

IPUMSU

MICHIGAN STATE UNIVERSITY | INSTITUTE OF PUBLIC UTILITIES Regulatory Research and Education
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IPU Grid School Course I:

Engineering Economics of the Supply Chain for Power

March 1-3, 2022 – Live Online Learning

IPU Power Grid School covers the engineering and economics of the electric utility systems across the supply chain for power and its transformation, from generation to transmission to distribution.

Program Agenda

All times are eastern standard time.

March 1 - Tuesday

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|---------------------------|--|
| 10:00-11:20 am
80 min. | Fundamentals of Power Systems and Grid Infrastructure Part 1 [Mitra]
Characteristics of electric power components and systems. Transmission and distribution operations and planning. Impact of developments in distribution on transmission. Distributed resources and microgrids. |
| 11:40-1:00 pm
80 min. | Fundamentals of Power Part 2 [Mitra]
Interconnected systems and balancing authorities. Interconnection seams, standards, and interoperability. Island systems. Line losses and solutions. Grid congestion, abnormalities, vulnerabilities, and emerging threats. |
| 2:00-3:20 pm
80 min. | Fundamentals of Power Part 3 [Mitra]
NERC and other standards for quality, reliability, and security. Supply-side capacity, efficiency, and expansion. Utility-scale and distributed storage. Distribution grid operating platforms and automation technologies. Grid modernization and smart grids. Grid architecture for reliability and resilience. |
| 3:20-3:50 pm
30 min. | Discussion (optional) |

March 2 - Wednesday

- | | |
|---------------------------|--|
| 10:00-11:20 am
80 min. | Fundamentals of Electricity Markets, Economics, & Regulation Part 1 [Rose]
Wholesale market structure, operation, economics, and pricing. Role of private, nonprofit, and public power. Regulatory jurisdiction and coordination for generation, transmission, and distribution. FERC regulation and key orders. |
| 11:40-1:00 pm
80 min. | Fundamentals of Electricity Markets Part 2 [Rose]
Grid access, neutrality, and the Public Utility Regulatory Policies Act (PURPA). Energy, capacity, and ancillary services markets and allocation rules. Emissions and carbon regulation. Renewable Energy Certificates (RECs). |

2:00-3:20 pm
80 min. **Fundamentals of Electricity Markets Part 3** [Rose]
Regional transmission planning, operation, and organizations (RTOs). Market performance and oversight. Impact of changing marginal costs. Choice and default service. Stranded and sunk costs. Market and policy uncertainty. Emerging trends, models, and policies. Implications of electrification.

3:20-3:50 pm
30 min. **Discussion** (optional)

March 3 - Thursday

10:00-11:20 am
80 min. **Grid Integration & Modeling for Distributed & Variable Resources** [Veselka]
Engineering properties and efficiency of energy resources. Portfolio diversity and changing fuel mix. Relevance of scale, location, and time variability. Value, costs, and benefits of renewable energy resources.





11:40-1:00 pm
80 min. **Grid Integration & Modeling Part 2** [Veselka]
Locational marginal pricing (LMP). Day-ahead and hour-ahead scheduling and real-time dispatch.

2:00-3:20 pm
80 min. **Grid Integration & Modeling Part 3** [Veselka]
Energy imbalance markets (western U.S.). Long-term reliability assessment and modern

3:20-3:50 pm
30 min. **Discussion** (optional)

3:50 pm **Program Adjourns**

IPU Power Grid Course 2020: Program Faculty

	<p>Janice BEECHER (beecher@msu.edu) Director, Institute of Public Utilities, Michigan State University Ph.D., Political Science, Northwestern University www.linkedin.com/in/janice-beecher-33a61810</p>
	<p>Joydeep MITRA (mitraj@msu.edu) Professor, Electrical and Computer Engineering, MSU Ph.D., Electrical Engineering, Texas A&M www.egr.msu.edu/~mitraj/profile.html</p>
	<p>Kenneth ROSE (ken@kenrose.us) Independent Consultant and Senior Fellow, Institute of Public Utilities, MSU Ph.D., Economics, University of Illinois at Chicago www.linkedin.com/in/ken-rose-738a4365/http://www.kenrose.us/id1.html</p>
	<p>Thomas VESELKA (tdveselka@anl.gov) Principal Computational Engineer-Energy Systems, Argonne National Laboratory M.S., Synoptic Meteorology, Northern Illinois University www.anl.gov/profile/thomas-d-veselka</p>

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