	6 credits
C. Elective Courses	3 credits	3 credits
D. Thesis	20 credits	12 credits
E. Internship	- credits	8 credits
F. English Courses(Conditions)	- credits	- credits
Total	40 credits	40 credits

Course Outline
Structure

A. Foundation Courses	11 Credits
Plan 1 (Thesis 20 credits) and Plan 1 (Thesis 12 credits)	
JEE 611 Research Communication	2 crecits
JEE 613 Research Methodology	3 credits
JEE 625 Energy and Environmental Economic, Management and Policy	3 credits
JEE 683 Energy, Environment and Sustainablility	3 credits
B. Specialization Compulsory Courses	6 Crecits
Plan 1 (Thesis 20 credits) and Plan 1 (Thesis 12 credits)	
Advanced Greenhouse Gases and Aerosols Research Laboratory (AGAR)	
JEE 661 Tropical Climates and Boundary Layer Science	3 credits
JEE 664 Atmospheric and Air Quality Modeling	3 credits

JEE 667 Environmental Pollution Control Technology	3 credits
JEE 673 Waste and Climate Change	3 credits
JEE 674 Waste to Energy and Its Sustainable Mitigation	3 credits
JEE 685 Climate Change: Physical Science Basis	3 credits
JEE 688 Data Science for Environmental and Energy Studies	3 credits
JEE 696 Greenhouse Gas Measurement, Mitigation and Monitoring Technology	3 credits

Life Cycle Sustainability Assessment Laboratory (LCSAL)

JEE 671 Life Cycle Assessment	3 credits
JEE 681 Environmental Chemistry and Ecotoxicology	3 credits
JEE 682 Environmental and Health Risk Assessment	3 credits
JEE 684 GIS and Remote Sensing	3 credits

C. Elective Courses 3 Credits

Plan 1 (Thesis 20 credits) and Plan 1 (Thesis 12 credits)

JEE 603 Special Study I	3 credits
JEE 604 Special Study II	3 credits
JEE 605 Special Study III	3 credits
JEE 621 Energy Economics, Market and Policies	3 credits
JEE 622 Energy Planning for Sustainable Development	3 credits
JEE 623 Policies for Energy Market Transformation	3 credits
JEE 624 Energy Modeling and Analysis	3 credits
JEE 633 Energy Management in Industry	3 credits
JEE 634 Climate Influence on Buildings and End-use Requirements	3 credits
JEE 635 Data-driven Energy Efficiency and Management	3 credits
JEE 637 Daylighting Applications	3 credits
JEE 649 Entrepreneurship and Innovation in Energy and Environment	3 credits
JEE 652 Natural Gas Utilization Technologies	3 credits

JEE 653 Energy Systems Integration and Smart Power Systems	3 credits
JEE 654 Renewable Energy Systems	3 credits
JEE 655 Sustainable Hydrogen and Electrical Energy Storage	3 credits
JEE 657 Fuel Cell and Hydrogen Technology	3 credits
JEE 659 Energy from Biomass	3 credits
JEE 661 Tropical Climates and Boundary Layer Science	3 credits
JEE 664 Atmospheric and Air Quality Modeling	3 credits
JEE 671 Life Cycle Assessment	3 credits
JEE 673 Waste and Climate Change	3 credits
JEE 674 Waste to Energy and Its Sustainable Mitigation	3 credits
JEE 681 Environmental Chemistry and Ecotoxicology	3 credits
JEE 682 Environmental and Health Risk Assessment	3 credits
JEE 684 GIS and Remote Sensing	3 credits
JEE 685 Climate Change: Physical Science Basis	3 credits
JEE 688 Data Science for Environmental and Energy Studies	3 credits
JEE 691 Climate Change Policy	3 credits
JEE 696 Greenhouse Gas Measurement, Mitigation and Monitoring Technology	3 credits
JEE 703 Selected Topics I	3 credits
JEE 713 Selected Topics II	3 credits

D. Thesis

JEE 640 Thesis (Plan 1: 20 credits)	20 credits
JEE 620 Thesis (Plan 1: 12 credits)	12 credits

E. Internship (Only Plan 1 (Thesis 12 credits)

JEE 616 Internship	8 credits

F. English Courses (Conditions and Non-credit)

LNG 601 Foundation English for International Programs	-
LNG 602 Thesis Writing	-

Study Plan
Plan 1 (Thesis 20 credits)

Year 1 / Semester 1		
JEE 611	Research Communication	2 credits
JEE 625	Energy and Environmental Economics, Management and Policy	3 credits
JEE 683	Energy, Environment and Sustainability	3 credits
XXX	Specialization Compulsory Courses/ Elective (As Recommended by Advisor)	3 credits
XXX	Specialization Compulsory Courses/ Elective (As Recommended by Advisor)	3 credits
Total		14 credits
Year 1 / Semester 2		
JEE 613	Research Methodology	3 credits
XXX	Specialization Compulsory Courses/ Elective (As Recommended by Advisor)	3 credits
JEE 640	Thesis	6 credits
Total		12 credits
Year 2 / Semester 1		
JEE 640	Thesis	8 credits
Total		8 credits
Year 2 / Semester 1		
JEE 640	Thesis	6 credits
Total		6 credits

Plan 1 (Thesis 12 credits)

Year 1 / Semester 1		
JEE 611	Research Communication	2 credits
JEE 625	Energy and Environmental Economics, Management and Policy	3 credits
JEE 683	Energy, Environment and Sustainability	3 credits
XXX	Specialization Compulsory Courses/ Elective (As Recommended by Advisor)	3 credits
XXX	Specialization Compulsory Courses/ Elective (As Recommended by Advisor)	3 credits
Total		14 credits
Year 1 / Semester 2		
JEE 613	Research Methodology	3 credits
XXX	Specialization Compulsory Courses/ Elective (As Recommended by Advisor)	3 credits
JEE 620	Thesis	6 credits
Total		12 credits
Year 2 / Semester 1		
JEE 616	Internship	8 credits
Total		8 credits
Year 2 / Semester 1		
JEE 620	Thesis	6 credits
Total		6 credits


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TUITION FEES

The following fee schedules apply for all students.

- School Fee: 40,000 Baht per semester
- Tuition Fee: 4,000 Baht per credit

For students attending specific subjects at other approved universities or additional English tutorial classes, the rate of the school offering the course applies.


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RULES AND REGULATIONS

Enrollment

A student must enroll according to the school's academic calendar and follow the enrollment procedures. A student is required to enroll for a minimum of 6 credits but no more than 15 credits in each semester. Course enrollment must be approved by the thesis supervisor. A student who cannot enroll within the scheduled period is required to file an application for late enrollment giving an appropriate reason that is endorsed by the thesis supervisor and submit it to the Academic Services Section. After obtaining such an approval, students must enroll within the date and time specified in the JGSEE Academic Calendar. Students who fail to enroll within 6 weeks after commencement will have their student status revoked. All students are required to enroll and, with the exception of those who are awarded type 1 or type 2 scholarships, pay tuition and school fees.

Note: Recipients of type 1 and 2 scholarships who have been transferred to one of the 5 universities need not come to the School for enrollment. They may submit the enrollment forms to the School via registered mail.

Late Enrollment

A fine of 50 Baht/day applies for the following cases:

1. Late enrollment
2. Late application for maintenance of student status
3. Late payment of each category of fees

Course addition

With the consent of the advisor, course addition is permissible within 2 weeks after the commencement of the semester.

Course withdrawal

With the consent of the thesis advisor, course withdrawal will result in one of the following cases: 1. If a course is withdrawn within 2 weeks after the commencement of the semester, the course is not recorded in the transcript of records. 2. If a course is withdrawn after 2 weeks, the course is recorded with a "U" (Unsatisfactory) grade or "F" (Failure).

Credit transfer and Exemption

Students may be exempted from attending compulsory courses if there is documentary evidence that equivalent competencies/learning outcomes have been formally achieved in other courses of study either at KMUTT or other universities. The grade of the equivalent subjects must be B+ or higher. It is advised that the application be lodged within 2 weeks after commencement of the course. Credit transfer application form (AS 05) can be obtained from the Academic Services or downloaded from JGSEE's website.

Transferring to a Partner University

Students who wish to study in a Partner University of JGSEE can be transfer by two mechanisms identified as Consortium Program and JGSEE Program.

The Consortium Program is for a student that transfers from the JGSEE curriculum to a partner curriculum and continues to complete the study there in conformity with the rules and regulations of that university. A student can transfer only to an accredited curriculum endorsed by the Professorial Board. A student transferring to a Consortium Program will be graduated with the degree of the Partner University. The transfer may start after the student finishes all course work at JGSEE, in general after the first semester.

A student that enters the JGSEE Program can also transfer to a Partner University to conduct research supervised by a JGSEE affiliate at the Partner University. In this mechanism the student transferring to the Partner University will be graduated and granted a degree certificate from KMUTT. The transferring time and schedule are the same as the Consortium Program. To date, the programs that are accredited by the Professorial Board as being compatible with JGSEE's research-based programs for the purpose of credit transfer are the following:

Chiang Mai University (CMU)

1. Doctor of Engineering in Civil Engineering
2. Doctor of Philosophy in Energy Engineering
3. Doctor of Philosophy in Electrical Engineering (Type 1)
4. Doctor of Philosophy in Mechanical Engineering (Type 1)
5. Doctor of Philosophy in Industrial Engineering (Plan 1.1, 2.1)
6. Doctor of Philosophy in Environmental Science (Plan 1.1, 1.2)
7. Master of Engineering in Electrical Engineering (A (1))
8. Master of Engineering in Mechanical Engineering (A (1))
9. Master of Engineering in Environmental Engineering (A (1))
10. Master of Engineering in Industrial Engineering (Plan A, Type A1)

11. Master of Engineering in Civil Engineering
12. Master of Engineering in Energy Engineering
13. Master of Science in Environmental Science (Plan A, Type 2)
14. Master of Science in Environmental Science (International Program)(Plan A, Type 2)

Prince of Songkhla University (PSU)

