

JGSEE PROSPECTUS 2021-2024







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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

Master Programs (MEng and MSc)

- Sustainable Energy Systems
- Environment, Climate Change and Sustainability
- Energy Technology and Management
- 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.

The number of credits required for each program are listed below.

	Degree	Number of Credit Required					
		Compulsory	Specific Compulsory	Elective	Thesis	Internship	Total
1.	Doctor of Philosophy (Sustainable Energy Systems)		-			-	
	Plan A from Master level	11		6	38		55
	Plan B from Bachelor level	11		15	49		75
2.	Doctor of Philosophy (Environment, Climate Change and Sustainability)		-			-	
	Plan A from Master level	11		6	38		55
	Plan B from Bachelor level	11		15	49		75
3.	Master of Engineering/Master of Science (Plan A2-2) (Energy Technology & Management)	10	6	3	12	9	40
4.	Master of Engineering/Master of Science (Plan A2-1) (Environmental Technology & Management)	7	9	3	21	-	40
5.	Master of Engineering/Master of Science (Plan A2-2) (Environmental Technology & Management)	7	9	3	12	9	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 tal	ke 4 subjects with total	11 credits
JEE 701	Research Communication	2 (0-6-6)
JEE 613	Research Methodology	3 (3-0-9)
JEE 629	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. Dissertat	tion	
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 o	ourses	
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 / Semes	ter 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 / Semes	ter 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 / Sei	mester 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 / Semes	ter 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

XXX Elective (As recommended by advisor)JEE 704 Dissertation for Ph.D.Total

Year 2 / Semester 2

JEE 704 Dissertation for Ph.D. Total

Year 3 / Semester 1

JEE 704 Dissertation for Ph.D. Total

Year 3 / Semester 2

JEE 704 Dissertation for Ph.D. Total

Year 4 / Semester 1

JEE 704 Dissertation for Ph.D. Total Credit(s) (Theory-Practice-Self-study) 3 (3-0-9) 9 (0-0-27) 12 (6-0-36)

Credit(s) (Theory-Practice-Self-study) 10 (0-0-30) 10 (0-0-30)

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

	Structure	
Plan A from M	aster level	
Total program	credits	55 credits
	Courses	9 cradita
A. Compulsory	ino	a credits
C Elective Cou		6 credits
D Dissertation	1303	38 credits
E. English Cour	se	non-credit
Li Liighsii Coui		non creare
Plan B from Ba	achelor level	
Total program	credits	75 credits
Program Comp	ponent	
A. Compulsory	Courses	8 credits
B. Cross-discipl	ine	3 credits
C. Elective Cou	rses	15 credits
D. Dissertation		49 credits
E. English Cour	se	non-credit
A Compulsor	v Courses	
All students take 3 subjects with total		8 credits
		ocicuits
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-disciplineStudents must take 1 subjects with total3 creditsJEE 683 Energy, Environment and Sustainability33 (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

	5, ,	
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

Dissertation for Ph.D. (Environment, Climate Change and Sustainability) for students with a master's degree background	38 credits
Dissertation for Ph.D.	So creatis
(Environment, Climate Change and Sustainability) for students with a bachelor's degree background	49 credits
rses	
Foundation English for International Programs Thesis Writing	non-credit non-credit
	Dissertation for Ph.D. (Environment, Climate Change and Sustainability) for students with a master's degree background Dissertation for Ph.D. (Environment, Climate Change and Sustainability) for students with a bachelor's degree background rses Foundation English for International Programs Thesis Writing

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 Total	Energy, Environment and Sustainability	3 (3-0-9) 11 (9-6-33)
Year 1 / Semes XXX XXX JEE 712 Total	ter 2 Elective (As recommended by advisor) Elective (As recommended by advisor) Dissertation for Ph.D.	Credit(s) (Theory-Practice-Self-study) 3 (3-0-9) 3 (3-0-9) 6 (0-0-18) 12 (6-0-36)
Year 2 / Semes JEE 712 Total	ter 1 Dissertation for Ph.D.	Credit(s) (Theory-Practice-Self-study) 9 (0-0-27) 9 (0-0-27)
Year 2 / Semes JEE 712 Total	ter 2 Dissertation for Ph.D.	Credit(s) (Theory-Practice-Self-study) 9 (0-0-27) 9 (0-0-27)
Year 3 / Semes JEE 712 Total	ter 1 Dissertation for Ph.D.	Credit(s) (Theory-Practice-Self-study) 9 (0-0-27) 9 (0-0-27)
Year 3 / Semes JEE 712 Total	ter 2 Dissertation for Ph.D.	Credit(s) (Theory-Practice-Self-study) 5 (0-0-15) 5 (0-0-15)

Plan B from Bachelor level

Year 1 / Seme	ester 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 / Seme	ester 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 / Seme	ester 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 / Seme	ester 2	Credit(s) (Theory-Practice-Self-study)
JEE 714	Dissertation for Ph.D.	10 (0-0-30)
Total		10 (0-0-30)

