For students enrolled since the first semester 2017 academic years and onward

Faculty of Engineering

Sustainable Energy and Resources Engineering (International Program)

Program Master of Engineering Program in Sustainable Energy and Resources Engineering (International Program)

Degree Master of Engineering (Sustainable Energy and Resources Engineering), M.Eng. (Sustainable Energy and Resources Engineering)

Plan A Option 2:

Total credits required: minimum 36 credits

(1) Major courses: minimum 24 credits

- Seminar: 2 credits

01230597	Seminar	1,1

- Major requirements: 11 credits

01230511	Principle of Sustainable Environmental Engineering	2(2-0-4)
01230516	Computation Method for Sustainable Engineering	1(1-0-2)
01230541	Creative Designing for Sustainable Environmental Engineering	2(2-0-4)
01230542	Process Design in Sustainable Environmental Engineering	2(1-3-4)
01230551	Alternative Energy for Sustainable Development	1(1-0-2)
01230561	Materials Characterization for Energy and Environment Research	1(1-0-2)
01230562	Nanoengineering for Energy and Environmental	1(1-0-2)
01230591	Sustainable Energy and Resources Engineering Research Methodology	1(1-0-2)

- Major electives: minimum 11 credits

01230513	Sustainable Environmental Engineering Ethics	1(1-0-2)
01230514	Environmental Risk Analysis	1(1-0-2)
01230515	Life Cycle Assessment	1(1-0-2)
01230521	Utilization of Resources and Waste for Sustainable Environment	2(2-0-4)
01230531	Advanced Environmental Pollutant Analysis	2(1-3-4)
01230532	Advanced Control of Global Environmental Problem	2(2-0-4)
01230533	Advanced Environmental Remediation Technology	1(1-0-2)

01230534	Hazardous Wastes Treatment and Disposal	1(1-0-2)
01230535	Radioactive Waste Treatment and Disposal	1(1-0-2)
01230536	Zero Emission Technology	1(1-0-2)
01230537	Future Power Train for Sustainable Community	1(1-0-2)
01230543	Economic and Ecological Design	1(1-0-2)
01230544	Advanced Water and Wastewater Treatment	2(2-0-4)
01230545	Project Management and Evaluation for Sustainable Environment	1(1-0-2)
01230547	LCA and Eco-design Modeling Software	1(1-0-2)
01230552	Sustainable Biofuels	1(1-0-2)
01230553	Bioenergy and Biorefinery	1(1-0-2)
01230563	Applications of Bioceramic	1(1-0-2)
01230564	Sustainable Biopolymer	1(1-0-2)
01230565	Electrochemical Engineering for Sustainable Energy and Resources	1(1-0-2)
01230571	Rail Transportation and Environmental Issues	2(2-0-4)
01230572	Safety Engineering for Rail Transportation	2(2-0-4)
01230596	Selected Topic in Sustainable Energy and Resources Engineering	1-3
01230598	Special Problems	1-3

(2) Thesis: minimum 12 credits

01230599	Thesis	1-12

Course Description

01230511 Principle of Sustainable Environmental Engineering 2(2-0-4)

Chemical pollutants, chemical reaction kinetics, organic and inorganic chemical pollutants transformation, biochemistry in microbial cells, biological transformation of pollutants. Environmental quality due to the climate change and the carbon management. The linkage of energy, environmental and economic issues, sustainability principles, sustainable development, environmental management systems, waste management.

01230513 Sustainable Environmental Engineering Ethics 1(1-0-2)

Ethical practices in technological application, concept of environmental justice. Responsibility of engineering professions on environmental and social of development projects. Determination of disproportionate impacts. Case studies.

01230514 Environmental Risk Analysis 1(1-0-2)

Environmental and health risk assessment, toxicology, dose-response model, environmental hazard identification, source and dispersion models, consequence analysis, fault tree analysis, risk mitigation and management.

01230515 Life Cycle Assessment **1(1-0-2)**

Principles of life cycle assessment (LCA), LCA research methodology, goal and scope definition, inventory analysis, life cycle impact assessment, interpretation and improvement analysis, applications of LCA software.

01230516 Computation Method for Sustainable Engineering **1(1-0-2)**

Numerical solutions for algebraic equations and ordinary differential equations, statistics in sustainable engineering, curve fitting.

01230521 Utilization of Resources and Waste for Sustainable Environment **2(2-0-4)**

Types of wastes, waste management, construction wastes, fly ash and rice hush ash utilization, wastewater sludge utilization, biomass and its utilization for sustainable environments.

01230531 Advanced Environmental Pollutant Analysis **2(1-3-4)**

Sampling and preservation of environmental samples. Pollutant analysis using advanced analytical instruments.

01230532 Advanced Control of Global Environmental Problem **2(2-0-4)**

Air quality management. Law and regulation relating to air quality control. Sampling and measurement techniques for air pollutants, estimation of pollution emission from various sources, meteorology with pollution dispersion modeling, design of control systems for particulate matter and gaseous pollutant.

01230533 Advanced Environmental Remediation Technology **1(1-0-2)**

Chemical and bioremediation technology of contaminated soil and groundwater, technology of groundwater and seepage, technology of diffusion and dispersion, technology of unsaturated soil behaviors, technology of hydro-geochemical transport modeling, technology of numerical modeling of transport in subsoil.