1. Doctor of Philosophy in Chemical Engineering (International Program)
2. Doctor of Engineering in Chemical Engineering (Thai) (Type 1, 2)
3. Doctor of Philosophy in Biotechnology (International Program) (Type 1, 2)
4. Doctor of Philosophy in Biotechnology (Thai) (Type 1,2)
5. Doctor of Philosophy in Environmental Engineering (Plan 1.1, 2.1, 2.2)
6. Doctor of Philosophy in Mechanical Engineering (Thai Type 1, 2)
7. Doctor of Philosophy in Material Engineering (Plan 1.1, 2.1)
8. Doctor of Philosophy in Sustainable Energy Management
9. Doctor of Philosophy in Energy Technology
10. Doctor of Philosophy in Earth System Science (International Program)
11. Master of Science in Biotechnology (International Program) (Type 1, 2)
12. Master of Engineering in Chemical Engineering (Thai) (Type 1(1))
13. Master of Engineering in Chemical Engineering (International Program)
14. Master of Engineering in Mechanical Engineering (Thai) (Type 1(1))
15. Master of Engineering in Environmental Engineering (Thai) (Plan A Type A1, A2)
16. Master of Engineering in Material Engineering (Plan A Type A1, A2)
17. Master of Engineering in Energy Technology
18. Master of Science in Sustainable Energy Management
19. Master of Science in Earth System Science (International Program)

Sirindhorn International Institute of Technology of Thammasart University (SIIT-TU)

1. Doctor of Philosophy in Engineering and Technology
2. Master of Science in Engineering and Technology

SIIT-TU

King Mongkut's University of Technology North Bangkok (KMUTNB)

1. Doctor of Philosophy in Mechanical Engineering (Type 1(2), 2(2))
2. Doctor of Philosophy in Electrical Engineering (Type 1(2), 2(2))
3. Doctor of Philosophy in Industrial Engineering (Plan 1.2, 2.2)

Students who wish to transfer to a Partner University are strongly advised to contact the Academic Services well in advance for further information, so that the transfer procedure can be completed smoothly.

KMUTNB

Note: The number of thesis credits required and publications of research results for graduation at the Partner University must comply with the requirement of JGSEE programs.

Grading system

"S"	=	Satisfactory ≥ B
"U"	=	Unsatisfactory < B
A	=	4 Excellent
B+	=	3.5 Very good
B	=	3 Good
C+	=	2.5 Fairly good
C	=	2 Fair
D+	=	1.5 Fairly poor
D	=	1 Poor
F	=	0 Failure

Semester leave

A student can apply for one semester leave at a time, but no more than two semesters in the entire course duration. This must be approved by the Executive Board on condition that the student has an appropriate reason, for example, illness, conscription, etc. A student who is permitted to take leave before registration must pay a fee for maintaining his/her student status. A leave during a semester will result in no grades and credits for the registered subjects.

Retaining student status

A student must pay a fee amounting to 10 % of the School fee for maintaining the student status if he/she has successfully defended the thesis but has yet to meet other graduation requirements such as publication and English language proficiency test.

Extension of study period

A Ph.D. student who have complete six years of study, passed their thesis defence examination, submitted a manuscript for publication and are awaiting publication of the final academic work to fulfill the requirements for graduation can take a leave of absence, which is not counted as a part of their duration of study, of no more than one academic year.

Payment of registration fees for recipients on JGSEE scholarship

The guidelines contained herein are intended for those students who have been awarded full or partial scholarships by the School. The purpose of the guidelines is to avoid registration-fee payment complications that may arise following student failure in an enrolled course and/or thesis credits.

1. This guideline applies to both present and new students, local or international, whose tuition fees are covered by a JGSEE scholarship.
2. The School shall pay for the students, as per the Scholarship Contract, the registration fees of the courses and/or thesis credits that are enrolled in each semester.
3. For any course failed or thesis credit not earned in a semester, the student shall be responsible for the

payment of the registration fees of that course, or the thesis credit not earned in subsequent semesters.

4. In case of course withdrawal or concurrent course addition and withdrawal, the student shall be responsible for the payment of the registration fees of the withdrawn courses in subsequent semesters. The registration fee paid for a withdrawn course is considered a default and may not be reclaimed or used for the payment of an added course.

Penalty for Terminating the study

JGSEE scholarships are awarded to students with the purpose of encouraging the recipients to work diligently until the completion of the program. Therefore if a JGSEE scholarship recipient fails to complete the program of study for reasons other than those that are beyond his/her control, such as accidents or severe health problems, he/she must repay the School the amount of scholarship disbursed in full. The School also reserves the right to withdraw the scholarship at any stage of the study, if the recipient is found to have performed badly in study or have unacceptable behavior, with the consequence that the student must repay the scholarship.


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EXAMINATIONS

1. Seminar / Research Communication

Objective

The objective of the course is to enhance students' capabilities in: the reading of technical papers, extracting and analyzing technical data and information, identifying and summarizing crucial information, as well as writing technical papers and making oral presentations in English.

The course is assumed to resemble a conference. The student is required to initially submit an abstract, followed by the full paper in the required format of the 'conference proceedings' and to finally present his/her paper in front of the class. Failure to meet any of the deadlines will result in the course being graded "U" (Unsatisfactory) or "F" (Failure).

Paper Format

The student has to produce a review style paper, based upon the student's own review of international scientific papers and other suitable references in English. The topic of the review is the student's choice but should ideally be based on one from the list of suggested topics provided at the beginning of the course by the seminar.

There is no minimum number of references required, but the student will specifically be assessed on the suitability of their references (both number and quality) used to conduct the review. An abstract for the paper, not exceeding 150 words, must be submitted by the student within the deadline given by the seminar advisor.

The paper must not exceed six A-4 pages in length (including figures and tables, etc.) and must conform to the specified format (see separate sheet). Two copies of the paper must be submitted in the form of a report, including the student's paper and copies of the principal papers used as references (where this is suitable). The report must be submitted within the deadline, given by the seminar advisor.

Oral Presentation

The student must make an oral presentation of his/her paper on the specified date. The presentation should not exceed 20 minutes and should ideally proceed for at least 15 minutes. The student should make good use of audio-visual aids. No later than before the presentation, the student must submit (i) a complete copy of the paper, (ii) a short biographical note and (iii) a description of the presentation.

Assessment

The student will be assessed on both the paper and the presentation, and is expected to attain a satisfactory standard in both in order to pass the course. The paper and presentation will be assessed on the following points:

a. Paper (assessed by the advisor and one other member of the JGSEE academic staff)

- Format (Division into sections with subheadings, paragraphing, definition of symbols, layout of equations, units of measure, references, tables and figures, etc.)

- Title and Abstract (Can the contents and main points in the paper be seen clearly from the title and the abstract?) - Introduction and Background Information
- Main text (Selection and logical organization of material.)
- Analysis and Conclusions
- Readability and Style (Is the English language satisfactory? Is the text original or the significant part copied from text written by other authors?)

b. Presentation (assessed by the advisor and other attending academic staff)
- Contents of the Presentation (Importance of topic, materials selected, logical organization)
- Visual Slides/Overheads (Readability, labeling of diagrams, definition of symbols, units of measure, acknowledgement of sources.)
- Oral Presentation (Clarity of speech, speed and timing, highlighting of key ideas.)
- Answering Questions (Understanding of questions, appropriateness and describing answers.)
- Overall Impression (Understanding of fundamentals, evaluation of presented materials, application in relevant areas.)

The student is also expected to attend the introductory presentations, the student presentations and other invited presentations. A poor attendance may result in the student's performance in the course being assessed as unsatisfactory.

2. Special Studies
Special Study is an elective subject for both master and doctoral programs. There are three types of Special Study as follows:

JEE603 Special Study I
is for students who are required to attend a specific lectured subject prescribed by the thesis supervisor. This subject may be offered in English or in Thai in any one of the collaborating universities, or in any other institutions approved by JGSEE.

JEE604 Special Study II
is for students who are required to make a study on a prescribed subject related to their thesis topic, under the supervision of the thesis supervisor. The study may involve: a situation review, data collection and data analysis as well as a critical survey in certain topics, in order to provide clarity for the thesis framework.

JEE605 Special Study III
is for students who are required to make an analysis or conduct experiments on a certain approved task, under the supervision of the thesis supervisor. The objective is to upgrade the student's analytical or experimental skills in order to facilitate the thesis undertaking. Each project should be completed within one semester.

Examination
To complete the study, the student is required to make a report on the results of his/ her investigation, and attend an oral examination prescribed by the School. An examination committee set up by the School will appraise the student's performance, which will be based on study rationale, objectives, methodology and results. The oral examinations may also be attended by other interested persons.

Procedures
1. A special study topic form should be completed and submitted to the Academic Services for approval within the fourth week following the commencement of the semester. The student needs to contact his/ her special study advisor for assistance in filling in the form.
2. After completing the study, the report are required for distribution to the examination committee. The student is required to fill in the request of examination (AS14 form) to notify the intention to take the examination no later than two weeks prior to the examination date.
3. If correction of the report is needed, it must be completed within one month and be submitted to the supervisor for final approval.

3. Thesis Proposal

1. The student must submit a thesis Proposal Form (AS 10) to the Academic Services within the period specified in the JGSEE Academic Calendar.
2. M.Eng. and M.Sc. thesis proposals and thesis advisory committee members must be approved by the Executive Board.
3. Ph.D. thesis proposals and thesis advisory committee members must be approved by the Professorial Board.

4. Comprehensive Examination

1. Only Doctoral students are required to take this examination in the semester in which they enroll for the thesis for the first time.
2. Students must consult with their thesis advisor to select at least three relevant academic papers related to the thesis proposal. The examination is intended to evaluate the student's ability in analysis, synthesis of information, identifying important issues and making comments, which are important elements in problem solving and foundations for his/her thesis work.
3. The examination may be either a written paper or an oral presentation, and must be in English.
4. All members of the Thesis Advisory Committee are requested to be present at this examination.
5. If a student fails the examination, he/she has only one more chance to take a re-examination. Failing the examination twice automatically results in his/her student status being revoked.

5. Qualifying Examination

1. This examination is required for both Master and Doctoral students and must be taken according to the Academic Calendar.
2. The student is required to take this examination in the semester that he/she registers for thesis study for the first time. It is imperative that he/she passes the examination before proceeding to the thesis work. The examination is intended to evaluate the student's readiness to undertake the proposed thesis work, which must be original. The work should indicate some initiative, which may lead to a new concept, or a new approach, or new findings.
3. Student are required to complete the theoretical and practical training courses on "Research Integrity" before taking a Qualifying Examination (QE).