Year 3 / Seme JEE 714 Total	ster 1 Dissertation for Ph.D.	Credit(s) (Theor	ry-Practice-Self-study) 10 (0-0-30) 10 (0-0-30)
Year 3 / Seme JEE 714 Total	ster 2 Dissertation for Ph.D.	Credit(s) (Theo	ry-Practice-Self-study) 10 (0-0-30) 10 (0-0-30)
Year 4 / Seme JEE 714 Total	ster 1 Dissertation for Ph.D.	Credit(s) (Theo	ry-Practice-Self-study) 10 (0-0-30) 10 (0-0-30)
3) Master of E (Energy Techi	ngineering/Master of Science (Plan A2-2) nology & Management)		
	Structure		
Total program	credits		40 credits
Program Com	ponent		
A. Compulsory	Courses		10 credits
B. Specific Cor	npulsory Courses		6 credits
C. Elective Cou	Irses		3 credits
D. Thesis			12 credits
E. Internship			9 credits
A. Compulsor	v courses		10 credits
JEE 601 Semin	ar for M.Eng./M.Sc. (Energy Technology & Mana	jement)	1 credit
JEE 613 Resea	rch Methodology	· ·	3 credits
JEE 625 Energy	y and Environmental Economics, Management a	nd Policy	3 credits
JEE 649 Entrep	preneurship and Innovation in Energy and Enviro	onment	3 credits

B. Specific compulsory courses	6 credits
Select 6 credits from research focus as recommended by advisor	
- Advanced Fuel Processing Laboratory (AFPL)	
JEE 642 Fuels and Combustion	3 credits
JEE 657 Fuel Cell and Hydrogen Technology	3 credits
JEE 658 Renewable Energy Technologies	3 credits
JEE 659 Energy from Biomass	3 credits

- Building Energy Science and Technology Laboratory (BEST)	
JEE 633 Energy Management in Industry	3 credits
JEE 634 Climate Influence on Buildings and End-use Requirements	3 credits
JEE 637 Daylighting Applications	3 credits
JEE 638 Advanced Topics in Building Energy Technology	3 credits
JEE 647 Design of Suitable Urban Ecology	3 credits

- Advanced Greenhouse Gases and Aerosols Research Laboratory (AGAR)

JEE 673 Waste and Climate Change	3 credits
JEE 685 Climate Change: Physical Science Basis	3 credits
JEE 696 Greenhouse Gas Measurement, Mitigation and Monitoring Technology	3 credits
JEE 661 Tropical Climates and Boundary Layer Science	3 credits
JEE 664 Atmospheric and Air Quality Modeling	3 credits

- Life Cycle Sustainability Assessment Laboratory (LCSAL)	
JEE 667 Environmental Pollution Control Technology	3 credits
JEE 671 Life Cycle Assessment	3 credits
JEE 681 Environmental Chemistry and Toxicology	3 credits
JEE 682 Environmental and Health Risk Assessment	3 credits
JEE 683 Energy, Environment and Sustainability	3 credits
JEE 684 GIS and Remote Sensing	3 credits
- Energy and Environmental Policy Laboratory (EEPL)	
JEE 631 Strategic Planning and Project Management	3 credits
- Other	
JEE 603 Special Study I	3 credits
C. Elective course	3 credits
Select a 3 credit-course as recommended by advisor from the following list	
Select a 3 credit-course as recommended by advisor from the following list JEE 603 Special Study I	3 credits
Select a 3 credit-course as recommended by advisor from the following list JEE 603 Special Study I JEE 604 Special Study II	3 credits 3 credits
Select a 3 credit-course as recommended by advisor from the following list JEE 603 Special Study I JEE 604 Special Study II JEE 605 Special Study III	3 credits 3 credits 3 credits
Select a 3 credit-course as recommended by advisor from the following list JEE 603 Special Study I JEE 604 Special Study II JEE 605 Special Study III JEE 606 Mathematical Techniques	3 credits 3 credits 3 credits 3 credits
Select a 3 credit-course as recommended by advisor from the following list JEE 603 Special Study I JEE 604 Special Study II JEE 605 Special Study III JEE 606 Mathematical Techniques JEE 607 Optimization Techniques	3 credits 3 credits 3 credits 3 credits 3 credits
Select a 3 credit-course as recommended by advisor from the following list JEE 603 Special Study I JEE 604 Special Study II JEE 605 Special Study III JEE 606 Mathematical Techniques JEE 607 Optimization Techniques JEE 621 Energy Economics, Market and Policy	3 credits 3 credits 3 credits 3 credits 3 credits 3 credits
Select a 3 credit-course as recommended by advisor from the following list JEE 603 Special Study I JEE 604 Special Study II JEE 605 Special Study III JEE 606 Mathematical Techniques JEE 607 Optimization Techniques JEE 621 Energy Economics, Market and Policy JEE 622 Emerging Energy Technologies and Management	3 credits 3 credits 3 credits 3 credits 3 credits 3 credits 3 credits
Select a 3 credit-course as recommended by advisor from the following list JEE 603 Special Study I JEE 604 Special Study II JEE 605 Special Study III JEE 606 Mathematical Techniques JEE 607 Optimization Techniques JEE 621 Energy Economics, Market and Policy JEE 622 Emerging Energy Technologies and Management JEE 623 Policies for Energy Market Transformation	3 credits 3 credits 3 credits 3 credits 3 credits 3 credits 3 credits 3 credits
Select a 3 credit-course as recommended by advisor from the following list JEE 603 Special Study I JEE 604 Special Study II JEE 605 Special Study III JEE 606 Mathematical Techniques JEE 607 Optimization Techniques JEE 621 Energy Economics, Market and Policy JEE 622 Emerging Energy Technologies and Management JEE 623 Policies for Energy Market Transformation JEE 624 Energy Modeling and Analysis	3 credits 3 credits 3 credits 3 credits 3 credits 3 credits 3 credits 3 credits 3 credits 3 credits
Select a 3 credit-course as recommended by advisor from the following list JEE 603 Special Study I JEE 604 Special Study II JEE 605 Special Study III JEE 606 Mathematical Techniques JEE 607 Optimization Techniques JEE 621 Energy Economics, Market and Policy JEE 622 Emerging Energy Technologies and Management JEE 623 Policies for Energy Market Transformation JEE 624 Energy Modeling and Analysis JEE 626 Cooling Systems and Environmental Control for Mission-Critical Facilities	3 credits 3 credits