01230534 Hazardous Wastes Treatment and Disposal **1(1-0-2)**

Classification of hazardous waste types and characteristics according to international standards, hazardous waste minimization, cradle to grave concept of hazardous waste management, treatment of hazardous wastes by physical, chemical and biological processes, hazardous waste disposal in secure landfill.

01230535 Radioactive Waste Treatment and Disposal **1(1-0-2)**

Hazard of radioactive materials. Nuclear power plant and reprocessing, nuclear waste management, processing for low level and high level radioactive waste, safety assessment for geological disposal of radioactive wastes.

01230536 Zero Emission Technology **1(1-0-2)**

Production and control technology of nitrogen oxides particulate matters. Advanced zero emission technologies.

01230537 Future Power Train for Sustainable Community **1(1-0-2)**

Future power train for sustainable community, energy consumption and environmental protection, present status in South-East Asia and World, future energy systems for sustainability, present status and future prospect of sustainable mobility, battery electrical vehicle, hybrid vehicle, fuel cell vehicle.

01230541 Creative Designing for Sustainable Environmental Engineering **2(2-0-4)**

Overview of specific environmental issues, discuss the approaches to the solutions, identify an “ill-defined environmental issue”, understand actual situation in detail, survey and evaluate current technologies to overcome the issue, estimate socio-economic impact, propose with technology assessment.

01230542 Process Design in Sustainable Environmental Engineering **2(1-3-4)**

Conceptual design of environmental operations, design standards and regulation, process modeling and simulation, design of control system, control simulation and design, advance computer application.

01230543 Economic and Ecological Design **1(1-0-2)**

Definition and principle of Economic and EcologicalDesign (Eco-design), environmental parameter, life cycle concept, stakeholder requirements, quality function deployment for environment technologies, environmental benchmarking, Eco-design improvement strategies, product improvement, Eco-label, application of Eco-design softwares.

01230544 Advanced Water and Wastewater Treatment **2(2-0-4)**

Quality standards of raw water, water supply, and effluent. Advanced water treatment processes, chemical precipitation, filtration, ion exchange, seawater desalination by membrane processes. Wastewater treatment by physical, chemical and biological methods. Reuse of treated water. Biological nutrient removal, biological treatment of hazardous materials. Treatment of heavy metals.

01230545 Project Management and Evaluation for Sustainable Environment **1(1-0-2)**

Project initiation, presentation and evaluation, environmental issue project.

01230547 LCA and Eco-design Modeling Software **1(1-0-2)**

Applications of software of environmental impact, life cycle assessment, eco-design modeling software.

01230551 Alternative Energy for Sustainable Development **1(1-0-2)**

Types of alternative energy, process of electric power generation from alternative energy, raw material and raw material management, the effect of environment and waste management from the aforementioned alternative energy.

01230552 Sustainable Biofuels **1(1-0-2)**

Meaning and definition of sustainable biofuels, type of biofuels, raw materials and production technology, process of electric power production from biofuels, application of biofuels to current industry and new biofuels.

01230553 Bioenergy and Biorefinery **1(1-0-2)**

Concept of bioenergy and biorefinery, type of bioenergy, potential of biologidal raw material for current and future use, technology of bioenergy and biorefinery, technology of chemical and biological substances production from biological raw materials, bioenergy production industries and related industries.

01230561 Materials Characterization for Energy and Environmental Research **1(1-0-2)**

Characteristic of material and applications of X-ray diffractometry, Scanning Electron Microscope and energy dispersive spectroscopy.

01230562 Nanoengineering for Energy and Environment **1(1-0-2)**

Nanotechnology, Structures and properties of nanomaterials, Fabrication and characterization techniques, applications and safety.

01230563 Applications of Bioceramics **1(1-0-2)**

Characteristics and properties of bioceramics, Biocompatibility with human bodies, applications of bioceramics in medicine and dentistry. Case studies.

01230564 Sustainable Biopolymers **1(1-0-2)**

Plant based polymers, animal based polymers, bacterial polymers, biocomposites, bionanotechnology, biomedical polymer, bioplastic industry.

01230565 Electrochemical Engineering for Sustainable Energy and Resources **1(1-0-2)**

Batteries and fuel cells, metal waste recycling by electrowinning and refining process, electrochemical instrument.

01230571 Rail Transportation and Environmental Issues **2(2-0-4)**

Knowledge of rail transportation, study of environmental impact concerning on development and operation of rail transportation, law and regulation, related standard.

01230572 Safety Engineering for Rail Transportation **2(2-0-4)**

Introduction of rail transportation, environmental impact, environmental law, prequalation, fuel Situation, climate change and railway emission, pollution management.

01230591 Sustainable Energy and Resources Engineering Research Methodology **1(1-0-2)**

Principles and research methods in sustainable energy and resources engineering, problems analysis for research topic identification, data collection for research planning, identification of samples and techniques. Analysis, interpretation and discussion of research result; report writing for presentation and publication.

01230596 Selected Topic in Sustainable Energy and Resources Engineering **1-3**

Selected topics in sustainable energy and resources engineering at the master' s degree level. Topics are subject to change each semester.

01230597 Seminar **1**

Presentation and discussion on current interesting topics in sustainable energy and resources engineering at the master's degree level.

01230598 Special Problems **1-3**

Study and research in Sustainable Energy and Resources Engineering at the master's degree level and compile into a written report.

01230599 Thesis **1-12**

Research at the master's degree level and compile into thesis.