ABET Course Syllabus Template

1. Course number and name
   ECE341: Energy Conversion

2. Credits and contact hours
   3 credit hours, 3 contact hours (including 20 minutes breaks)

3. Instructor's or course coordinator's name
   Instructor: Dr. Walid Hubbi

4. Text book, title, author and year
   Electric Machinery Fundamentals by Stephen J. Chapman (2011)
   MHID: 0073529540   **ISBN:** 9780073529547

5. Specific course information
   a. brief description of the content of the course (Catalog Description)
      This course covers fundamental concepts of Magnetic circuits and their applications, and the steady-state performance of dc and ac electromechanical energy converters.

   b. prerequisites or co-requisites
      Prerequisites: ECE 231

   c. indicate whether a required, elective, or selected elective
      Required course.

6. Specific goals for the course
   a. specific outcomes of instruction:
      1. Students learn three-phase circuit analysis.
      2. Students learn some fundamental laws of electromagnetism (Faraday's and Ampere's Laws) and their application in the analysis and design of simple energy conversion devices and transformers.
      3. Students learn fundamentals of magnetic circuits and application to machine design.
      4. Students learn fundamentals of electromechanical energy conversion.
      5. Students learn fundamentals of direct-current generators and motors.
      6. Students learn the fundamentals of alternating-current generators and motors.
      7. Students learn the importance of energy conversion to society.
      8. Students use Matlab to solve engineering problems

   b. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
      Criterion 3(a) is addressed by 6.a.(1, 2, 3, 4, 5, 6).

Criterion 3(c) is addressed by 6.a.(2, 3)

c. Criterion 3(e) is addressed by 6.a.(1, 2, 3, 4, 5, 6)
d. Criterion 3(f) is addressed by 6.a.7
e. Criterion 3(h) is addressed by 6.a.7
f. Criterion 3(j) is addressed by 6.a.7
g. Criterion 3(k) is addressed by 6.a.(1 to 8)

The course outline that was distributed to students at the beginning of the semester follows:

Department of Electrical and Computer Engineering
ECE341: Energy Conversion

Tentative Course Outline   **Fall 2014**

Instructor: Dr. Walid Hubbi   **email: hubbi@njit.edu**
Office: ECE 329   **phone: (973) 596-3518**
Office Hours: Tuesdays and Fridays 9:00-10:00

Class Schedule:

Tues and Thurs	11:30 – 12:55 am	ECEC 115

Catalog Description:
ECE 341 - Energy Conversion (3-0-3)

Prerequisites: ECE 231
This course covers fundamental concepts of Magnetic circuits and their applications, and the steady-state performance of dc and ac electromechanical energy converters.

Textbook(s)/Materials required:
Electric Machinery Fundamentals by Stephen J. Chapman (2011)
MHID**: 0073529540   ISBN:** 9780073529547

Grading Policy: Maximum points is 150 points divided as follows: two tests 35 points each; homework and class performance 30 points; and final 50 points. The letter grade will be as follows: A>90%, B+>80%, B>70%, C+>60%, C>50%.

Homework: Homework is due on Thursdays unless otherwise notified. Occasionally I will give you a quiz at the beginning of the class based on the homework problems that you are supposed to have done. Solutions to homework problems may be available on the web. **Please, DO NOT COPY solutions from the web or any other source. This is unethical and unwise. Always try the problem yourself first. Refer to the solution (if available) ONLY after you have gotten stuck, and use it only to get unstuck. Getting stuck (finding out what you don't know) is an important step in the learning process.   Copying solutions will be penalized beyond the grade of the homework.**

Time Requirements: On the average, a full-time student during the Fall or Spring semester takes courses having a total of 15 credits and study about 45 hours/week. This is equivalent to 2 hours of study for every hour in class. Therefore, you are expected to allocate 9 hours/week for this course (including time spent in class).

Other Policies

1. Students should be familiar with NJIT Honor Code. This code will be rigorously upheld, any violations will be brought to the immediate attention of the administration.
2. Students are expected to read the listed text sections prior to each lecture period. (See weekly outline below) .
3. Students are expected to complete the assigned homework problems after each lecture period.
4. Please use a cover sheet (a copy appears at the end of this outline), with every homework.
5. At the end of each chapter students should be prepared to discuss their solutions in class.
6. Regular class attendance is expected.

Assumed Knowledge

*   complex number representation and arithmetic,

    To practice operations on complex numbers you can download a Matlab program to test your ability in dealing with complex numbers (it is assumed that you have Matlab installed on your computer). Go to http://users.ece.gatech.edu/mcclella/matlabGUIs/ scroll down to the section titled ZDrill and download ZDrill to a location where MATLAB can find it. To use this program, type zdrill at the Matlab prompt ">>".