JEE 628 Foundations fo Decision Analysis	3 credits
JEE 631 Strategic Planning and Project Management	3 credits
JEE 632 Project Implementation and Control	3 credits
JEE 633 Energy Management in Industry	3 credits
JEE 634 Climate Influence on Buildings and End-use Requirements	3 credits
JEE 637 Daylighting Applications	3 credits
JEE 638 Advanced Topics in Building Energy Technology	3 credits
JEE 642 Fuels and Combustion	3 credits
JEE 644 Power Plant Engineering	3 credits
JEE 645 Clean Technologies for Solid Fuels	3 credits
JEE 647 Design of Suitable Urban Ecology	3 credits
JEE 651 Heat and Power Generation Technologies	3 credits
JEE 652 Natural Gas Utilization Technologies	3 credits
JEE 653 Energy System Integration and Smart Power System	3 credits
JEE 656 Energy Efficiency	3 credits
JEE 657 Fuel Cell and Hydrogen Technology	3 credits
JEE 658 Renewable Energy Technologies	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 667 Environmental Pollution Control Technology	3 credits
JEE 671 Life Cycle Assessment	3 credits
JEE 674 Waste to Energy and its sustainable mitigation	3 credits
JEE 681 Environmental Chemistry and Toxicology	3 credits
JEE 682 Environmental and Health Risk Assessment	3 credits
JEE 683 Energy, Environment and Sustainability	3 credits
JEE 684 GIS and Remote Sensing	3 credits

The Joint Graduate School of Energy and Environment

JEE 685 Climate Change: Physical Science Basis	3 credits
JEE 691 Climate Change Policy	3 credits
JEE 696 Greenhouse Gas Measurement, Mitigation and Monitoring Technolog	y 3 credits
JEE 703 Selected Topics I	3 credits
JEE 713 Selected Topics II	3 credits
XXX Elective (As recommended by advisor)	3 credits
D. Thesis	12 credits
JEE 610 Thesis (Energy Technology & Management)	12 credits
E. Internship	9 credits
JEE 616 Internship	9 credits
F. English Courses (without credit)	
LNG 601 Foundation English for International Programs*	S/U
LNG 602 Thesis Writing	S/U
* Only for students with condition to improve English skill since admission.	

Study Plan

Credit(s) (Lecture-Practice-Self-study)

Year 1 Semester 1

JEE 601 Seminar for M.Eng./M.Sc. (Energy Technology & Management)	1 (1-0-3)
JEE 613 Research Methodology	3 (3-0-9)
JEE 625 Energy and Environmental Economics, Management and Policy	3 (3-0-9)
JEE 649 Entrepreneurship and Innovation in Energy and Environment	3 (3-0-9)
JEE xxx Specific Compulsory Course (research group)	3 (3-0-9)
Total	13 credits