4. For a Doctoral student, the examination must be taken after passing the comprehensive examination. The student may be allowed to take this examination on the same day as the comprehensive examination.
5. To initiate the examination process, students are required to declare their intention by submitting the thesis proposal report to the thesis committee. Furthermore, they must complete and submit the AS14 request for examination form through the online system to the Academic Services Section at least two weeks prior to the scheduled examination date, following the specified deadline outlined in the academic calendar. As supporting evidence for the report submission, students are also obligated to submit the AS15 report submission form into the system.
6. If a student fails the examination, he/she has only one more chance to take a re-examination. Failing the examination twice automatically results in the student's status being revoked. For a student who is unable to take a re-examination in the same semester, no credits will be earned in that semester. The student is then required to pass the re-examination in the following semester.
7. All members of the thesis advisory committee are requested to be present at this examination. If the chairman is not available in the scheduled period, the examination must be held prior to the scheduled period. Late examinations are permitted only for students facing an unforeseen hardship or emergency. The student is required to fill in the application form (AS07) late examination with an appropriate reason that is endorsed by the thesis supervisor and submit it to the Academic Services Section before the examination date. The application will be passed to the Executive Board for approval.
8. Following the Examination, the student is required to submit the revised report along with the checklist through the online system (AS17 form) in order to claim the next installment of research funds each semester. The subsequent installments will be disbursed after the submission of the revised report.

6. Thesis Progress Examination

1. This examination is required for all students taking a thesis study. The examination is held according to the schedule set out in the Academic calendar, and the language used is English.
2. The examination is intended to evaluate the student's performance for that semester and the number of credits that he/she will earn for that semester will be based on that performance.

3. To initiate the examination process, students are required to declare their intention by submitting the thesis progress report to the thesis committee. Furthermore, they must complete and submit the AS14 request for examination form through the online system to the Academic Services Section at least two weeks prior to the scheduled examination date, following the specified deadline outlined in the academic calendar. As supporting evidence for the report submission, students are also obligated to submit the AS15 report submission form into the system.
4. All members of the thesis advisory committee are required to be present at this examination. Late examination is permitted in case there is a compelling reason and must be taken no later than one week beyond the original schedule. The student is required to fill in the application form (AS07) late examination with an appropriate reason that is endorsed by the thesis supervisor and submit it to the Academic Services Section before the examination date. The application will be passed to the Executive Board for approval. Failure to take a scheduled examination will result in grade "U" being given for thesis performance and may also affect the eligibility for continued scholarship support.
5. In case a thesis advisory committee member is unable to assess the student on the examination date, students can request to take the examination separately, but it must not exceed the specified deadline outlined in the academic calendar.
6. Following the Examination, the student is required to submit the revised report along with the checklist through the online system (AS17 form) in order to claim the next installment of research funds each semester. The subsequent installments will be disbursed after the submission of the revised report.

7. Internship Examination

1. Only Master's students in program plan A2-2 are eligible to enroll in the internship course after completing one year of study. The aim of the course is to enable the student to gain professional experience.
2. The student must submit Internship Activity Form (AS12) to the Academic Services Section within the period specified in the academic calendar.
3. The student are required to work on in an internship within industry, government, or a research institute, either domestically or internationally. The internship will be supervised by a host supervisor.
4. The examination must be taken after the end of the internship. To initiate the examination process, stu-

dents are required to declare their intention by submitting the internship report to the internship committee. Furthermore, they must complete and submit the AS14 request for examination form through the online system to the Academic Services Section at least two weeks prior to the scheduled examination date, following the specified deadline outlined in the academic calendar. As supporting evidence for the report submission, students are also obligated to submit the AS15 report submission form into the system.

5. All members of the internship committee are required to be present at this examination. Late examination is permitted in case there is a compelling reason and must be taken no later than one week beyond the original schedule. The student is required to fill in the application form (AS07) late examination with an appropriate reason that is endorsed by the thesis supervisor and submit it to the Academic Services Section before the examination date. The application will be passed to the Executive Board for approval. Failure to take a scheduled examination will result in grade "U" being given for thesis performance and may also affect the eligibility for continued scholarship support.
6. In case a internship committee member is unable to assess the student on the examination date, students can request to take the examination separately, but it must not exceed the specified deadline outlined in the academic calendar.
7. Following the Examination, the student is required to submit the revised report along with the checklist through the online system (AS17 form) in order to claim the next installment of research funds each semester. The subsequent installments will be disbursed after the submission of the revised report.

8. Thesis Defence Examination

1. This examination is required for a student completing his/her research work. The advisor is the evaluator who deems whether the student is ready for the final examination and is also the approving authority for the request to take the final exam.
2. Students must submit or publish their publications in accordance with the program's requirements.
3. An external examiner who expertise in the research area relevant to the student's thesis will be appointed in the semester in which student enroll for the final thesis examination.
4. To initiate the examination process, students are required to declare their intention by submitting a

thesis to the thesis committee. Furthermore, they must complete and submit the AS14 request for examination form through the online system to the Academic Services Section This should be done at least two weeks before the scheduled examination date for master's students and at least 30 days before for doctoral students, following the specified deadline outlined in the academic calendar. As supporting evidence for the report submission, students are also obligated to submit the AS15 report submission form into the system.

5. All members of the thesis advisory committee, including the external examiner, are requested to be present at the examination. If the external examiner resides outside Thailand and is unable to be present at the scheduled examination, the complete thesis will be sent to the examiner by the School. However, the student must submit the complete thesis to the Academic Services Section at least 4 weeks prior to the examination date, ensuring that the external examiner's evaluation report can reach the School before the scheduled examination.
6. Following the defence examination, the student is required to make all the corrections requested by the examining committee and submit the revised thesis report to the Academic Services Section within 30 days. However, in case of major revisions, the examining committee may recommend to the school to have the submission deadline extended, but must not be more than 60 days from the date of the examination.
7. The student is required to submit a thesis along with the checklist through the online system (AS17 form) to claim the final installment of closed research funds.


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GRADUATION REQUIREMENTS

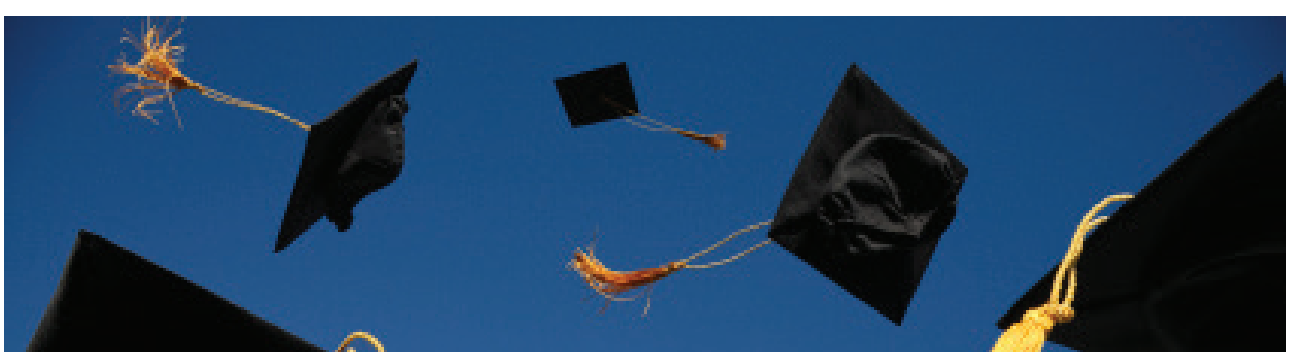
To qualify for graduation, students must fulfill the following requirements:

1. Earning Credits

To complete the degree, the Doctoral students programs are required to pass all subjects with grade "S" (Satisfactory). For Master students programs, the minimum grade of compulsory courses must be abrove B, the minimum grade of specific compulsory courses and elective courses must be above C and the total average grade (GPA) must be above 3.00.

The total number of credits for each program are as follows,

M.Eng./M.Sc.	(Sustainable Energy Systems)/ (Environmental Technology & Management)	40	credits
Ph.D. (from Master Level)	(Sustainable Energy Systems) (Environment, Climate Change and Sustainability)	55	credits
Ph.D. (from Bachelor Level)	(Sustainable Energy Systems) (Environment, Climate Change and Sustainability)	75	credits



2. Publications of Research Results

Before being awarded a degree, students need to have their research work published in recognized national or international journals, or their equivalent.

The minimum numbers of published papers are as follows:

Ph.D (from Master Level) Sustainable Energy Systems Environment, Climate Change and Sustainability	Two international journal papers or equivalent and one international conference proceeding
Ph.D (from Bachelor Level) Sustainable Energy Systems Environment, Climate Change and Sustainability	Two international journal papers (ISI) and one international conference proceeding , but not their equivalent (see note below)
M.Eng / M.Sc Sustainable Energy Systems Environmental Technology & Management	**Plan 1 Thesis 20 credits** One national journal or one international journal paper **Plan 1 Thesis 12 credits** One international journal paper or One national journal paper or One international conference proceeding

Publication Equivalence:

An international journal paper may be substituted by two national journal papers, or one national journal paper plus one international conference paper or two international conference. The substituting journals or international conference must be those endorsed by the Professorial Board.

Students are strongly recommended to study carefully the types of journals and conference proceedings that are recognized by the Professorial Board, and they must provide all necessary evidence to facilitate the approval process of the School. In particular, the student should note the following:

(1) International Journal Papers

- For Ph.D. candidates, at least one paper must be published in an international journal listed in ISI Web of Knowledge data base. The other paper could be published in SCOPUS database with peer review instead.
- The student is required to attach the full paper and the acceptance-for-publication letter form the journal (if the paper has not yet been published) when submitting the "Request for Graduation Form"
- If the journal is not listed in ISI (see information on JGSEE Website), attach a copy of the page containing the Editorial Board Members.

(2) National Journal Papers

- The student is required to attach the full paper and the "acceptance-for-publication" letter from the journal (if the paper has not yet been published), when submitting the Request for Graduation Form.

(3) International Conference Proceedings

- The student is required to attach the full paper and the copy of the pages containing the names of the conference organizing committee and the technical committee when submitting the Request for Graduation Form.

