

MIE535: Electrification Via Electricity Markets
Spring 2025

Learning Objectives:

By the end of the course students should be able to

1. Participate with industry and government experts in the booming electricity sector.
2. Perform analyses to participate in various roles in electricity markets.
3. Perform analyses to invest in new generation and transmission assets.

Course Description:

Challenges of Meeting Net-Zero, Fundamentals of Markets, Structures and Participants, Spot Markets, Economic Dispatch, Day-Ahead Markets, Optimal Unit Commitment, Forward Markets, Settlement Process, Storage and Demand Management, Renewable and Distributed Energy Resources, Trading over Transmission Networks, Nodal Pricing, Reliability Resources, Generation and Transmission Capacity Investment Models, Capacity Markets.

Instructor: Daniel Frances – frances@mie.utoronto.ca

Lectures: Mon 4-5, Tue 5-6, Thu 4-5 in BA1230

Tutorial: Mon 9-11 in BA2185.

Lab: Tue 12-2 in RS303 (4 labs between weeks of Feb 24 and Mar 24)

Grading: 2 Midterms (30% each), Final (40%)

TAs: Oscar Alvarez Lemus oscar.alvarez@mail.utoronto.ca,

Textbook: Fundamentals of Power System Economics, 2nd Edition, D.S. Kirschen and G. Strbac. 2018. Wiley.

Lecture Schedule

<u>Starting</u>	<u>Coverage</u>	<u>Tut</u>	<u>Lab</u>
6-Jan-25	INTRODUCTION: Net Zero. Industry Evolution. Market Players.		
13-Jan-25	INTRODUCTION (cont'd): IESO Guest Lecture. Climate vs Reliability vs Economics. ECONOMICS REVIEW: Economics of the Spot Market.		
20-Jan-25	ECONOMICS REVIEW (cont'd): How much to Produce? Spot Market Risks. Spot Market Alternatives.	Ch 1	
27-Jan-25	ELECTRICITY MARKETS: Electricity Market Trading. Optimal Unit Commitment. Uplift Payments & Settlements Process.	Ch 2	
03-Feb-25	MARKET PARTICIPANTS: Consumers and Retailers. Generator - Economic Dispatch. Generator – Competition.	Ch 3	
10-Feb-25	MARKET PARTICIPANTS (cont'd): Generator - Non-fossil resources. Other Players. TRANSMISSION CONSTRAINTS: Physical Transmission Rights.	Q?	Mid Term-1
17-Feb-25	Reading Week		
24-Feb-25	TRANSMISSION CONSTRAINTS (cont'd): Tx Constrained Dispatch. Nodal Pricing. Losses and AC Modeling.	Ch 4	Lab 1
03-Mar-25	TRANSMISSION CONSTRAINTS (cont'd): Financial Transmission Rights. OPERATIONS: Reliability. Types of Ancillary Services.	Ch 5	Lab 2
10-Mar-25	OPERATIONS (cont'd): Provision of Ancillary Services. Optimizing Energy and Reserve. GENERATION INVESTMENTS: New Assets from Investor's Perspective.	Q?	Mid Term-2
17-Mar-25	GENERATION INVESTMENTS (cont'd): Retiring Assets from Investor's Perspective. New Assets from Consumer's perspective. TRANSMISSION EXPANSION: Cost Based Transmission Expansion	Ch 6	Lab 3
24-Mar-25	TRANSMISSION EXPANSION (cont'd): Value Based Transmission Expansion. Optimal Transmission Expansion. Other Sources of Transmission Value. Non-wires Alternatives	Ch 7	Lab 4
31-Mar-25	Review and Industry Panel Session	Ch 8	Panel
07-Apr-25	One class for Q?	Q?	X