*   basic DC and sinusoidal steady-state AC electrical circuit analysis: eg. Ohm's law, Kirchhoff's Voltage Law, Kirchhoff's Current Law, phasor representation of sinusoidal AC signals, series and parallel impedances, Thevenin's theorem,
*   concept of complex, real and reactive power, power triangle (Circuits and Systems I),
*   basic Physics, Ampere's law, Faraday's law.

Weekly Outline:

Dates T=Tuesday Th= Thursday.	Topics	HW
T. 9/2 and Th. 9/4	Newton's law, rotational motion, force, torque, work, and power. Magnetic field and magnetic circuits. Pages 1-28	Problems 1.3, 1.4, 1.5 1.6, and 1.8
Week 2 T. 9/9 and Th. 9/11	Production of Induced Force on a wire, Induced Voltage on a Conductor Moving in a Magnetic Field, Real, Reactive, and Apparent Power in Single-Phase AC Circuits. Pages 28-34 and 47-53	1-10, 2, 14, 16, 18, 21, 22
Week 3. T. 9/16 and Th. 9/18	Types and Construction of Transformers, The Ideal Transformer, Theory of Operation of Real Single-Phase Transformers, The Equivalent Circuit of a Transformer. Pages 65-94	
Week 4 T. 9/23 and Th. 9/25	The Per-Unit System of Measurements, Transformer Voltage Regulation and Efficiency, Transformer Taps and Voltage Regulation, The Autotransformer. Pages 94-116	
Weeks 5 T. 9/30, and Th. 10/2	AC Machinery Fundamentals, A Simple Loop in a Uniform Magnetic Field, The Rotating Magnetic Field, Magnetomotive Force and Flux Distribution on AC Machines, Induced Voltage in AC Machines, Induced Torque in an AC Machine, Winding Insulation in an AC Machine, AC Machine Power Flows and Losses Voltage Regulation and Speed Regulation	
T. 10/7	Test 1	
Week 7, 8, and 9 Th. 10/9 T. 10/14, Th. 10/16, T. 10/20, And Th. 10/23.	Synchronous Generators 191 4.1 Construction 192 4.2 The Speed of Rotation 197 4.3 The Internal Generated Voltage 4.4 The Equivalent Circuit 198 4.5 The Phasor Diagram 202 4.6 Power and Torque 205 4.7 Measuring Synchronous Generator Model Parameters 208 4.8 The Synchronous Generator Operating Alone 213 4.9 Parallel Operation of AC Generators 4.11 Synchronous Generator Ratings Synchronous Motors 271 5.1 Basic Principles of Motor Operation 271 5.2 Steady-State Synchronous Motor Operation 275 5.3 Starting Synchronous Motors 290 5.4 Synchronous Generators and Synchronous Motors 297 5.5 Synchronous Motor Ratings 298	
Week 10	Three-Phase Transformers, Transformer Ratings and Related Problems	

Th. 10/30	Test II	
T. 11/4, Th. 11/6, T. 11/11, Th.11/13, and T. 11/18	Chapter 6 Induction Motors 307 6.1 Induction Motor Construction 309 6.2 Basic Induction Motor Concepts 311 6.3 The Equivalent Circuit of an Induction Motor 315 6.4 Power and Torque in Induction Motors 321 6.5 Induction Motor Torque–Speed Characteristics 328 6.7 Trends in Induction Motor Design 353 6.8 Starting Induction Motors 357 6.12 The Induction Generator 388	
Th. 11/20, T. 11/25, T. 12/2, Th. 12/4, and T. 12/9	Chapter 8 DC Motors and Generators 464 8.1 Introduction to DC Motors 465 8.2 The Equivalent Circuit of a DC Motor 467 8.3 The Magnetization Curve of a DC Machine 468 8.4 Separately Excited and Shunt DC Motors 469 8.5 The Permanent-Magnet DC Motor 491 8.6 The Series DC Motor 493 8.7 The Compounded DC Motor 500 8.8 DC Motor Starters 505 8.10 DC Motor Efficiency Calculations 524 8.11 Introduction to DC Generators 526 8.12 The Separately Excited Generator 528 8.13 The Shunt DC Generator 534 8.14 The Series DC Generator 540 8.15 The Cumulatively Compounded DC Generator 543 8.16 The Differentially Compounded DC Generator 547	

ECE 341 HW#

Name: _____   **Date Submitted:** _____

Roster# _____   **Problem Solved:** _____