Failure to submit all required evidence may result in delays in the graduation approval process.

Approved National Journals:

List of National Journal is referred to the accreditation of Thai-Journal Citation Index. https://tci-thailand.org/

Note : Before submitting a research paper for publication, students must read the School's "Publication Authorship Policy" carefully

3. English Requirement for graduation

- Students who do not comply with the English language proficiency criteria must take the mandatory course, LNG 601 Foundation English for International Programs
- LNG 602 Thesis writing is compulsory for all students
- Both LNG 601 and LNG 602 are the non-credit courses

4. Submitting Evidence for Graduation

A student who has fulfilled all the requirements for graduation must proceed as follows:

1. Fill in the "Application for Graduation Form" and submit it to JGSEE's Academic Services.
2. Attach all of the items listed below:
2.1. Publications (full paper in hard copy)
2.2. Evidence proving English proficiency
2.3. Thesis abstract
2.4. An inside cover of the thesis comprising the signatures of all thesis examining members

All the evidence submitted will be checked by an authorized officer of the Academic Services. If found sufficient, the student's request for graduation will then be forwarded to higher authorities for approval, namely the School's Executive Board, the Professorial Board and the Board of Trustees, respectively. In the event that the request is finally approved, the date when the student has submitted all the required evidence to the Academic Services is deemed the official date of graduation, and the student is required to submit a completed Graduate Registration form (G.09) to the University Registrar via the School's Academic Services.

Note: Graduating students must have returned all borrowed items such as advanced payments, equipment, measuring instruments, or books, to the School before the G.09 form can be obtained.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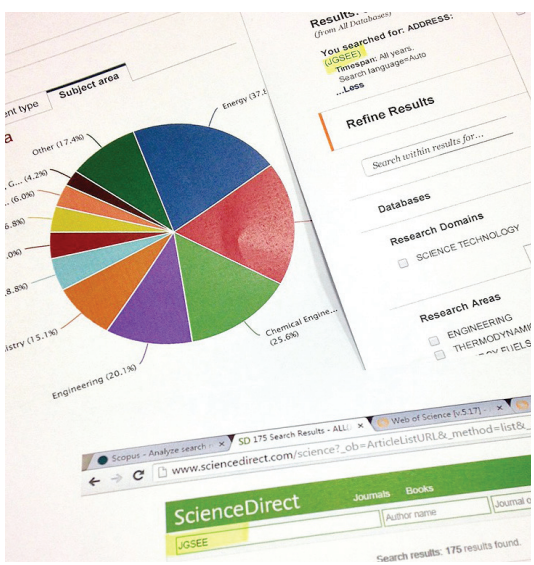
PUBLICATION AUTHORSHIP POLICIES

The following policies apply to publications involving authors, both staff and students, that are affiliated with the JGSEE.

1. **Authorship** - A person claiming authorship of a scholarly publication must have met the following criteria:
   - Substantial participation in conception and design of the study, or in analysis and interpretation of data;
   - Substantial participation in the drafting of the manuscript or in the substantive editing of the manuscript;
   - Final approval of the version of the manuscript to be published;
   - Ability to explain and defend the study in public or scholarly settings.



2. **Acknowledgment** - Contributions that do not justify authorship should be acknowledged separately in the notes to the manuscript. These may include general supervision of a research group, assistance in obtaining funding, or technical support.

3. **Undeserved Authorship** - - A claim of authorship by, or assignment of authorship to, persons who may have been associated in some way with a study but do not meet the four criteria in item 1 may constitute an unethical research practice. Such undeserved authorship should not be expected or awarded.

4. **Graduate Student Authorship** – – A graduate student whose thesis research is the major source of material for a publication should have first authorship, and the project advisor should be a later author. If some material from the thesis is used in a review paper, proposal, progress or final report written by the project advisor, a reference to the material's origin is sufficient. The graduate student should not expect joint authorship in this case.
5. **Senior Authors/Project Advisor** - The senior author has special responsibilities when it comes to publications.
   - If portions of a student's thesis material are used by the project advisor in a review paper prior to the original publication of the thesis work the advisor must be sure that publication of the material does not jeopardize the subsequent publication of the thesis related material.
   - The senior author/project advisor has the responsibility to help the authors involved in a publication to agree upon the order of authorship among the study participants. As projects proceed, agreements regarding authorship may need to be changed. It is the responsibility of the senior author to assure that the contributions of all study participants are properly recognized.
   - The senior author/project director is generally listed as the "Corresponding Author" on papers submitted for publication. The responsibility for being corresponding author may be assigned to another appropriate individual by the senior author. The corresponding author needs to be relatively easy to locate, contact and communicate with before, during and after the publication of the paper.

6. **Disputes Over Authorship** - Disagreements over authorship, e.g. who has a right to be an author or the order of authorship, should be resolved by the Senior Author in collegial consultation with the other authors. When this process cannot reach resolution, the Senior Author should arrange for arbitration by the Executive Board of the School, who may in turn refer the case to the Professorial Board, if necessary, for final resolution of the dispute. During the arbitration process all the authors are expected to refrain from unilateral actions that may damage the authorship interests and rights of the other authors.

7. **Accountability** - Every author listed on a publication is presumed to have read and approved the final version of the manuscript. Each author is responsible for the integrity of the research being reported.

Ethical Responsibilities of Authors

Many societies that publish technical journals have a specific set of ethical guidelines for authors. Below are some general guidelines, to which authors must adhere.

1. Plagiarism - A submitted manuscript shall not contain plagiarized material or falsified research data. Plagiarism is commonly defined as the use or presentation of the ideas or words of another person from an existing source without appropriate acknowledgment to that source.
2. Submitting to Multiple Journals - To ensure that a manuscript is submitted for publication in only one journal at a time, it is not acceptable for an author to submit a manuscript (or manuscripts describing essentially the same matter) to more than one journal at a time. A manuscript may be resubmitted to another journal after it has been rejected or withdrawn from publication.
3. Previously Published Results – Publication of technical results must be original, not previously published results.
   - A manuscript which is a full paper report of a published communication may be submitted for publication. Some journals publish in a brief form the preliminary or early results for particularly interesting research as a communication or preliminary communication. Authors of such communications are expected to follow this preliminary publication with a full paper describing the research. The author has the responsibility to inform the editor of the previously published communication that a full paper describing the research is being submitted.
   - Issuance in a scientific journal, in a book offered for public distribution, in a serial issued by a commercial publishing company, or in a widely available governmental document are all regarded as publication. Reports distributed to very limited and defined distribution lists may not constitute publication.
   - Papers that are presented at conferences and appear in conference proceedings and distributed to participants of the symposium are not regarded as published. Hence, this allows the full paper to also be submitted to a journal for publication and wider distribution.
   - Scientific results have come to be printed and distributed by such varied means that it has become necessary to define as accurately as possible what constitutes prior publication. Electronic posting of

preprints to services that provide or purport to provide archiving and the ability to cite a specific location for the paper constitutes publication. If the preprint is removed from the archive, it is no longer considered published.

Format for writing author's affiliation and acknowledgement

Author's Affiliation

1. International Journals, National Journals and Conference proceedings

1.1 Students and Lecturers from JGSEE

Format:
Title of paper
Type the name of the authors, e.g. First author[1], Second author[2],*, Third author[3]

Affiliation of authors
[1]First author's affiliation : Organization, City, Country.
[2]Second author's affiliation : Organization, City, Country.
[3]Third author's affiliation : Organization, City, Country.

The first author must be the student who performed the work and the corresponding author should be the thesis advisor / senior author / project advisor

Eample:

Enhancing Waste Decomposition and Methane Production in Simulated Landfill Using Combined Anaerobic Reactors

Nirawan Sanphoti[1,4], Sirintornthep Towprayoon[1,4],*, Pawinee. Chaiprasert[2,4] and Annop. Nopharatana[3]

[1]The Joint Graduate School of Energy and Environment, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.
[2]School of Bioresources and Technology, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.
[3]Pilot Plant Development and Training Institute, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.
[4]Center of Excellence on Energy Technology and Environment (CEE), Ministry of Higher Education, Science, Research and Innovation, Bangkok, Thailand.
* Corresponding author: sirin@jgsee.kmutt.ac.th

1.2 Students and Lecturers from JGSEE's Consortium Partners
Format:

Title of paper
Type the name of the authors, e.g. First author1, Second author2,*, Third author3

Affiliation of authors
First author's affiliation: Organization, City, Country.
Second author's affiliation: Organization, City, Country.
[3]Third author's affiliation: Organization, City, Country.

Example:
Transesterification of Palm Oil in Series of Continuous Stirred Tank Reactors

Theerayut Leevijit[1,3],*, Worawut Wisutmethangoon[2], Gumpon Prateepchaikul[2,3], Charkirt Tongurai[2,3], Michael Allen[2]

[1]The Joint Graduate School of Energy and Environment, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.
[2]Faculty of Engineering, Prince of Songkla University, Songkla, Thailand.
[3]Center of Excellence on Energy Technology and Environment (CEE), Ministry of Higher Education, Science, Research and Innovation, Bangkok, Thailand.

* Corresponding author: theerayut_leevijit@gmail.com

2. Book

Example:
Research Methodology
Robert H.B. Exell

The Joint Graduate School of Energy and Environment, King Mongkut's University of Technology Thonburi, and the Center of Excellence on Energy Technology and Environment (CEE), Ministry of Higher Education, Science, Research and Innovation, Bangkok, Thailand.

3. Article

Example:
Thai Climate Change Policy and Research
Bundit Fungthammasan[1, 2], Sirintornthep Towprayoon[1, 2], Amnat Chidthaisong[1, 2]

[1]The Joint Graduate School of Energy and Environment, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.
[2]Center of Excellence on Energy Technology and Environment (CEE), Ministry of Higher Education, Science, Research and Innovation, Bangkok, Thailand.

Acknowledgement
1. Students and Lecturers from JGSEE
The authors would like to express their gratitude to The Joint Graduate School of Energy and Environment (JGSEE), King Mongkut's University of Technology Thonburi and the Center of Excellence on Energy Technology and Environment (CEE), Ministry of Higher Education, Science, Research and Innovation for the financial support provided to perform this study.