Year 1 Semester 2	
JEE xxx Specific Compulsory Course (research group)	3 (3-0-9)
xxx Elective (As recommended by advisor)	3 (3-0-9)
JEE 610 Thesis (Energy Technology & Management)	6 (0-0-18)
Total	12 credits
Year 2 Semester 1	
JEE 616 Internship	9 (0-0-27)
Total	9 credits
Year 2 Semester 2	
JEE 610 Thesis (Energy Technology & Management)	6 (0-0-18)
Total	6 credits
4) Master of Engineering/Master of Science (Environmental Technology &	Management)
4) Master of Engineering/Master of Science (Environmental Technology & Structure	Management)
4) Master of Engineering/Master of Science (Environmental Technology & Structure Total program credits	Management) 40
4) Master of Engineering/Master of Science (Environmental Technology & Structure Total program credits Program Component	Management) 40
 4) Master of Engineering/Master of Science (Environmental Technology & Structure Total program credits Program Component Plan A2-1 	Management) 40
 4) Master of Engineering/Master of Science (Environmental Technology & Structure Total program credits Program Component Plan A2-1 A. Compulsory Courses 	Management) 40 7 credits
 4) Master of Engineering/Master of Science (Environmental Technology & Structure Total program credits Program Component Plan A2-1 A. Compulsory Courses B. Specific Compulsory Courses 	Management) 40 7 credits 9 credits
 4) Master of Engineering/Master of Science (Environmental Technology & Structure Total program credits Program Component Plan A2-1 A. Compulsory Courses B. Specific Compulsory Courses C. Elective Courses 	Management) 40 7 credits 9 credits 3 credits
 4) Master of Engineering/Master of Science (Environmental Technology & Structure Total program credits Program Component Plan A2-1 A. Compulsory Courses B. Specific Compulsory Courses C. Elective Courses D. Thesis 	Management) 40 7 credits 9 credits 3 credits 21 credits

A. Compulsory Courses

7 credits

B. Specific Compulsory Courses	9 credits
C. Elective Courses	3 credits
D. Thesis	12 credits
E. Internship	9 credits
A Compulsory courses	7 credits
JEE 611 Seminar for M Eng /M Sc. (Environment Technology & Management)	1 credit
IFE 613 Research Methodology	3 credits
JEE 625 Energy and Environmental Economics, Management and Policy	3 credits
	0 0.00.00
B. Specific compulsory courses	9 credits
JEE 667 Environmental Pollution Control Technology	3 credits
JEE 683 Energy, Environment and Sustainability	3 credits
JEE xxx Specific Compulsory (As recommended by advisor)*	3 credits
*Select 3 credits from research focus as recommended by advisor	
- Advanced Fuel Processing Laboratory (AFPL)	
JEE 658 Renewable Energy Technologies	3 credits
JEE 659 Energy from Biomass	3 credits
- Building Energy Science and Technology Laboratory (BEST)	
JEE 647 Design of Suitable Urban Ecology	3 credits
- Advanced Greenhouse Gases and Aerosols Research Laboratory (AGAR)	
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 696 Greenhouse Gas Measurement, Mitigation and Monitoring Technolog	y 3 credits

JEE 661 Tropical Climates and Boundary Layer Science	3 credits
JEE 664 Atmospheric and Air Quality Modeling	3 credits
- Life Cycle Suctainability Accessment Laboratory (LCSAL)	
Ele Cycle Sustainability Assessment Laboratory (LCSAL)	2 cradita
JEE 671 Life Cycle Assessment	3 credits
JEE 601 Environmental and Lealth Disk Assessment	3 credits
JEE 602 Environmental and Health Risk Assessment	3 credits
JEE 684 GIS and Remote Sensing	3 credits
- Other	
JEE 604 Special Study II	3 credits
JEE 605 Special Study III	3 credits
C. Elective courses	3 credits
Select a 3 credit-course as recommended by advisor from the following list	
JEE 604 Special Study II	3 credits
JEE 605 Special Study III	3 credits
JEE 606 Mathematical Techniques	3 credits
JEE 645 Clean Technologies for Solid Fuels	3 credits
JEE 647 Design of Suitable Urban Ecology	3 credits
JEE 649 Entrepreneurship and Innovation in Energy and Environment	3 credits
JEE 653 Solar Energy	3 credits
JEE 656 Energy Efficiency	3 credits
JEE 658 Renewable Energy Technologies	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

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JEE 681 Environmental Chemistry and Toxicology	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 691 Climate Change Policy	3 credits
JEE 696 Greenhouse Gas Measurement, Mitigation and Monitoring Technolog	y 3 credits
JEE 703 Selected Topics I	3 credits
JEE 713 Selected Topics II	3 credits
XXX Elective (As recommended by advisor)	3 credits
D. Thesis Plan A 2-1 JEE 640 Thesis (Environmental Technology & Management)	21 credits
JEE 620 Thesis (Environmental Technology & Management)	12 credits
E. Internship Plan A 2-2	9 credits
JEE 616 Internship	9 credits
F. English Courses (without credit)	
LNG 601 Foundation English for International Programs*	S/U
LNG 602 Thesis Writing	S/U

* Only for students with condition to improve English skill since admission.

