EEL 3211C – Basic Electric Energy Fall 2021 Flipped Classroom

Credits: 4

Meeting Times: MWF 8’th period (3:00 p.m.-3:50 p.m.) NEB 101
Class Section 11995 Lab Time M 11-E1 (6:15 p.m.- 8:10 p.m.) NEB289
Class Section 11996 Lab Time T 11-E1 (6:15 p.m.- 8:10 p.m.) NEB289
Class Section 11997 Lab Time W 2-E3 (8:20 p.m.- 10:10 p.m.) NEB289

Instructor: Keith J. Rambo 534 NEB rambo@ufl.edu 352-392-4243
Office Hours: M W F 1:30-2:30, or by appointment

TA/Lab: Brenden Mears NEB 289 mearsb@ufl.edu Office Hours: Lab Times
NINJA: Abigail Bryant NEB 222 abigail.bryant@ufl.edu Office Hours: TBD

General Description: Analysis and modeling of power system components. Magnetic circuits, energy conservation, transformers, AC and DC rotating machines, introduction to power transmission.

Objectives: Learn the basics magnetic circuits, transformers, motors, and generators. Design circuits and systems to meet desired needs. Engage in life-long learning. After successful completion of this course, the student will have a basic understanding of:

- MATLAB examples and Electromagnetic circuits and systems Week 1-3
- Three phase circuits including wye and delta configurations Week 3-4
- Transformer function, characteristics and uses Week 5-7
- AC machinery Week 8-9
- Synchronous Machinery, characteristics and uses Week 9-11
- Induction Motors, characteristics and uses Week 12-13
- DC Machinery, characteristics and uses Week 14
- Transmission Lines, characteristics Week 15


Calculator: A TI N-Spire or equivalent polar-rectangular mixed mode calculator will be required.

Internet Bandwidth Requirement: You must have 10 Mbps download bandwidth speed to take this course. This is to ensure that you can view video without buffering as defined by UF Mediasite bandwidth requirements. Measurements of bandwidth should be tested at http://speedtest.net to verify availability of bandwidth (home or campus). Campus Wireless Access Points (WAP) generally (based on number of users on a single WAP) have sufficient bandwidth to accommodate this requirement.

Zoom Simulcast with recording: All classes with be live in their respective classrooms and Zoom simulcast with the Zoom recording available shortly after class. Synchronous attendance of the class is required. Breakout spaces will be used during class and computers are required during class time.

Grading: Class attendance for the entire period and participation is required. There will be three tests, a final, Laboratory, in/out of class homework and daily quizzes via PollEverywhere (for required video viewing and class attendance verification (no credit provided for partial period attendance/participation). Homework turned in late will not be given credit as solutions will be reviewed and video posted following the homework due date.
For the daily quizzes, you must log in with your gatorlink id and must have watched 90% or more (as measured by Mediasite analytics) of each of the videos that are required for that class period as shown on the website eadmin.ece.ufl.edu. Failure to meet this requirement will result in a zero score for the material on that quiz. A quiz grade credit of (+0.25) will be given for attending and putting your name on the quiz if you have not watched the material as the quiz is for two purposes: Attendance and Comprehension. Each class period will have one quiz associated with that period unless otherwise notified on Canvas.

**Quiz/Test/Exam:** One 3” X 5” card will be allowed to assist, as well as calculator. No other electronics are allowed. A ruler will be allowed and will be helpful in interpreting graphs. Formula sheet will be provided with formulas from Chapman on Tests/Exam. Each quiz also contains bonus point(s) that are mostly based on architecture of the UF campus. You will see me standing in front of, places on campus, which you should be able to identify as a member of the Gator Nation (hint: check out…. http://web.uflib.ufl.edu/ufarch/historic.htm and http://web.uflib.ufl.edu/ufarch/gallery.htm).

The tests (1-3) will be given in evenings as part of a combined help session/test starting at 7:00 PM.

<table>
<thead>
<tr>
<th>Test</th>
<th>Date</th>
<th>Tentative Chapters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>09/21/21 (Tuesday)</td>
<td>1-2</td>
</tr>
<tr>
<td>2</td>
<td>10/21/21 (Thursday)</td>
<td>3-4</td>
</tr>
<tr>
<td>3</td>
<td>11/18/21 (Thursday)</td>
<td>5,7</td>
</tr>
<tr>
<td>Final</td>
<td>12/14/21 12:30 p.m.-2:30 p.m.</td>
<td>1,2,3,4,5,7,8,9</td>
</tr>
<tr>
<td>Homework</td>
<td>In Class</td>
<td></td>
</tr>
</tbody>
</table>

An overall test score, \( T \), between 0 and 100, will be calculated for each student as shown below.

\[
T = \frac{0.13T_1 + 0.13T_2 + 0.13T_3 + 0.26F}{0.65}
\]

Where \( T_1, T_2, T_3 \) and \( F(Final) \) are each of the three tests and final weighted as shown above.