2. Students and Lecturers from JGSEE's Consortium Partners
The authors would like to express their gratitude to the Faculty of Engineering, <Name of University from JGSEE's Consortium>, and the Center of Excellence on Energy Technology and Environment (CEE), Ministry of Higher Education, Science, Research and Innovation for the financial support provided to perform this study.

FINANCIAL SUPPORT

One of the aims of JGSEE is to produce high quality research work. To this end, funds are made available to all students as thesis expenses starting from the first semester that the students enroll for their thesis study. The maximum amount of funding for each program is set below:

M.Sc, M.Eng	:	135,000	baht
Ph.D	:	290,000	baht

An appropriate amount of funds will also be made available for research in other programs.

A number of scholarships are also available for students with appropriate qualifications. A scholarship that includes monthly stipend and tuition/School fees may be awarded to a student who has a prominent academic record and shows high potential for accomplishment. Partial scholarships are also available for those who have very good academic records. This latter type of scholarship may include the support for all the fees, or either School fee or tuition fee. The scholarship recipients are selected by a panel on the basis of academic records and financial need. A scholarship recipient's academic progress is reviewed at the end of each semester to determine the recipient's eligibility for continued support.

Note : After passing the Thesis Examination scholarship students must submit one copy of the Examination Report and Financial Report to the Academic Services to qualify for continued support in thesis expenses and/or scholarship in the following semester.

ACADEMIC SUPPORT FACILITIES

The following study and research support facilities are located at JGSEE on the KMUTT campus. For students who carry out their research work at other universities that are consortium members of JGSEE, facilities will also be available at the respective university.

Laboratories
The laboratories of the School are equipped with advanced facilities for thesis studies in the fields of energy and environment. The facilities have been acquired with substantial funding support by the Higher Education Development Project (HEDP) or commonly known as the "ADB Loan project" and of The Energy Conservation Promotion Fund of the Ministry of Energy.

Library
Students can use their student ID card to access services and borrow materials from KMUTT's main library.

Computing Facilities and Internet Access
Students can use the university's Wi-Fi by logging in with their student account and can download licensed software from the Computer Center's website. https://cc.kmutt.ac.th

Entry Visa for International Students
International students who need to obtain or extend the entry visa are advised to contact the Academic Services at least 15 days before the visa expires, with a copy of passport pages showing:
1. personal details
2. visa expiry date.

Further information can be found via the JGSEE website (Current Student)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RESEARCH AREAS

A wide range of interesting and challenging research topics are offered by JGSEE's core staff and affiliated members at the five collaborating institutions. The topics available cover various aspects of energy and environment including policy, management and technology.

Advanced Fuel Processing Laboratory (AFPL)

The main focus of the Advanced Fuel Processing Laboratory is the research and development of fuel processing technology to serve the needs for the country's energy security and environmental protection. A broad range of topics related to coal, biomass, biogas upgrading and waste processing from fundamental research to practical approach are parts of the research activities of AFPL.

Activities and Research Program:

- Biomass gasification and pyrolysis for heat, power and transport fuel production
- Effective combustion of lignite and co-firing of coal and biomass
- Integrative conversion of lignocellulosic biomass to ethanol and industrial value-added chemicals
- Upgrading of biomass by torrefaction and pelletization process
- Biogas upgrading and utilization
- Production of high-grade carbonaceous materials/fuels from lignite and biomass by degradative solvent extraction

Facilities and Equipments:

- Energy lab (Standard analytical devices and Project-specific bench scale reactors)
- Fluidized bed laboratory (Large-scale fluidized bed test facilities)
- Pilot scale gasification and pyrolysis reactor

Building Energy Science and Technology Laboratory (BEST)

The objective of this laboratory is to facilitate conduct of research and undertaking of professional assignments on energy science and energy technology of buildings as well as to conduct research on low energy buildings that will support implementation of energy conser- vation programs for buildings in Thailand and countries in the region. Energy efficient building systems and components: Thermal performance and cost-effectiveness of building facade and envelope, efficient electric lighting, and efficient conventional air-conditioning.

Activities and Research Program:

- Shading of windows and daylighting: Comparative performance and cost effectiveness of external shading, shading between two glass panes, and internal shading, daylighting through various light pipe configurations, etc.
- Development of energy code and labeling scheme: Upgrade of building energy code and building energy labeling program
- Radiant cooling and solar cooling and dehumidification: Application of radiant cooling solar cooling and solar dehumidification in residential and commercial buildings

Facilities and Equipments:

- A station that measures all components of solar radiation, sky and air temperatures, air relative humidity, and wind speed and direction
- Outdoor experimental rooms with pyranometers, temperature and heat flux sensors and data loggers
- A mobile outdoor laboratory for testing of prefabricated door, window, and roof products
- An outdoor experimental room fitted with radiant cooling panels on wall and ceiling and radiant cooling wall and radiant cooling roof

Advanced Greenhouse Gas and Aerosol Research Laboratory (AGAR)

AGAR: The main focus of the Aerosols and Greenhouse gases (GHGs) Projection and Mitigation Laboratory is to conduct and implement research and decision support tools (1) in emission inventory; (2) in monitoring the atmospheric concentration over Thailand of trace atmospheric compounds, e.g. methane, nitrous oxides, carbon dioxide and carbonaceous aerosols including black carbon and organic carbon, which are recognized to be short live climate forcing agents; (3) in projection of the emissions of these compounds for medium and long term; (4) defining appropriate mitigation options both for energy and non-energy related sectors (5) in investigating issues related to regional and urban climate, air quality, and ambient energy using data analytics and computer simulation.

Theme 1: Aerosols from Biomass Burning to the Atmosphere
Contact Person: Assoc. Prof. Dr. Savitri Garivait

- Estimation of forest fires activity
- Estimation of agricultural burning activities
- Quantification of emission factors of carbonaceous aerosols from forest fires and agricultural fields burning
- Estimation of air pollutants emissions from biomass open burning, with focus on carbonaceous aerosols

- Estimation of land use change and related emissions/removals using GIS-RS information
- Characterization of indirect effects of biomass open burning on the ecosystem and GHG emissions/removals
- Development of forest fires emissions model using fire propagation characteristics
- Development of low carbon community model based on land use management

Theme 2: GHG Monitoring
Contact Person: Assoc. Prof. Dr. Amnat Chidthaisong
- Monitoring of CO2 flux of tropical deciduous forest
- Monitoring of soil carbon dynamics of forest land and cropland in Thailand
- Estimation of carbon stock under land use change
- Soil respiration
- Estimation of root system respiration
- Develop of soil C dynamics of forestland and cropland

Theme 3: GHG Emission Projection and Mitigation
Contact Person: Assoc. Prof. Dr. Sirintornthep Towprayoon
- National GHG emission inventory using IPCC 1996 revised GL and 2006 GL
- Projection of national GHG emissions for short, medium term and long term using econometrics techniques
- Development of mitigation options in non-energy sectors
- Development of process for converting hemicellulose to fuel and chemicals
- Development of GHG mitigation model for AFOLU sector enabling to include socio-economic drivers

Theme 4: Development of standard methods for GHG measurement in non-energy sectors
Contact Person: Dr. Komsilp Wang-Yao
- Development of standard methods for measurement of GHG from rice fields
- Development of standard methods for measurement of GHG from landfills
- Development of standard methods for measurements of GHG from cropland

Theme 5: Data Analytics and Modeling for Climate-Atmospheric System (DCAS)
Contact Person: Assoc. Prof. Dr. Kasemsan Manomaiphiboon

- Scientific and policy investigation on regional and urban climate, air quality, and ambient energy
- Data analytics, numerical modeling, and tool development
- Contemporary issues: PM2.5 extreme events, urban environment and energy use, and wind-solar-ocean energy.

Life Cycle Sustainability Assessment Laboratory (LCSAL)

The focus of the lab is to develop tools and conduct sustainability assessment of various energy technologies, conventional as well as alternative, in a life cycle perspective. The results of such research will provide support to decision makers in Thailand vis-à-vis the sustainability implications of energy conversion and use. Research in LCSAL focuses on 2 main areas which are (1) Sustainability assessment of energy systems and (2) Energy and environmental policy support tools.

Activities and Research Program:

- FOOD Footprint calculator to enhance carbon footprint measurement and management in Thai food industry to promote low-carbon economy for climate change mitigation
- Global assessments and guidelines for sustainable liquid biofuels production in developing countries (Thailand component)
- Food, fuel and climate change - LCA and policy research
- Water footprint of biofuels
- Water footprint of agricultural products
- Testing of sustainability indicators for biofuels

Facilities and Equipments:

- Various software licenses for life cycle assessment
- Computational facilities

Energy and Environmental Policy Laboratory (EEPL)

To conduct policy relevant studies and develop tools to support public agencies and corporations in decision-making and formulating strate- gies and plans, for the development and deployment of energy and environmental technology options and measures, which would lead to sustainable economic growth and development.

Activities and Research Program:

- Energy efficiency, renewable energy and low carbon technology: Technology assessment and policy analysis and design for effective development and deployment of energy efficiency technologies and measures, renewable energy
- Energy systems and low-carbon scenario analysis: Scenario studies for future energy supply and demand, and pathways towards a secure and low-carbon energy system, as well as a low-carbon society
- Energy security, energy and environmental economics: Studies on energy-security related issues, energy pricing, cost of low carbon energy and GHG-mitigation options and measures
- Regional energy and climate policy: Policy studies relevant to the formulation of policy and strategies for national and regional cooperation in energy, environment and climate change issues

Facilities and Equipments:

- Various software licenses for GHG reduction scenarios analysis and economic analysis
- Specific models development for low carbon city analysis
- Computational facilities


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COURSE DESCRIPTION

JEE 601 Research Communication for M.Eng./M.Sc. (Sustainable Energy Systems) 2(0-6-6)
Category: Mandatory courses
Prerequisite(s)/ Co-requisite(s): None
The objective of the course is to enhance the capabilities of students in extracting information from technical papers and reports, as well as in writing scientific/review papers and making academic presentations. At the beginning of the course, classes are devoted to provide (1) guidelines and techniques to extract and

analyze information from scientific publications, (2) research methods and tools to search, manage and generate bibliographies (Mendeley; Google Scholar; Science Direct; etc.) and (3) guidelines for paper writing and oral presentation. These classes delivered during live classroom sessions are accompanied with online teaching materials and guidance. Students will be required to work independently, as well as to interact with other students, researchers and academic staff as part of a process of exchange of ideas and information.

