



## College of Engineering

### Master of Science in Renewable Energy Engineering

Year I - Semester 1		
Course Code	Course Title	CH
EEM 601	Statistical Data Analysis and Research Methods	4
REE 601	Renewable Energy Systems Fundamentals	4
REE 602	Photovoltaic Energy Systems	4

Year I - Semester 2		
REE 603	Wind Energy Systems	4
REE 604	Solar Thermal Energy	4
REE 605	Special Topics in Renewable Energy Engineering	4

Year II - Semester 3-4		
EEM 699	Thesis	12

Total Credit Hours 36

**Courses Descriptions:****EEM 601: STATISTICAL DATA ANALYSIS AND RESEARCH METHODS,  
(4 CREDIT)**

This applied course is designed for graduate students. The goals of the course are to develop the skills necessary to identify an appropriate statistical technique, estimate models, analyze data, and interpret results for independent research and to critically evaluate contemporary research using advanced quantitative methods. The course will include descriptive and inference statistics, hypothesis testing, confidence intervals, processing and analysis of research data using different parametric and nonparametric statistical methods, regression analysis for linear and nonlinear models, and introduction to the design of experiments. Research methods, research ideas through literature survey, planning and designing specific methods for conducting research, analyzing data using scientific methodology and presenting research results in a systematic and objective way.

**REE601: RENEWABLE ENERGY SYSTEMS FUNDAMENTALS,  
(4 CREDIT HOURS)**

Gaining an understanding of the principles of renewable energy technologies is key to understanding the technological basis of the systems and their applications. This is particularly important with regards to the overall energy mix of a specific country. This course provides you with the fundamentals of renewable energy technologies and their impact on global and national energy systems. The purpose of this course is to introduce the basis for assessment of the performances of solar, wind, wave and tidal, hydro-electricity, biomass and waste technologies, and geothermal technologies. Basic introduction to the relevant market and financial management, policies, regulations and incentives will be experienced.

**REE602: PHOTOVOLTAIC ENERGY SYSTEMS,  
(4 CREDIT HOURS)**

History of PV technology; Types of PV Systems, Principles of operation of photovoltaic systems; PV systems performance characteristics as a function of environmental conditions; Site assessment for PV systems installation, selection of an appropriate system design; Installation of basic subsystems; Inspection and maintenance of PV Systems; Safety considerations during installation and exploitation of PV systems. PV systems: standard PV systems, PV concentrator.

**REE603: WIND ENERGY SYSTEMS,  
(4 CREDIT HOURS)**

The following topics will be covered in the course: Statistical methods of wind analysis, Wind Resources Assessment and Site Selection, Wind Machine Technologies and wind turbines performance analysis. The course deals with the basic characteristics of wind energy, site characterization, fundamental principles of wind energy utilization, and discusses the design of basic parts including aerodynamics, mechanical and electrical design aspects. Special emphasis will be given to the theory of design of turbine blades. Off-shore and onshore wind

plants. integration into the power systems will also be addressed in this course. Furthermore, environmental impacts of wind power utilization will be discussed.

**REE604: SOLAR THERMAL ENERGY,  
(4 CREDIT HOURS)**

Management and storage of heat, mechanical, and electrical energy are treated. The following forms of storage: Thermal energy storage: heat reservoirs, phase transition utilization and chemically bound heat are presented. Mechanical energy storage: Spin Wheels, pumps, turbines and heat recovery and Electrochemical storage of electrical energy:

**REE605: SPECIAL TOPICS IN RENEWABLE ENERGY ENGINEERING  
(4 CREDIT HOURS):**

Depending on the request of the majority of the M.Sc. Candidates and the availability of a specialized instructor one of the advanced topics in renewable energy will be offered such as:

**ENERGY STORAGE SYSTEMS:** Management and storage of heat, mechanical, and electrical energy are treated. The following forms of storage: Thermal energy storage: heat reservoirs, phase transition utilization and chemically bound heat are presented. Mechanical energy storage: Spin Wheels, pumps, turbines and heat recovery and Electrochemical storage of electrical energy: Important battery technologies and hydrogen technologies are detailed.

**ENERGY ECONOMICS, POLICIES, AND REGULATIONS:** A variety of theoretical and empirical topics related to energy demand, energy supply, energy prices, renewable vs depletable resources and environmental consequences of energy consumption and production, all from an economic perspective are discussed. How key economic principles are used in various energy-environment models to inform energy and climate policy are demonstrated. Key factors to consider include legal and licensing provisions, tariff regulations, financial support, quality standards and eventual grid interconnection to the main grid are considered.

**ENERGY CONSERVATION TECHNIQUES:** Skills to identify and understand energy efficiency and conservation methods used to reduce energy consumption in the built environment are detailed. Students will analyze residential and commercial facilities for opportunities to employ energy saving measures. Students will become familiar with the use of energy monitoring and measuring equipment used for energy auditing. Students will also learn how to calculate energy savings and determine environmental impacts of these energy saving methods.

**INSTALLATION OF RENEWABLE ENERGY SYSTEMS: Rules and Practices:**

Techniques and rules that have to be followed step by step and to be respected in installing standalone as well as grid tied systems. A certificate will be delivered to the

candidate that may authorize him/her to open a business in installing locally renewable energy systems.

**GEOHERMAL ENERGY:** To provide an understanding of the physical principles, technologies and systems associated with renewable energy generation from geothermal sources. To provide an understanding of the position of these sources of energy in the current and future global energy requirements and the technical challenges in meeting the future energy demand.

**WAVE ENERGY:** This course deals with the marine renewable energy resources, markets and technologies. The course provides students with good understanding of the fundamentals of wind turbines, tidal turbines and wave energy converters performances and a hands-on experience with the assessment of the performance of these technologies.

**OTHER FORMS OF RENEWABLE ENERGY SYSTEMS:** Other forms of renewable energy systems like Biomass, Fuel Cells, Biofuels systems will be offered. The different types/technologies of each resource are explained.

**EEM 699 THESIS: (12 CREDITS):**

The last semester of the Master program provides the student with an opportunity to undertake extensive investigation of an advanced or specialized topic relating to his/her MSc program; to provide the opportunity to plan and execute a significant project of research, investigation or development.