



University of Tehran
School of Industrial and Systems Engineering

Course:	8101072 – Energy Modeling (Energy 2)		
Course type:	Optional	IE – SE – ES*	Credit: 3
Level:	Graduate		
Co-requisite(s):	Mathematical Programming		
Prerequisite(s):	Energy Systems (Energy 1)		
Prerequisite by topic:	Optimization, Mathematical Modeling		
Reference(s):	<p>[1] Francis M. Vanek, Louis D. Albright, <i>Energy Systems Engineering, Evaluation and Implementation</i>, McGraw Hill, 2008.</p> <p>[2] Nicole van Beeck, <i>Classification of Energy Models</i>, Tilburg University, 1999 (digitally available).</p> <p>[3] ...</p>		
Coordinator:	H. Shakouri G., Associate Professor, School of ISE		
Goals:	The main purpose of the course is to introduce types of energy systems modeling and the corresponding techniques. Students will learn how to decide on choosing an energy model to analyze specified problems or build up their own mathematical model for each of the supply and demand subsystems of energy systems.		
Topics:	<p><u>Chapter 1. Introduction</u> (fundamental concepts of modeling for socio-economic systems)</p> <p><u>Chapter 2. Classification of Energy Models</u> (criteria to classify energy models and recognize their similarities and differences)</p> <p><u>Chapter 3. Optimization Models Application</u> (Single and Multi objective models and corresponding constraints)</p> <p><u>Chapter 4. Single-Fuel Energy Supply Systems</u> (electricity generation technology selection, NG network design)</p> <p><u>Chapter 5. Multi-Fuel Energy Supply Systems</u> (basics of a energy supply system optimization)</p> <p><u>Chapter 6. System Approach</u>, (supply-demand interactions, energy-economy-environment interconnections)</p> <p><u>Chapter 7. Energy Demand Modeling</u> (bottom-up analysis, system dynamics approach)</p> <p><u>Chapter 8. Introduction to several Energy System Models</u> (MESSAGE, LEAP, IDEAS, ...)</p>		

Computer usage:	EXCEL, Optimization Tools, MESSAGE, LEAP, VENSIM, MATLAB
Assignments:	5 – 10 homework assignments
Projects:	Development of an energy system model, running the model, analysis of the results and proposing a practical solution
Grading:	Assignments: 10 % Midterm exams: 10 % Final exam: 40 % Course Project: 40 %
Date:	Jan 29, 2014

*IE: Industrial Engineering SE: Systems Engineering ES: Energy Systems