JEE 603 Special Study I 3(3-0-9)
Category: Foundational Course
Prerequisite(s)/ Co-requisite(s): None
Student taking the subject is required to attend a certain subject prescribed by his/her advisor. The subject may be offered in English or Thai in any accredited university or in any one of the collaborating universities. At the end of the course, the student needs to prepare the state- of- the- art report in English and have an oral examination with the Thesis Advisory Committee or a Special Study Committee appointed by JGSEE.

JEE 604 Special Study II 3(3-0-9)
Category: Elective Course
Prerequisite(s)/ Co-requisite(s): None
Student is required to make a study on a certain prescribed subject related to thesis topic under supervision of thesis advisor. The study may involve situation review, data collection and data analysis as well as critical survey in certain topics in order to provide clarity for thesis framework. At the end of the semester, student needs to prepare a report in English on the subject and attend an oral examination with the Thesis Advisory Committee or a Special Study Committee appointed by JGSEE.

JEE 605 Special Study III 3(0-9-9)
Category: Elective Course
Prerequisite(s)/ Co-requisite(s): None
Student is required to make analysis or conduct experiments on certain approved task under supervision of thesis advisor. The objective is to upgrade the students analytical or experimental skill in order to facilitate his/her thesis undertaking. Each project should be completed in one semester. At the end of the semester, student needs to prepare a report in English of the task and attend the oral examination evalu-

ated by the Thesis Advisory Committee or a Special Study Committee appointed by JGSEE.

JEE 610 C Thesis (M.Eng./M.Sc. in Sustainable Energy System) 12(0-0-36)
Category: Thesis
Prerequisite(s)/ Co-requisite(s): None
The students are required to undertake research or development studies under supervision of a member of the faculty. The thesis should be completed within three semesters.

JEE 611 Research Communication for M.Eng./M.Sc. (Environmental Technology and Management) 2(0-6-6)
Category: Mandatory courses
Prerequisite(s)/ Co-requisite(s): None
The objective of the course is to enhance the capabilities of students in extracting information from technical papers and reports, as well as in writing scientific/review papers and making academic presentations. At the beginning of the course, classes are devoted to provide (1) guidelines and techniques to extract and analyze information from scientific publications, (2) research methods and tools to search, manage and generate bibliographies (Mendeley; Google Scholar; Science Direct; etc.) and (3) guidelines for paper writing and oral presentation. These classes delivered during live classroom sessions are accompanied with online teaching materials and guidance. Students will be required to work independently, as well as to interact with other students, researchers and academic staff as part of a process of exchange of ideas and information.

JEE 613 Research Methodology 3(3-0-9)
Category: Mandatory courses
Prerequisite(s)/ Co-requisite(s): None
This is an introductory course of research methods for postgraduate students preparing them to learn advanced research methods in their respective fields. It is designed to understand the general techniques for conducting research independently in various fields. As publishing your research articles in reputed journals is an important part of the research, therefore, the course emphasis on learning to write and pub-

lish scientific journals. By the end of this course, the students should be able to design, conduct, and communicate their research and critically evaluate the research of others.

JEE 616 Internship 8 (0-0-24)

Category: Internship

Prerequisite(s)/ Co-requisite(s): completed 1 year of study

The aim of the course is to enable the student to gain professional experience. The students who choose the internship option are required to work on an internship in industry/institute for 20 consecutive weeks. The internship will be supervised by an instructor. The Guidelines for the Internship Program describe the procedures for the selection of suitable companies and tasks for the internship, as well as the selection of the industrial supervisors and the required reporting.

JEE 620 Thesis (M.Eng./M.Sc. in Environmental Technology and Management) 12(0-0-36)

Category: Thesis

Prerequisite(s)/ Co-requisite(s): None

The students are required to undertake research or development studies under supervision of a member of the faculty. The thesis should be completed within three semesters.

JEE 621 Energy Economics, Market and Policies 3(3-0-9)

Category: Specialization tracks

Prerequisite(s)/ Co-requisite(s): None

- Major energy sources, their uses, markets, and value chains: fossil fuels (oil, gas, coal), nuclear, renewables; electricity, and transport.
- Economics of energy use, energy demand, and energy supply, industrial organization, market structure and pricing, market failures and barriers for clean energy policy, economies of scale, externalities, and natural monopoly.
- Domestic and international energy market structures: competitive, monopoly, oligopoly, cartel; liberalization of the energy sector, particularly electricity industry.

- Economics of renewable energy sources, nonmarket valuation, and policy supports Economics of climate change, national policy, international cooperation and climate funds.

JEE 622 Energy Planning for Sustainable Development 3(3-0-9)

Category: Specialization tracks course

Prerequisite(s)/ Co-requisite(s): None

The concept and principle of sustainable development. Energy and sustainable development. Climate change and mitigation strategies. Energy-related CO2 emissions and grid emission factors. Energy planning models: conventional and integrated resource planning (IRP). Planning options and steps. Energy generation resources: conventional, renewable and distributed generation. Planning and management of power plants: dispatchable and intermittent power, integration of intermittent generation into the grid. Demand-side management resources and demand-side flexibility. Energy storage and technologies, and integration of energy storage.

JEE 623 Policies for Energy Market Transformation 3(3-0-9)

Category: Specialization tracks

Prerequisite(s)/ Co-requisite(s): None

The concept of market transformation. Market transformation agents for whom performance incentives could be useful: utilities, nonprofit organizations, state agencies. Energy policy objectives. Interactions between energy supply- and demand-side policies. Demand-side management (DSM) concept, DSM load shape methods, cost-benefit analysis of DSM initiatives. Elements of energy efficiency market transformation: grants, loans, and tax incentives; bulk purchases; energy efficiency resource standard (EERS); building codes; and equipment efficiency standards, etc. Key policy tools to transform the renewable energy market: feed-in-tariff; renewable portfolio standards (RPS); incentives/subsidies; emission trading schemes; etc. Electricity market evolution. Organized wholesale markets and utility regulations to support transition towards integration of clean energy, storage, efficiency, and behind-the-meter resources.

JEE 624 Energy Modeling and Analysis 3(3-0-9)

Category: Specialization tracks course

Prerequisite(s)/ Co-requisite(s): None

The concept of market transformation. Market transformation agents for whom performance incentives could be useful: utilities, nonprofit organizations, state agencies. Energy policy objectives. Interactions between energy supply- and demand-side policies. Demand-side management (DSM) concept, DSM load shape methods, cost-benefit analysis of DSM initiatives. Elements of energy efficiency market transformation: grants, loans, and tax incentives; bulk purchases; energy efficiency resource standard (EERS); building codes; and equipment efficiency standards, etc. Key policy tools to transform the renewable energy market: feed-in-tariff; renewable portfolio standards (RPS); incentives/subsidies; emission trading schemes; etc. Electricity market evolution. Organized wholesale markets and utility regulations to support transition towards integration of clean energy, storage, efficiency, and behind-the-meter resources.

JEE 625 Energy and Environmental Economics, Management and Policy 3(3-0-9)

Category: Mandatory courses

Prerequisite(s)/ Co-requisite(s): None

This course introduces first the basic concepts of economics, economic sectors and activities, and the relationship between economic development and energy demands. The roles of energy supply and energy security, energy resources and conversion, environmental and climate implications due to modern energy utilization and externality, limitation of growth theory, a new paradigm shift in economic development and sustainable development, UNFCCC and Kyoto Protocol, economic tools for efficient energy resources utilization and environmental remedy, protection and control, contemporary energy and environmental issues, are also presented. Drivers of energy-saving program initiatives, analysis of rational energy use, basic energy audit, identification of energy conservation opportunities, the concept of economic analysis, and evaluation are then introduced and discussed. Environmental impact assessment tools and indicators, such as LCA and environmental standards, state of environmental assessment reporting, and its applications, are then presented in the form of mini-projects and case studies as an introduction to the individual/ team projects to be presented at the end of the course.

JEE 630 Thesis (M.Eng./M.Sc. in Sustainable Energy System) 20(0-0-60)
Category: Thesis
Prerequisite(s)/ Co-requisite(s): None
The students are required to undertake research or development studies under supervision of a member of the faculty. The thesis should be completed within three semesters.

JEE 631 Strategic Planning and Project Management 3(3-0-6)
Category: Foundational Course
Prerequisite(s)/ Co-requisite(s): None
The objective of this course is to enable the students to learn the basics of strategic planning and project management. It will explain how to develop a strategic plan and implement a project, like definition, objectives, characteristics, and phases of projects as well as execution plans, cost/schedule estimation and control. Project evaluation is also included.

JEE 633 Energy Management in Industry 3(3-0-9)
Category: Elective Course
Prerequisite(s)/ Co-requisite(s): None
The objective of this course is to provide a sound knowledge to evaluate all major energy systems. In this course, the principles of thermal energy conversion systems will be presented. It will start with an overview about the current energy situation, its demand and supply and the characteristics of the conventional and renewable energy resources. All major energy conversion systems will be introduced and the specifics in their application explained. In addition, necessary instrumentation and measurement techniques are presented to monitor and evaluate energy systems.

JEE 634 Climate Influence on Buildings and End-use Requirements 3(3-0-9)
Category: Specialization tracks course
Prerequisite(s)/ Co-requisite(s): None
This course introduces students to the phenomena related to the use of energy in buildings. Students will learn mechanisms and method of calculation for air properties, thermal comfort, air-conditioning load,

and energy use in buildings. It covers a board topic of influences and energy use of buildings, solar radiation and climate, air psychrometry, thermal comfort, air-conditioning, air flow in buildings, lighting, building energy code, and estimation and management of energy use in buildings with the use of a building energy code program.

JEE 635 Data-driven Energy Efficiency and Management 3(3-0-9)

Category: Specialization tracks course

Prerequisite(s)/ Co-requisite(s): None

This course aims to equip students with a modern concept of the data-driven energy efficiency and management for buildings. The students will learn the basic knowledge of practical internet-of-thing (IoT) approaches with hands-on skills on energy data collection, monitoring, wrangling, and analysis, and employ them to establish energy efficiency measure (EEM) initiative of buildings. The course contents are inclusive of introduction to digital transformation in the area of energy efficiency, building energy audits and retro-commissioning, performance benchmarking, advanced sensing technologies for buildings, data-driven energy modelling, solar and load forecast, predictive control of the indoor climate, fault detection and diagnostics, demand response and smart grid.

