Energy Markets

EMGT 5962/MBAD 6962 (also cross-listed as SEGR 4962, ECRG 4172, ECRG 5172, PPOL 8000, INES 8090)

Classroom: EPIC G287

Time: Tuesdays 5:30 – 8:15 pm

Instructors: Prof. Badrul H Chowdhury

Phone: (704) 687-1960 Fax: (704) 687-5588

E-mail: b.chowdhury@uncc.edu

Office: EPIC 1162

Hours: Tu: 3 – 4 pm; W: 11 am – 12 pm

and by appointment

Prof. Peter M. Schwarz

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E-mail: pschwarz@uncc.edu

Office: FRI 223A

Hours: T Th 10-11 am, 1-1:30 pm

Course Description: Energy and power systems in regulated and competitive environments and implications on business decisions for firms in these industries. Topics include: mechanism of energy markets; comparative market systems; determination of prices under different market structures; gas, oil, coal, and electricity market architecture; electricity market design; dispatch and new build decisions; smart grid and renewable energy in electricity markets; risk and risk management in energy including demand and price volatility and use of financial derivatives; and the impact of financial market trends and current and proposed policies on the energy industry.

Special Reminder: This is a cross-disciplinary course that spans two colleges at UNC Charlotte: The Belk College of Business and the Lee College of Engineering. Prof. Schwarz represents the Belk College and Prof, Chowdhury represents the Lee College. As obvious from the course title and the cross-listings, this course will include concepts from both Economics and Engineering. The course was designed for a specific type of student – one who values both economics and engineering. It is not meant for a student only interested in economics, nor for a student only interested in engineering principles of energy markets.

Prerequisite: Basic math (including elementary Calculus, and economics (including Principles of Microeconomics) or consent of instructor(s)). SEGR 4961/EMGT 5961 Introduction to Energy Systems or ECON 5181 Energy and Environmental Economics.

Corequisite: If students have not completed ECRG 4171/SEGR 4961/EMGT 5961 Introduction to Energy Systems or ECON 4181/5181 Energy and Environmental Economics, they should enroll in one of these courses concurrently with this one; or permission of instructor(s).


This text can be viewed online at no charge via a free service offered by the UNC Charlotte library. URL:


Students who follow the link from a non-UNCC IP address will be prompted to log in with their NinerNet username and password before they are connected to the publisher’s site.
Reference Textbooks:


Supplementary Materials: Lecture notes and non-textbook readings (from among the listed readings below) will be provided through the course website on Canvas.

Learning Objectives:

After completing the course, the students will be able to
1. Have a working knowledge of the mechanisms of energy markets
2. Understand supply and demand dynamics
3. Understand marginal cost
4. Understand electricity market economics and the constitution of locational marginal price
5. Understand the impact of transmission congestion on pricing
6. Understand risk management policies.
**Course Requirements:**
(1) This class is offered as both an on-campus face-to-face delivery and an online version. Online students don’t have to be present in class to take this course if they sign up for the online section. Each lecture will be recorded using Panopto software. The software is maintained by Classroom Support. All students (both on-campus and online) will be able to watch the recording on Canvas shortly after the lecture ends.

(2) Regular, on-time attendance, including arriving on time, staying until the end of class, and not leaving class except during breaks, is a requirement for on-campus students.

A student whose religion requires that (s)he miss class for a religious observance must fill out a “Request for Religious Observances” form and submit it prior to the census date for that semester to receive an excused absence for that event. The University’s inclement weather number is 704-786-2877.

For online students, it is expected that they will watch the lecture on the day the lecture is recorded. However, if that’s not possible, they should finish watching the lecture before the next lecture.

(3) There will be two in-course quizzes, a midterm and a final examination. The format will be a combination of in-class and take-home exams unless otherwise announced. The two quizzes will be in-class for 30 minutes. The midterm exam will be a take-home exam which will be posted on Canvas a few days earlier. The first part of the final exam will be in class for 2.5 hours. The second part will be a take-home exam which will be posted on Canvas a few days earlier. The take-homes focus on questions that require a different format or more time than is available during in-class exams.