The laboratory will be worth up to 20% of the final grade. If the semester lab grade (\( L \)) falls below a C+ (77.5%) then the lab grade (\( L \)) will be weighted as: \( L = (\text{Final Lab Grade}) \times 0.50 \) and that value will be applied in the formula below.

The score, \( S \), for the course will be calculated as follows assuming that \( HW \) represents the overall homework score.

Then:

\[
S = 103\% = 3\%(\text{Daily Quizes}) + 15\% \text{HW} + 65\% T + 20\% L .
\]

****** WARNING: Canvas Posted Scores (S) **Do Not Reflect** the Actual Score (S). ******
Grades will be assigned based on the table shown below.

<table>
<thead>
<tr>
<th>Overall Score ($)</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>92.5-100</td>
<td>A</td>
</tr>
<tr>
<td>90-92.499…</td>
<td>A-</td>
</tr>
<tr>
<td>87.5-89.99…</td>
<td>B+</td>
</tr>
<tr>
<td>82.5-87.499…</td>
<td>B</td>
</tr>
<tr>
<td>80-82.499…</td>
<td>B-</td>
</tr>
<tr>
<td>77.5-79.999…</td>
<td>C+</td>
</tr>
<tr>
<td>72.5-77.499…</td>
<td>C</td>
</tr>
<tr>
<td>70-72.499..</td>
<td>C-</td>
</tr>
<tr>
<td>67.5-69.99…</td>
<td>D+</td>
</tr>
<tr>
<td>62.5-67.499…</td>
<td>D</td>
</tr>
<tr>
<td>60-62.499…</td>
<td>D-</td>
</tr>
<tr>
<td>Less than 60</td>
<td>E</td>
</tr>
</tbody>
</table>

More information on UF grading policy may be found at: [https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx](https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx)

**Students Requiring Accommodations**

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting [https://disability.ufl.edu/students/get-started/](https://disability.ufl.edu/students/get-started/). It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

**Course Evaluation**

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at [https://gatorevals.aa.ufl.edu/students/](https://gatorevals.aa.ufl.edu/students/). Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via [https://ufl.bluera.com/ufl/](https://ufl.bluera.com/ufl/). Summaries of course evaluation results are available to students at [https://gatorevals.aa.ufl.edu/public-results/](https://gatorevals.aa.ufl.edu/public-results/).

**In-Class Recording**

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by
a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

**University Honesty Policy**

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Conduct Code ([https://sccr.dso.ufl.edu/process/student-conduct-code/](https://sccr.dso.ufl.edu/process/student-conduct-code/)) specifies a number of behaviors that are in violation of this code and the possible sanctions. If you have any questions or concerns, please consult with the instructor or TAs in this class.

**Commitment to a Safe and Inclusive Learning Environment**

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

• Your academic advisor or Graduate Program Coordinator  
• Jennifer Nappo, Director of Human Resources, 352-392-0904, jpenacc@ufl.edu  
• Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu  
• Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

**Software Use**

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

**Student Privacy**

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: [https://registrar.ufl.edu/ferpa.html](https://registrar.ufl.edu/ferpa.html)

**Campus Resources:**

**Health and Wellness**

**Covid-19 Protocols:**

• You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated. Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.

• If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email covid@shcc.ufl.edu) to be evaluated for testing and to receive further instructions about returning to campus. UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the UF Health Screen, Test & Protect website for more information.

**U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another.
and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** [https://counseling.ufl.edu](https://counseling.ufl.edu), and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

**Sexual Discrimination, Harassment, Assault, or Violence**
If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the [Office of Title IX Compliance](mailto:title-ix@ufl.edu), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

**Sexual Assault Recovery Services (SARS)**
Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or [http://www.police.ufl.edu/](http://www.police.ufl.edu/).

**Academic Resources**

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. [https://lss.at.ufl.edu/help.shtml](https://lss.at.ufl.edu/help.shtml).

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling; [https://career.ufl.edu](https://career.ufl.edu).

**Library Support**, [http://cms.uflib.ufl.edu/ask](http://cms.uflib.ufl.edu/ask). Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. [https://teachingcenter.ufl.edu/](https://teachingcenter.ufl.edu/).


Material:

Topic
Material: Topic

- #52 EEL 3211C Synchronous Generator Phasor Diagrams (15').mp4
- #53 EEL 3211C Synchronous Generator Power and Torque (19').mp4
- #54 EEL 3211C Synchronous Generator Model Parameter Determination (16').mp4
- #55 EEL 3211C Synchronous Delta Connected Machine Example (Turner) (21').mp4
- #56 EEL 3211C Synchronous Wye Delta Connected Machine V Phi Analysis (Turner) (14').mp4
- #57 EEL 3211C Synchronous Machine Power, Efficiency and Regulation (Turner) (15').mp4
- #58 EEL 3211C Why do we Simplify the Machine Model? (Turner) (9').mp4
- #59 EEL 3211C Synchronous Machine Motor Model Differences (Turner) (13').mp4
- #60 EEL 3211C Synchronous Motor Phasor Diagrams (13').mp4
- #61 EEL 3211C Synchronous Motor Delta Connected Example (17').mp4
- #62 EEL 3211C Synchronous Generator Delta Connected Example (16').mp4
- #63 EEL 3211C Synchronous Motor Use for Power Factor (PF) Correction (11').mp4
- #64 EEL 3211C Starting Synchronous Motors (17').mp4
- #65 EEL 3211C Amorisseur Winding, Service Factors, Phasor Summary (18').mp4