JEE 637 Daylighting Applications 3(3-0-9)

Category: Specialization tracks course

Prerequisite(s)/ Co-requisite(s): None

This course aims to expose students to the nature of daylight, methods and practices of daylighting. The course introduces students to concepts and methods of lighting and daylighting. It covers the subjects of nature of light, lighting units and measurement, visual ability and lighting requirements, lighting calculations, daylight availability and models, daylighting methods, concentration of daylight, economic and societal benefits of daylighting.

JEE 638 Advanced Topics in Building Energy Technology (3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

This course aims to expose students to the mechanisms and calculation of light and heat gain through building envelope and the development of energy performance indicators of building systems. It covers the subjects of heat transfer, steady and non-steady heat gain through building envelope, nature of solar radiation and calculation of solar radiation on shaded surfaces, optical and thermal aspects of solar radiation gain through glazing, and heat gain through shaded windows. It briefly examines models of heat transfer mechanisms of cooling equipments. It examines air flows due to wind and stack pressures. It examines energy performance of the building systems and energy performance of the whole building. It then examines how to reduce energy consumption of buildings through improving energy performance of individual systems to eventually achieving levels of low-energy, zero-energy and net-positive energy buildings.

JEE 640 Thesis (M.Eng./M.Sc. in Environmental Technology and Management 20(0-0-60)

Category: Thesis

Prerequisite(s)/ Co-requisite(s): None

The students are required to undertake research or development studies under supervision of a member of the faculty. The thesis should be completed within three semesters.

JEE 642 Fuels and Combustion 3(3-0-9)

Category: Specialization tracks course

Prerequisite(s)/ Co-requisite(s): None

The objective of the course is to provide the student with the basic concepts of combustion processes. Classification of fuels. Properties and characterization of gaseous, liquid and solid fuels. Characteristics of the combustion flame. Stoichiometry. Thermodynamics of combustion. Chemical kinetics of combustion. Energy balance and furnace efficiency. Overview on major combustion technologies for solid, liquid and gaseous fuels.

JEE 644 Power Plant Engineering 3(3-0-9)

Category: Specialization tracks course

Prerequisite(s)/ Co-requisite(s): None

Objective of the course is to provide students an overview of various types of power plants and their components. Basic concepts for fuels and combustion processes, Analysis of steam cycles and combined cycle power generation, Steam generation and turbines, Condenser, feed water and circulating water systems, Gas turbine power plants, emission control and flue gas treatment. Economics of power generation.

JEE 649 Entrepreneurship and Innovation in Energy and Environment 3(3-0-9)

Category: Mandatory courses/Compulsory course

Prerequisite(s)/ Co-requisite(s): None

Objective of the course is for students to familiarize themselves with various tools from idea creation to business development and can use them effectively when needed. Attending the course, the students will learn about business relating to energy and environment technology and management. The learning journey will start with the overview of energy and environment system in which the problems/gaps will be identified. Then, how to solve the problems with innovations and in some cases as far as new business creation. The student will also learn about the business model development and market validation in order to meet the customer demand and commercialize the idea or research results. Through lecture content, case studies of energy startups/incubators) and self-practice under guidance/coaching, at the end of the course, the students are expected to demonstrate their learning outcome through presentation of idea project for business development.

JEE 652 Natural Gas Utilization Technologies 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

The objective of the course is to give students an understanding of the natural gas utilization technologies. Natural gas properties. Reserves and uses. Natural gas processes and transportation. Liquefied Natural Gas (LNG) and Compressed Natural Gas (CNG). Thermoacoustic liquefaction: methane reforming, partial oxidation, and hydrogen production. Fischer Tropsch process, Gas-to-Liquid plants, and direct conversion

of natural gas. Ammonia, methanol, and dimethylether synthesises. Combustion fundamentals. Use of natural gas in reciprocal engines and as catalytic pollutant control. The application of gas in gas turbines and power plants as well as in fuel cells. Environmental and economic considerations, as well as life-cycle assessment.

JEE 653 Energy Systems Integration and Smart Power Systems 3(3-0-9)

Category: Specialization tracks course

Prerequisite(s)/ Co-requisite(s): None

Introduction to energy systems integration. Coupling of energy vectors; coupling across geographical scales, coupling of regulation and control mechanisms, and coupling of other infrastructures. Cost-benefit analysis for integrated energy systems. Overview of power system structure and operation, and challenges introduced by high penetrations of intermittent renewable energy (VRE) sources. Fundamentals and technologies in power systems of the future: smart flexible grids, virtual power plate (VPP). Various energy storage systems and their characteristics including electric vehicles. Solar and wind resources, design and evaluation of standalone, grid-connected and large-scale PV systems and wind systems. Overview of and design of elements within a microgrid and hybrid power systems. Energy economy and levelized cost of energy. Overview of grid codes with high penetration of renewable sources.

JEE 654 Renewable Energy Systems 3(3-0-9)

Category: Specialization tracks course

Prerequisite(s)/ Co-requisite(s): None

Global sources of energy and energy-related CO2 emissions. The role of renewable energy in mitigating climate change and meeting other sustainable development objectives. The global resources availability of each type of renewable energy, options for their application and available conversion technologies, as well as their learning curves. Solar energy: fundamentals, solar thermal systems, solar photovoltaics. Wind energy: fundamentals, types of wind turbines and wind power electric generator. Bioenergy: biomass types, heat and power conversion, biofuels for transportation, waste-to-energy, biogas and biorefinery concept. Hydropower and pumped storage. Marine energy. Geothermal energy. Energy storage system.

JEE 655 Sustainable Hydrogen and Electrical Energy Storage 3(3-0-9)

Category: Specialization tracks course

Prerequisite(s)/ Co-requisite(s): None

The objective of the course is to give students an understanding of the hydrogen economy and future energy storage technologies. The course content includes: hydrogen production, purification, transportation and storage. Type of energy storages, their applications and operations will be explained throughout this course.

JEE 657 Fuel Cell and Hydrogen Technology 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

The objective of the course is to give students an understanding of the hydrogen production and fuel cell technologies. The course content includes: hydrogen production from several approaches i.e. reforming, gasification, water splitting. Information on hydrogen purification will also be provided. Use of hydrogen as fuel in fuel cells will also described. Type of fuel cells, their applications and operations will be explained throughout this course.

JEE 659 Energy from Biomass 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

This course aims to give students an understanding of the processes to produce the energy from biomass. The advantages of bio-energy production and various technologies for biomass conversion for heat and power are reviewed. The thermochemical conversion of biomass includes combustion, gasification, and pyrolysis. Biogas, biofuel and bio-refinery are also included. Finally, the economic assessment of biomass utilization system, the impact on environmental and the policy framework for biomass utilization will be discussed.

JEE 661 Tropical Climates and Boundary Layer Science 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

This course aims to give an introductory overview of tropical climates and boundary layer science, with perspectives of those associated with Thailand and Southeast Asia. The contents include the importance and roles of tropical climates, atmospheric structures, general circulation, dimensional analysis and variable decomposition, scales of motion, thermodynamic laws of air, conservation laws of mass, momentum and energy, winds and air masses, turbulence, eddy covariance, surface energy balance, logarithmic wind profiles, water vapor in the tropics, regional temperature and precipitation. Contemporary related issues are also given, such as regional monsoons, drought, trace constituents and associated chemistry, wind & solar energy, pollutant dispersion, sea breeze circulation, mountain-valley circulation, and urban heat island.

JEE 664 Atmospheric and Air Quality Modeling 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

This course aims to give fundamental concepts of atmospheric and air quality modeling, with perspectives of regional and local applications in Thailand and Southeast Asia. The contents include the importance and roles of the modeling to environmental management and policy making as well as scientific problems, governing equations of atmosphere, atmospheric structure, thermodynamic laws for air, conservation laws of mass and momentum, atmospheric diffusion equation, space and time discretization, parameterizations of atmospheric boundary layer, land surface interaction, and convective clouds, emissions and modeling, Gaussian plume dispersion, Lagrangian tracking, photochemical modeling, deposition modeling, model performance evaluation, and atmospheric measurements. Contemporary related topics are also given, such as regulatory modeling for industrial sources, urban ozone modeling, and smoke-haze modeling, wind resource modeling, and regional climate modeling.

JEE 667 Environmental Pollution Control Technology 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

The objective of this course is to provide a broad based introduction to aspects of environmental pollution and control in air, water and soil media. The course will introduce environmental monitoring and analysis techniques and environmental impact assessment. The course will include an introduction to pollutants present in aqueous systems, the fate and transport of these pollutants, and an introduction to water and wastewater treatment processes. The course will include an introduction to the sources, fate and transport of air and climate pollutants, and an introduction to air and climate pollution control technology. It will also include an introduction to solid and hazardous wastes, their fate and interactions with other media, and handling, control and treatment technologies.

JEE 671 Life Cycle Assessment 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

The objective of this course is to introduce the students to the concept of life cycle thinking. The systems approach to dealing with environmental pollution problems is highlighted and Life Cycle Assessment (LCA) is introduced as an assessment tool. The course details are as follows. LCA: Introduction; methodology – goal, scope, inventory analysis, impact assessment; software; improvement analysis, such as identification of environmental "hotspots". Application of LCA to waste management and energy conversion systems. Product stewardship and design for environment. The course is structured to have more emphasis on actual case studies, class assignments and particularly important is a term project where the students are required to select a topic in the first few weeks of the beginning of the course and should follow the LCA methodology as it is discussed in the lectures. They are also given guidance on the term project all through the course so that they can learn the concepts discussed in the class by practical application to their individual topics.

JEE 673 Waste and Climate Change 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

The objective of the course is to enable students to understand the relationships between waste management practice and climate change.

Overview of climate change. Global trends in waste generation and management. Waste management practices: landfill; thermal treatment; composting; anaerobic digestion; mechanical biological treatment; recycling; waste prevention. Climate impacts of waste management practices.

Greenhouse gas mitigation options for waste sector. Current international activity for waste and climate change (CDM, JI, NAMA, and MRV).