For the in-class part of the final exam and the quizzes, you are allowed to use the following items:

- One single-sided 8.5 in x 11 in. sheet of notes in student’s own handwriting to be attached when the exam is turned in.
- Calculator (mobile phone, laptop, tablet and other forms of PDA are not allowed).
- Writing utensils.

For online students, there will be two take-home exams: a midterm and a final exam. There will be no quizzes or in-class portion for the final exam.

Further details on each exam will be distributed in due time. It is of the utmost importance that there be no communication among students in completing the take-home exams. It is our utmost desire that students will read and adhere to every aspect of the UNC Charlotte Honor Code and that there will be no incidents. Violations represent cheating and will be pursued through the Academic Integrity Code.

(4) During the semester undergraduate students will be required to present a ten-minute presentation on two aspects—one economic and one engineering--of energy markets at your employer. If you are not currently working you may choose to focus on any organization with operations in NC or SC, or with permission of the instructors, a company outside the Carolinas. The goal of your presentation should be to educate us about a practice that needs improvement and possible solutions or an energy markets practice at your organization about which you think others would benefit from learning. Depending on class size, these may be team presentations of up to three students.

You are asked to discuss the topic (either face-to-face or via email) with the instructors before making the final decision on your topic. This discussion will comprise 10% of the project grade.
On-campus graduate students will do one team project with up to three students per team. Teams will be required to submit a written version of the project and do a presentation on May 2. Online graduate students will do a solo or team project, and will not present it. Detailed instructions will be distributed separately.

(5) Special requirements for online students for exams, homework, and projects.
For online students, the exams and homework submission are handled via Canvas. We anticipate all exams for online students will be take-home exams, in which case online students will have the same amount of time as the on-campus students to take the exam. Canvas will not accept submissions past a specific time. Homework submissions work in a similar fashion - students have to upload their scanned homework to Canvas by the submission deadline. You must name your file as ‘HW#_Lastname_Firstname’ or ‘Exam#_Lastname_Firstname’ where # is replaced by the assignment number, Lastname and Firstname are your last and first names. You must also scan into a pdf document before uploading the assignment.

(6) Graduate and undergraduate sections will be taught jointly, but obtaining graduate credit will require the inclusion of more advanced assignments on the homework, project, and exams.

**Grading:**

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Quiz I</td>
<td>10%</td>
</tr>
<tr>
<td>Midterm</td>
<td>25%</td>
</tr>
<tr>
<td>Quiz II</td>
<td>10%</td>
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<tr>
<td>Final Exam</td>
<td>30%</td>
</tr>
<tr>
<td>Homework</td>
<td>15%</td>
</tr>
<tr>
<td>Presentation/Project</td>
<td>10%</td>
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</tbody>
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The grading scale is as follows:

- A = 90 - 100
- B = 80 - 89.99
- C = 70 - 79.99
- D = 60 - 69.99
- F = < 60
- U = < 70

**Canvas Environment:**

This course includes a significant and required use of the Canvas online environment. You must be able to access course materials and announcements on-line. You can login to Canvas here: [https://uncc.instructure.com/courses/46923](https://uncc.instructure.com/courses/46923)

**Email:**

You must be reachable via your UNC Charlotte email account. All course communication will be directed to you at your UNC Charlotte email address via Canvas. If you primarily use a different email account, then you should forward your email to your primary account.
Diversity:

The Belk College of Business and the William Lee States College of Engineering strive to create an inclusive academic climate in which the dignity of all individuals is respected and maintained. Therefore, we celebrate diversity that includes, but is not limited to ability/disability, age, culture, ethnicity, gender, language, race, religion, sexual orientation, and socio-economic status.