- #66 EEL 3211C Magnetic Field Measurements on a Rotor (8').mp4
- #67 EEL 3211C Introduction to Induction Motors (16').mp4
- #68 EEL 3211C Rotor Slip on Induction Motors (13').mp4
- #69 EEL 3211C Rotor Slip Example (8').mp4
- #70 EEL 3211C Induction Motor Equivalent Circuit (13').mp4
- #71 EEL 3211C Induction Motor Power Flow (8').mp4
- #72 EEL 3211C Induction Motor Power and Torque (12').mp4
- #73 EEL 3211C Induction Motor Power, Torque and Efficiency Example (13').mp4
- #74 EEL 3211C Induction Motor Motor Loss and Power Analysis (21').mp4
- #75 EEL 3211C Induction Motor Thevenin Circuit Analysis (21').mp4
- #77 EEL 3211C Induction Motor Power, Torque, Slip and Speed Example (19').mp4
- #78 EEL 3211C Induction Motor Motor R Effects and Model Determination (18').mp4
- #79 EEL 3211C Induction Motor Motor Model Parameter Calculation Example (25').mp4

- #81 EEL 3211C DC Motors; E(Ind) on Rotating Loop in Static B (28').mp4
- #82 EEL 3211C DC Motors; Example Torque Voltage and Power (11').mp4
- #83 EEL 3211C DC Motors; Commutation on a 4 Loop Machine (10').mp4
- #85 EEL 3211C DC Motors; Differences with Commutation (11').mp4
- #86 EEL 3211C DC Machines; Design, Power Flow and Examples (13').mp4
- #87 EEL 3211C DC Machines; Effect of Varying Rf (6').mp4
- #84 EEL 3211C Chuck Hawkins Lecture (52').mp4
- #88 EEL 3211C DC Machines; Effect of Varying R on Omega (5').mp4
- #89 EEL 3211C DC Machines; Commutator Segment Connections (11').mp4
- #90 EEL 3211C DC Machines; Additional Types (8').mp4

- #91 EEL 3211C Introduction to Power Transmission Lines (20').mp4
- #92 EEL 3211C Properties of Distribution Systems (17').mp4
- #93 EEL 3211C Transmission Line Tables and Chapman 9.1 (19').mp4

**LEGEND:**

- **Matlab**
- **Magnetic Cores**
- **Transformers**
- **Rotating Machines**
- **Synchronous Machines**
I. Catalog Description
   Electric energy conversion, devices and systems.

II. Co-requisites
    None

III. Course Objectives
    The main purpose of this lab is to familiarize the student with the main areas of study of conventional electric energy conversion. This includes Power Measurement & Instrumentation, Transformers, DC Motors & Generators, Induction Machines, and Synchronous Machines.

IV. Lab TA: Brenden Mears
    a. Phone:
    b. Email: mearsb@ufl.edu

V. Class Nija TA: NA

VI. Meeting Location
    NEB 289

VII. Grading
    The course will be composed of the following:
    - Lab Reports
    - Participation and Prelab
    - Quizzes

VIII. Grading Scale
    Letter grades are based on the table below.

    | Overall Score | Grade |
    |---------------|-------|
    | 92.5-100      | A     |
    | 90-92.499…   | A-    |
    | 87.5-89.99…  | B+    |
    | 82.5-87.499… | B     |
    | 80-82.499…   | B-    |
    | 77.5-79.999… | C+    |
    | 72.5-77.499… | C     |
    | 70-72.499…   | C-    |
    | 67.5-69.99…  | D+    |
    | 62.5-67.499… | D     |
    | 60-62.499…   | D-    |
    | Less than 60 | E     |
IX. **Lab Policies & Expectations**
   a. **Groups:** Beginning with Lab 1, students will form groups of two, with each group getting a separate workstation.
   b. **Preparation:** The student is expected to read and understand the laboratory procedure before starting the experiment, and to have answers for any questions contained in any assigned prelabs.
   c. **Safety:** All safety requirements are outlined in the lab manual and must be followed at all times.
   d. **Reports:** Lab Reports are due by the start of the next lab. Each member of every group is responsible for their own lab report. For more information on report structure and grading, refer to the lab manual.
   e. **Make-Up Labs:** If a lab cannot be attended, send the TA an email prior to the lab to arrange a make-up.
   f. **Late Attendance:** If a student is 10 minutes late to class, the student will not be allowed to perform the lab that day or turn in a lab report.
   g. **Late Lab Reports:** Completed lab reports are due the following lab (Usually every two weeks). If a lab report is not turned in during the first 10 minutes of the following lab, there is a 25% penalty. If it is turned in 1 week after the due date there will be a 50% penalty.

X. **Lab Schedule- TBD**