JEE 674 Waste to Energy and Its Sustainable Mitigation 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

Understanding the big picture of waste management and its linkage to climate change and mitigation options. Ability to show clear perception on link of waste management from down-stream to upstream contribute to sustainable development, climate change and beyond. Capable to discuss in full dimension of preparation and treatment technologies contribute to energy and sustainability. Understand mitigation options and GHG accounting to reduce and avoid emission from the system of waste to energy technology under sustainability platform. Ability to forecast future amount of waste generation under economic dynamic and situation change. Understanding modern knowledge and trends related to current waste issue such as plastics waste and micro-plastics. Ability to apply circular economy philosophy to waste management with sustainable manner. Increase skill in presentation, brainstorming, and interact among students and instructor. Increase experience of field experiments and improve view of waste to energy utilization under the real implementation at national and global scale.

JEE 681 Environmental Chemistry and Ecotoxicology 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

Chemistry of environmental media (soil, air and water resources) and their geochemical and biological interactions. Pollutant behaviour and their interactions and bioaccumulation in the environment and food chains. Reactions of natural living organisms with pollutants and their toxicity, and adverse effects upon the ecosystem. Sustainability of the biosphere. Environmental critical load. Threshold limits of ecotoxicology. Mechanisms and modes of interactions within the ecosystem. Ecological standardisation. Environmental monitoring. Ecological risk assessment.

JEE 682 Environmental and Health Risk Assessment 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

The objective of this course is to understand concepts of risk assessment and to gain a knowledge of risk estimates, as well as the applications of risk assessment in the environmental management and planning systems. Introduction to Environmental and Health Risk Assessment. Use of statistical tools for risk assessment. Transport and transfer processes of pollutants in soil, water and air. Risk assessment: risk characterization, exposure, dose-response and target level calculations. Risk-Based Decisions for Corrective Action.

JEE 683 Energy, Environment and Sustainability 3(3-0-9)

Category: Mandatory courses/Compulsory course

Prerequisite(s)/ Co-requisite(s): None

This course examines the interrelationships between the environment and the ways in which energy is produced, distributed, and used. Worldwide energy use patterns and projections are reviewed. Underlying scientific principles are studied to provide a basis for understanding the inevitable environmental consequences of energy use. Topics studied include fossil, and renewable sources, including hydropower, wind, and solar. The Use of alternative fuels such as biodiesel and ethanol are also included. Emphasis is placed on the environmental impacts of energy sources, including local effects resulting from emissions of nitrogen oxides, sulfur, hydrocarbons, and particulates as well as global effects such as mercury release from

coal combustion. Carbon emissions are a continuing theme as each energy technology is studied and its contribution to climate change is assessed. All these energy and environmental challenges are addressed within the context of sustainable development. The purpose is to help students understand how energy is converted into useful forms, how this conversion impacts the environment, and how this shapes sustainable development strategies and action plans.

JEE 684 GIS and Remote Sensing 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

This course describes the concepts and the applications of GIS and Remote Sensing as a tool in environmental management and planning. Principles of remote sensing. Physical background in electromagnetic wave theory. Propagation of electromagnetic radiation and its interaction with matter. Spectral signature, data acquisition, and digital image processing techniques. Image classification. Accuracy assessment. Geographic Information Systems (GIS). Characteristics of spatial information database. Mapping concepts and data structure. Data management techniques. Data acquisition, manipulation and analysis. Map output generation. Application of GIS and remote sensing in environmental management and planning.

JEE 685 Climate Change: Physical Science Basis 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

This course aims to provide the scientific fundamentals of climate change. The course will explore the past, present, and projected changes in Earth's climate. Topics include Earth's climate, response and feedback mechanisms, natural and anthropogenic climate change, climate observations and trends and extreme events. The way scientists study and the evidences they use to explain how climate has been changed will be introduced. Some part of lecture will also introduce the greenhouse gas sink & sources, greenhouse gas metrics, methodology and exercise to estimate their sinks& soruces's strength. The last part will introduce topics such as climate modelling, emission scenarios and climate mate change projection.

JEE 688 Data Science for Environmental and Energy Studies 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

To introduce essential elements of data science and its ecosystem, as motivated by their significance and utility in today-world applications, including environmental and energy issues. The course is designed to prepare students to be equipped not only with basic knowledge but initial familiarity to certain data tools and open data to necessarily enhance their academic research and future career. The backbone of the course is dedicated to data analytics and predictive modeling. Real-world data-related applications are illustrated for additional perspectives.

JEE 691 Climate Change Policy 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

The objective of this course is to understand the current climate change policies that may lead to solving climate change-related problems, including both impacts and adaptation. Policy formulation and its implementation. Climate and principles of climate change. Natural and anthropogenic causes. Sources of emission. Emission factors and control of emissions. Principles and essence of United Nations Framework Convention on Climate Change (UNFCCC) and Montreal convention: Intergovernmental Panel on Climate Change (IPCC) and its assessment reports. Scenario of emissions (SRES) model. International agreements and standards involved in Greenhouse gas (GHG) reduction. Kyoto protocol and its mechanisms: joint implementation, emission trading, clean development mechanism and related national policies.

JEE 696 Greenhouse Gas Measurement, Mitigation and Monitoring Technology 3(3-0-9)

Category: Elective Course

Prerequisite(s)/ Co-requisite(s): None

The course will provide the basic concept of greenhouse gas emission estimate by various methodologies, monitoring and accounting. Climate change data will be introduced and the interplay between climate change and greenhouse gas will be highlighted. Measurement methods for greenhouse gas in various

IPCC sectors, IPCC methodology for national greenhouse gas inventory, and reporting and accounting will be introduced. Specific topics include use of chamber and non-chamber method to estimate greenhouse gas emissions, basic principle of greenhouse gas inventory, quality controls and error/uncertainty estimate, monitory methodology. Understanding global climate change policy such as under UNFCCC-Kyoto protocol and their systems for reporting and accounting greenhouse gas will be emphasized.

JEE 701 Research Communication for Ph.D. (Sustainable energy systems) 2 (0-6-6)

Category: Compulsory course

Prerequisite: None

To be able to summarize scientific material and results of the research clearly and present them in an appropriate form to a range of audiences is a necessary skill for any doctoral graduate. This course is designed to develop relevant capabilities, including extracting, paraphrasing and summarizing key points/messages from papers, reports, VDOs; report and article writing, oral and poster presentations; creating ppt and VDO, etc. It also aims to develop skills for communicating the significance of research and potential impacts that it may have to an audience both within and outside the student's own discipline or subject area. Through these practice-based skill development sessions, interactions with and among the audience in exchange of ideas and information are encouraged. In addition, students shall learn to use a range of smart research tools, e.g. Google Scholar, Mendeley, ResearchGate, Evernote, Grammarly, etc., that would facilitate their research and communication.

JEE 702 Dissertation for Ph.D. (Sustainable Energy Systems) 38 (0-0-114)

Category:Thesis

Prerequisite:None

The thesis must be based on a well-defined research project that is related to the application of science, engineering, economics, or policy principles to the solving of energy-related problems. The dissertation must be written strictly according to the format and submitted within the timetable given by the school.

JEE 703 Selected Topics I 3 (3-0-9)

Category: Elective

Prerequisite: None

The aim of the course is to introduce the students to selected current topics in energy and environment. The students have the opportunity to learn about actual problems in order to expand their vision of local and global challenges. The subjects can vary in each academic year.

JEE 704 Dissertation for Ph.D. (Sustainable Energy Systems) 49 (0-0-147)

Category:Thesis

Prerequisite:None

The thesis must be based on a well-defined research project that is related to the application of science, engineering, economics, or policy principles to the solving of energy-related problems. The dissertation must be written strictly according to the format and submitted within the timetable given by the school.

JEE 711 Research Communication for Ph.D. (Environment, Climate Change and Sustainability) 2 (0-6-6)

Category: Compulsory course

Prerequisite: None

To be able to summarize scientific material and results of the research clearly and present them in an appropriate form to a range of audiences is a necessary skill for any doctoral graduate. This course is designed to develop relevant capabilities, including extracting, paraphrasing and summarizing key points/messages from papers, reports, VDOs; report and article writing, oral and poster presentations; creating ppt and VDO, etc. It also aims to develop skills for communicating the significance of research and potential impacts that it may have to an audience both within and outside the student's own discipline or subject area. Through these practice-based skill development sessions, interactions with and among the audience in exchange of ideas and information are encouraged. In addition, students shall learn to use a range of smart research tools, e.g. Google Scholar, Mendeley, ResearchGate, Evernote, Grammarly, etc., that would facilitate their research and communication.

JEE 712 Dissertation for Ph.D. (Environment, Climate Change and Sustainability) 38 (0-0-126)

Category:Thesis
Prerequisite:None
The thesis must be based on a well-defined research project that is related to the application of science, engineering, economics, or policy principles to the solving of energy-related problems. The dissertation must be written strictly according to the format and submitted within the timetable given by the school.

JEE 713 Selected Topics II 3 (3-0-9)

Category: Elective
Prerequisite: None
The aim of the course is to introduce the students to selected current topics in energy and environment. The students have the opportunity to learn about actual problems in order to expand their vision of local and global challenges. The subjects can vary in each academic year.

JEE 714 Dissertation for Ph.D. (Environment, Climate Change and Sustainability) 49 (0-0-147)

Category:Thesis
Prerequisite:None
The thesis must be based on a well-defined research project that is related to the application of science, engineering, economics, or policy principles to the solving of energy-related problems. The dissertation must be written strictly according to the format and submitted within the timetable given by the school.

LNG 601 Foundation English for International Programs

This course aims to develop English Language skill necessary for use in international graduate programs. The course is designed for mature students in engineering and technology. It will be based on practical skills and focus on real language demands in studying in an international program, including: speaking and listening, lecture note taking, conference and group discussion, verbal report and presentation, report and technical paper writing.

LNG602 Thesis Writing

This course aims to develop knowledge and writing skills focusing on writing a thesis of doctoral students. This course emphasizes the development of a language corpus, strategies and techniques that help students write a thesis in English. The contents cover components of a thesis; characteristics of a good thesis; planning and drafting a thesis; resourcing; development of a language corpus for writing an abstract, the introduction, the methodology, the results, the discussion, and the conclusion; editing; and techniques to avoid plagiarism such as paraphrasing.