Study Plan	Credit(s) (Lecture-Practice-Self-study)
Plan A2-1	
Year 1 Semester 1	
JEE 611 Seminar for M.Eng. / M.Sc. (Environmental Technology	/ & Management) 1 (1-0-3)
JEE 613 Research Methodology	3 (3-0-9)
JEE 625 Energy and Environmental Economics, Management a	and Policy 3 (3-0-9)
JEE 667 Environmental Pollution Control Technology	3 (3-0-9)
JEE 683 Energy, Environment and Sustainability	3 (3-0-9)
Total	13 credits
Year 1 Semester 2	
JEE xxx Specific Compulsory Course (As recommended by adv	visor) 3 (3-0-9)
xxx Elective (As recommended by advisor)	3 (3-0-9)
JEE 640 Thesis (Environmental Technology & Management)	6 (0-0-18)
Total	12 credits
Year 2 Semester 1	
JEE 640 Thesis (Environmental Technology & Management)	9 (0-0-27)
Total	9 credits
Year 2 Semester 2	
JEE 640 Thesis (Environmental Technology & Management)	6 (0-0-18)
Total	6 credits

Plan A2-2

Year 1 Semester 1

JEE 611 Seminar for M.Eng / M.Sc (Environmental Technology & Management)	1 (1-0-3)
JEE 613 Research Methodology	3 (3-0-9)
JEE 625 Energy and Environmental Economics, Management and Policy	3 (3-0-9)
JEE 667 Environmental Pollution Control Technology	3 (3-0-9)
JEE 683 Energy, Environment and Sustainability	3 (3-0-9)
Total	13 credits
Year 1 Semester 2	
JEE xxx Specific Compulsory Course (As recommended by advisor)	3 (3-0-9)
xxx Elective (As recommended by advisor)	3 (3-0-9)
JEE 620 Thesis (Environmental Technology & Management)	6 (0-0-18)
Total	12 credits
Year 2 Semester 1	
JEE 616 Internship	9 (0-0-27)
Total	9 credits
Year 2 Semester 2	
JEE 620 Thesis (Environmental Technology & Management)	6 (0-0-18)

JEE 620 Thesis (Environmental Technology & Management) 6 (0-0-18 Total 6 credits

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.

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

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.

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 \ge 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.

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.

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 credit	s for each program are as follows,		
M.Eng./M.Sc.	(Energy Technology & Management)/ (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

Ph.D (from Bachelor Level) Sustainable Energy Systems Environment, Climate Change and Sustainability

M.Eng / M.Sc Energy Technology & Management

M.Eng / M.Sc Environmental Technology & Management Two international journal papers or equivalent and one international conference proceeding

Two international journal papers (ISI) and one international conference proceeding , but not their equivalent (see note below)

Plan A2-2 One international journal paper or One national journal paper or One international conference proceeding

Plan A2-1 One national journal or one international journal paper Plan A2-2 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 Library Website), attach a copy of the page containing the Editorial Board Members (Journal presented in Beall's list are not recommended).

(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.
- Papers published in journals other than those listed below will not be accepted as National Journal papers.

(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, L NG 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.

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 author¹, Second author²,*, Third author³

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. Nopharatana³

¹The Joint Graduate School of Energy and Environment, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.

²School of Bioresources and Technology, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.

³Pilot Plant Development and Training Institute, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.

⁴Center 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. ³Third author's affiliation: Organization, City, Country.

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

Theerayut Leevijit^{1,3},*, Worawut Wisutmethangoon², Gumpon Prateepchaikul^{2,3}, Charkirt Tongurai^{2,3}, Michael Allen²

¹The Joint Graduate School of Energy and Environment, King Mongkut's University of Technology Thonburi, Bangkok, Thailand. ²Faculty of Engineering, Prince of Songkla University, Songkla, Thailand. ³Center 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}

¹The Joint Graduate School of Energy and Environment, King Mongkut's University of Technology Thonburi, Bangkok, Thailand.

²Center 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

The School library is a specific library for the field of energy and environment. It is located on the third floor of the School building. It holds specialized books, journals, research reports, etc. The library also has a computerized search system to assist students in locating information sources. The library is open from Monday to Friday, between 08.30-17.00 hrs. Students are also encouraged to borrow materials from KMUTT's main library and other libraries, particularly the on-campus Technical Information Services, through an interlibrary loan service. Please ask the librarian for more details.

Computing Facilities and Internet Access

JGSEE has its own computing facilities and Internet access. JGSEE provides students access to electronic mail, the World Wide Web, as well as facilities to enable students to work at their own pace utilizing computers. The computer room is located on the 5th floor of the School building.

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)



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-solarocean 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

COURSE DESCRIPTION

JEE 601 Seminar for M.Eng / M.Sc (Energy Technology & Management 1 (1-0-3) Prerequisite: None

The principal objective is to enhance student's capabilities in extracting main points from technical papers and reports, as well as report writing skill and oral presentation. In addition, the course also aims to promote interactions among students, researchers and academic staff in the exchange of ideas and information


JEE 603 Special Study I

Prerequisite: 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 collaborat- ing 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

Prerequisite: 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

Prerequisite: 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 student's 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 evaluated by the Thesis Advisory Committee or a Special Study Committee appointed by JGSEE.