Academic Honesty:

You are required to complete 100% of your own work in this class including making a full contribution to the team project and not communicating with other students on exams or homework assignments. Cheating violates the UNC Charlotte Code of Academic Integrity and may result in a 0 on a homework assignment or an exam, course failure, suspension, and/or expulsion. For more information see the following: http://integrity.uncc.edu/

Disability and Impairment Accommodation:

If you require course adaptations or accommodations because of a disability, or if you have emergency medical information about which we should be informed, please speak with us as soon as possible. Students who require such accommodations must work with the Office of Disability Services (704-687-0040).

Course Outline and Reading Schedule: (C = Prof. Chowdhury; S = Prof. Schwarz)

A. Introduction to Energy Markets
   I. Week 1 Jan. 10 Course Overview: Syllabus and Energy and Electricity Markets (S)
      • Reading:

   Martin Luther King Holiday Monday Jan. 16

   II. Week 2 Jan. 17 Review of Microeconomics (S)
      • Reading:
        1. Text Ch. 2

   III. Week 3 Jan. 24 Energy Markets: Oil (S)
      • Reading:
        1. Oil: Oil Energy Charter Secretariat document
B. Overview of Electricity Markets

IV. Week 4 Jan. 31 Introduction to Electricity Markets (C/S)  
(and Guest Speaker Ronak Bhatt on Oil Pricing)

Quiz (S): Covers International Energy Markets (U TX document) and Review of  
Microeconomics (Text Ch. 2)
- Reading:
  1. J Griffin and S Fuller: A Primer on Electricity and the Economics of  
     Deregulation

V. Week 5 Feb. 7 Markets for Electrical Energy (C)
- Readings:
  1. Kirschen Ch 1, 3
  2. Selected reading material from US electricity markets

VI. Week 6 Feb. 14 Markets for Electrical Energy (cont.) (C)
- Readings:
  3. Kirschen Ch 4
  4. Selected reading material from US electricity markets

VII. Week 7 Feb. 21 Regulation (S)
- Reading:

Take-home Midterm posted Feb. 22, due Feb. 28
- Text Ch’s 1-4, Intro, Oil, Primer on Electricity

C. Additional Energy Markets

VIII. Week 8 Feb. 28 Natural Gas (S)
- Reading:
  1. Natural Gas: Energy Information Administration document

Spring Recess March 6-11

IX. Week 9 Mar. 14 Renewable Energy (S)
- Midterm Returned
- Readings:
  1. Timmons, et al. The Economics of Renewable Energy
  2. Joskow: Intermittent vs. Dispatchable Technologies

Mar. 20 11:59 pm Last day to withdraw from course with a ‘W’ grade
D. Additional Electricity Markets

X. Week 10 Mar. 21 Ancillary Services (C)
   • Readings:
     1. Kirschen Ch. 5
     2. Selected reading material from US electricity markets

XI. Week 11 Mar. 28 Transmission Networks (C)
    • Readings:
      1. Kirschen Ch. 6
      2. Selected reading material from US electricity markets

XII. Week 12 Apr. 4 Transmission Networks (cont.) (C)
    • Reading:
      1. Selected reading material from US electricity markets

XIII. Week 13 Apr. 11 Investing in Generation and Transmission (C)
    • Reading:
      1. Kirschen Ch. 7

April 14-15, Spring Weekend

XIV. Week 14 Apr. 18 Investing in Generation and Transmission (cont,) (C)
     (Also Guest Speaker Ronak Bhatt Investing in Energy)

Quiz (C): Covers Text Chapters 5, 6 Ancillary Services and Transmission Networks
    • Reading:
      1. Kirschen Ch. 8

XV. Week 15 Apr. 25 – Make-up class for topics not covered earlier in the semester.

XVI. Week 16 May 2 – Graduate student presentations.

Reading Day: May 3 (Wednesday)

Final Exam posted May 3 and due May 9 (Tuesday), In class part of Final Exam on May 9, 5-7:30 PM.

ALL PARTS OF THIS SYLLABUS ARE SUBJECT TO REVISION
ANY REVISIONS WILL BE ANNOUCED IN CLASS OR VIA CANVAS
Citations