JEE 606 Mathematical Techniques

Prerequisite: None

Numerical methods for ordinary differential equations, finite difference methods of initial and boundary valued problems. FORTRAN computer programming. Numerical methods for partial differential equations. Elliptic equations, Parabolic Equations, Hyperbolic equations. Optimization techniques: classical optimization techniques, Lagrange multiplier method, Linear programming, Simplex method, Nonlinear programming, steepest-ascent, steepest-descent method, Conjugate gradient method, Newton method. Curve Fitting.

3 (3-0-9)

3 (0-0-9)

3 (0-9-9)

JEE 607 Optimization Techniques

3 (3-0-9)

Prerequisite: None

Introduction to optimization techniques, formulation of mathematical model, classical optimization, single-variable optimization, multivariable optimization with no constraints, multivariable optimization with constraints, Lagrange multiplier method. Linear programming, solution of system of linear simultane- ous equation, FORTRAN computer programming, Simplex method, dual- simplex method, two phases of simplex method. Nonlinear Programming, one-dimensional minimum search, golden section search, parabolic interpolation, multi-dimension minimum search, steepest-descent methods, conjugate-gradient method, Newton's method, Quasi- Newton methods. Geometric programming, unconstrained minimization problem, constrained geometric programming problem.

JEE 610 Thesis (Energy Technology & Management) 12 (0-0-36)

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

JEE 611 Seminar for M.Eng / M.Sc (Environmental Technology & Management) 1 (1-0-3)

Prerequisite: None

The objective of the course is to enhance the capabilities of students to extract the main points from technical papers and reports, as well as writing skills and oral presentation skills. At the beginning of the course, introductory sessions are devoted to guidelines for extracting and analyzing information obtained from research papers and reports as well as techniques for technical paper writing and oral presentation. 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)

Prerequisite: None

Introduction to modern data acquisition. Research project management and analysis. Theories and practices of various experimental techniques necessary for research including physical and chemical methods of analysis. The course will not attempt to give the particular techniques needed in special

subject areas because these techniques will be different for each student, and they will be given by the university departments and supervisors of students.

JEE 616 Internship

Prerequisite: 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 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 (Environmental Technology & Management) 12 (0-0-36)

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

Energy, Economics, Markets and Policies JEE 621

Prerequisite: 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.

Energy Planning for Sustainable Development JEE 622

Prerequisite: 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

9(0-0-27)

3 (3-0-9)

3 (3-0-9)

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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)

Prerequisite: 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)

Prerequisite: None

Rationale for modeling energy systems. Background tools: time value of money, net present values, variable and fixed costs. Useful and final energy and unit conversion. Introduction to modeling and decision analysis. Model design, data requirements, driver analysis and sectoral disaggregation. Energy demand analysis: trend analysis, end-use method and econometric approach. Reference energy system. Integrated energy planning. Electricity sector expansion planning, reliability and availability factors. Techniques for solving problems under uncertainties. Comparative analysis of levelized costs using screening curves. Introduction to multi-criteria decision analysis (MCDA) and application of MCDA in energy planning. Classification of energy models: top-down, bottom up and hybrid models. Policy implications of model output.

JEE 625Energy and Environmental Economics, Management and Policy3 (3-0-9)Prerequisite: None

Introduction to basic economics concepts, economic sectors and activities, relationship between economic development and energy demands, 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, new paradigm shift in economic development and sustainable development, UNFCC and Kyoto Protocol, economic tools for efficient energy resources utilization and environmental remedy, protection and control, contemporary energy and environmental issues. Drives on energy saving program initiatives, analysis of rational energy uses, and basic energy audit, identification of energy conservation opportunities, concept of economic analysis and evaluation. Environmental impact assessment tools and indicators: LCA and environmental standards, state of environmental assessment reporting and its applications. Project implementation, execution, monitoring, and control, case studies.

JEE 628 Foundations of Decision Analysis

3 (3-0-9)

Prerequisite: None

An introduction to decision analysis. Different tools and techniques: decision trees, pay-off matrices, influence diagram decision networks, Bayesian networks. Decision under competition or conflict – Game Theory and its extensions. Multi-criteria decision making, including the Simple Multi-Attribute Rating Technique (SMART), the Analytic Hierarchy Process (AHP), and ELECTRE methods. Consensus methods. Problem structuring and soft methods. Software for decision analysis.

JEE 629 Entrepreneurship and Innovation in Energy and Environment 3 (3-0-9)

Prerequisite: None

Access to sustainable, reliable, affordable energy is fundamental to social and economic security. Similarly, a clean and healthy environment is essential for economic prosperity. Therefore, investment and innovation in the energy sector and preservation of environmental quality is crucial for sustainable growth. In this course, students learn to generate business ideas relating to energy and environmental technology and

management, especially for advancing clean energy, energy and resource efficiency, materials reuse and recycling, and emissions reduction. The learning journey includes: overview of the energy system, energy related environment & sustainability including circular economy issues, problems/gaps (pain point) identification and idea creation, business model development and market validation, from research to commercialization, and pitching skills. The learning will be through lecture and case studies by start-ups and industry. By working collaboratively in interdisciplinary and, where possible, international teams, students develop effective communication and management skills.

JEE 631 Strategic Planning and Project Management

Prerequisite: None

The objective of this course is to address the fundamental aspects of planning and policy making and to enable the students to learn the basics of project management. The course focuses on policy analysis, strategic planning and project implementation. Contents of the course also include planning 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 632 Project Implementation and Control

Prerequisite: None

The objective of this course is to enable the students to learn the basics of project management. It will explain how to design and implement a project, like definition, objectives, characteristics, and phases of projects as well as execution plans, cost/schedule estimation and control. It will end with project evaluation.

JEE 633 Energy Management in Industry

Prerequisite: None

The objective of this course is for students to develop a sound knowledge of how to plan and to implement energy management programs in industrial complexes. In this course, the technical and economic aspects of energy management will be presented and applied to case studies in industry. First, the principles of energy management, including management programs, organizational set up, energy auditing, establishing an

3 (3-0-9)

3(3-0-9)

energy balance for industrial complexes will be explained, followed by the introduction of tools and methods to increase the efficiency of industrial energy systems. Later, energy efficient technologies and systems will be presented.

JEE 634Climate Influence on Buildings and End-use Requirements3 (3-0-9)Prerequisite: None

This course presents a broad perspective of how buildings function as shelters for occupants and the development of building design and construction under the influences of climate, culture, and socioeco- nomic conditions. The course presents information derived from surveys of extent of end-uses as well as information on building configuration and construction. It presents the sun, its radiation, and geographical location as the key determinants of climate and the effects on different facades of buildings. It examines properties of moist air and how these change under heating and cooling processes. It presents how thermal sensation comfort is quantified. It examines air-conditioning processes and equipment used. It briefly deals with acoustical processes and how to improve acoustical quality of a space. It examines the influence of winds and stack effect on air flow and air leakages from buildings.

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

Prerequisite: 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 retrocommissioning, 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

Prerequisite: None

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

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

Prerequisite: None

This course aims to enable students to understand the effects of dynamic influence of driving forces on buildings and the consequences on energy consumption and how to improve the efficiency of such consumption. It covers the subjects of dynamic heat and moisture transfer through building envelope and methods of calculation, dynamic and steady control of cooling systems and their responses. The systems to consider include water chillers, heat exchanger, humidifying coils of air-handling units, cooling towers, radiant cooling walls and panels, desiccant dehumidifying systems, dedicated outside air systems. Analysis tools used include building energy simulation programs such as BESim and TRNSYS.

Thesis (Environmental Technology & Management) 21 (0-0-63) **JEE 640**

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

Fuels and Combustion JEE 642

Prerequisite: 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.

3 (3-0-9)

JEE 644 Power Plant Engineering

Prerequisite: None

The aim 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 generators and turbines, condenser, feed water and circulating water systems. Diesel engine and gas turbine power plants. Energy storage. Emission control and flue gas treatment. Economics of power generation.

JEE 645 Clean Technologies for Solid Fuels

Prerequisite: None

The objective of this course is to provide the student basic concepts of clean technologies for solid fuels. Classification of solid fuels: coal, biomass and waste. Chemical and physical properties of solid fuels. Pyrolysis, gasification and liquefaction of solid fuels. Combustion processes and environmental considerations. Special attention is given to domestic lignite and biomass and the development of clean coal technologies and co-firing.

JEE 647 Design of Suitable Urban Ecology (Only for Master Students) 3 (3-0-9)

Prerequisite: None

This course examines social, economic, and environmental dimensions of sustainability in urban ecology. It examines policies and programs that address the challenges of sustainability under the cultural environment of ASEAN. It examines demographic trends and migration, income distribution, crimes and security. It also examines and compares alternative transportation modes, food supply and energy consumption, water and waste generation and disposal that contribute to ecological foot print. It delineates ecological foot print into thermal aspect of the extent of air and radiant temperature rises and the effect of heat island, biological aspect of increasing invasion species, pollutants and carbon emission, and geographical aspects of modification of land and water ways and effect of flooding.

3 (3-0-9)

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

Prerequisite: None

Access to sustainable, reliable, affordable energy is fundamental to social and economic security. Similarly, a clean and healthy environment is essential for economic prosperity. Therefore, investment and innovation in the energy sector and preservation of environmental quality is crucial for sustainable growth. In this course, students learn to generate business ideas relating to energy and environmental technology and management, especially for advancing clean energy, energy and resource efficiency, materials reuse and recycling, and emissions reduction. The learning journey includes: overview of the energy system, energy related environment & sustainability including circular economy issues, problems/gaps (pain point) identification and idea creation, business model development and market validation, from research to commercialization, and pitching skills. The learning will be through lecture and case studies by start-ups and industry. By working collaboratively in interdisciplinary and, where possible, international teams, students develop effective communication and management skills.

JEE 651 Heat and Power Generation Technologies

Prerequisite: None

This course covers various technologies for heat and power generation worldwide as well as in Thailand. Fossil and non-fossil resource potential and technologies are included. Fossil fuel technologies are those of coal, oil, natural gas and other new fossil based fuels like oil shale and tar sand. Non-fossil fuel technologies are those of renewable energies (biomass, solar, wind and so on) as well as nuclear. Economic aspect, environmental impact and energy policy-related aspect will also be discussed.

3 (3-0-9)

3 (3-0-9)

JEE 652 Natural Gas Utilization Technologies

Prerequisite: 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 System Integration and Smart Power Systems 3 (3-0-9)

Prerequisite: None

ntroduction 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)

Prerequisite: 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

Prerequisite: 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 656 Energy Efficiency

Prerequisite: None

The objective of this course is to provide a basic knowledge of energy-consuming systems which are typically found in factories and buildings. The systems include a steam system, an electric power system, a compressed air system, and a refrigeration system. In each system, the students will learn about its equipment and components, operation and opportunities for energy conservation. In this course, a concept of energy management system is introduced. The students will learn how the energy management system can be established and implemented successfully for the energy efficiency improvement in factories and buildings.

JEE 657 Fuel Cell and Hydrogen Technology

Prerequisite: 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 658 Renewable Energy Technologies (Only for Master Students 3 (3-0-9)

Prerequisite: None

The objective of this course is to give students an understanding of the nature and characteristics of renewable energy resources, renewable energy technologies and their limitations, economic aspects, and environmental impacts. To develop analytical skills for resource assessment. Renewable energy resources

3 (3-0-9)

3 (3-0-9)

and technologies to be covered are solar thermal and photovoltaic, wind, biomass and small hydro.

JEE 659 Energy from Biomass

(3-0-9)

Prerequisite: None

Objective of the course is for students to understand the advantages of bio-energy production and various technologies for biomass conversion for heat and power. Biomass resource assessment, handling and processing: charcoal and biomass briquette preparation, bio-fuel and biogas production. Thermal and thermo-chemical conversion processes: pyrolysis, gasification and combustion. Finally, the impact on environment and the policy framework for biomass utilization will be discussed.

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

Prerequisite: 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)

Prerequisite: 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)

Prerequisite: 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 waste water treatment processes. The course will include an introduction to the sources, fate and transport of air pollutants, and an introduction to air 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

Prerequisite: None

The objective of this course is to introduce the students to the concept of pollution prevention and 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. Basics of environmental interactions: Biogeochemical cycles and environmental impacts – global, regional and local. LCA: Introduction; methodology – goal, scope, inventory analysis, impact assessment; software; improvement analysis, like identification of environmental "hotspots". Application of LCA to waste management and energy conversion systems. Product stewardship and design for environment.

JEE 673 Waste and Climate Change

3 (3-0-9)

3 (3-0-9)

3 (3-0-9)

Prerequisite: None

The objective of the course is to introduce students to pollution treatment technologies for wastewater, solid and hazardous waste. Wastewater treatment: Characterization – physical, chemical and biological; physicochemical unit operations – screening, filtration, size/volume reduction, mixing, sedimentation, flotation, flocculation, adsorption, disinfection; reactor types and modeling – batch and continuous stirring tank reactor (CSTR) kinetics; biological processes – microbial kinetics, suspended and attached growth systems, aerobic and anaerobic treatment systems. Solid waste treatment: Solid waste generation and characterization; waste separation and preliminary mechanical-biological treatment; waste treatment – recycling, landfill composting, incineration. Hazardous waste treatment: Characterization of hazardous wastes and legislation; risk assessment; processing and treatment methods – physicochemical, biological, stabilization and solidification, thermal treatment, secure landfilling; remediation of contaminated sites.

JEE 681 Environmental Chemistry and Ecotoxicology

Prerequisite: 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

Prerequisite: 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)

Prerequisite: 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)

Prerequisite: 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)

3 (3-0-9)

Prerequisite: 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)

Prerequisite: 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 analyticsand predictive modeling. Real-world data-related applications are illustrated for additional perspectives.

JEE 691 Climate Change Policy

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

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.

Dissertation for Ph.D. (Sustainable Energy Systems) JEE 702

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.

Selected Topics I JEE 703

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)

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.

38 (0-0-114)

3 (3-0-9)

49 (0-0-147)

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

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)

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

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.

38 (0-0-126)

3 (3-0-9)

JGSEE PROSPECTUS 91

JEE 714 Dissertation for Ph.D. (Environment, Climate Change and Sustainability)

49 (0-0-147)

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.