Master Course Syllabus for EEL 3211

1. **Department:** ELECTRICAL AND COMPUTER ENGINEERING

2. **Title:** Basic Electric Energy Engineering  
   **Credits:** 3 hours (3 hours lecture)

3. **Course Designation as Elective or Required:** Required

4. **Catalog Description:** Analysis and modeling of power system components. Magnetic circuits, energy conservation, transformers, AC and DC rotating machines. A grade of 2.0/4.0 or better is required in the prerequisite(s). A material and supply fee will be assessed.

5. **Prerequisite(s):** EEL3111

6. **Corequisite(s):** EEL3112

7. **Textbook(s) and/or Other Required Materials:**  

   **Reference:**  

8. **Course Objectives:**
   - Introduce the student to machine mechanics and electromagnetic fundamentals.
   - Introduce the student to three-phase circuits including delta-wye conversion and network representations and power relationships.
   - Introduce the student to analysis of balanced systems and one line diagrams.
   - Introduce the student to single-phase and three-phase transformers, theory of operation of ideal and real transformers, voltage and current ratio techniques, equivalent circuits, per-unit system, and transformer voltage regulation and efficiency calculations.
   - Introduce the student to AC synchronous motor and generator fundamentals which include schematics with power/torque calculations, equivalent circuit models and phasor diagrams.
   - Introduce the student to induction motor fundamentals that include basic concepts and construction, equivalent circuit models, and power and torque calculations.
   - Introduce the student to transmission line fundamentals and how they tie power system(s) together.
9. **Topics Covered:**

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<th>Items</th>
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<tr>
<td>1</td>
<td>Mathcad</td>
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<td>2</td>
<td>Power World Software</td>
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<td>Single–phase power fundamentals</td>
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<td>4 Tests</td>
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<td>12</td>
<td>Final (finals week)</td>
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**Computer Resources:** Each student must become proficient in the use of Power World and Mathcad software. The homework will be exclusively Mathcad and all projects will include Power World and Mathcad.

10. **Class/Laboratory Schedule:**

Two classes of 75 minutes per week. Computer simulation projects are integral parts of the course.

11. **Contribution to Meeting Professional Component:**

This course introduces the student to the critical electrical energy system and machine analysis skills needed to become a successful student and electrical engineer. The student learns via the textbook, class work, handouts, and field trips, the theory and analysis methodologies behind basic electric energy apparatus and systems, and their equivalent networks. These concepts lay the ground work for more advanced electrical energy engineering courses and ultimately to a successful and fulfilling work experience. The student also gains valuable team work experience in design and project management setting. This course consists of three (3) credits: two and one half (2.5) credits of engineering topics and one half (0.5) credit of electric energy system design.

**Design/Science Content:**

ABET Science: 2.5 credits
ABET Design: 0.5 credits
12. **Relationship to Program Objectives:**
   - Students will obtain an ability to analyze and solve novel electrical energy engineering problems in a practical environment by applying their knowledge of mathematics, science, and basic electrical engineering. Modern engineering techniques, skills, and tools will be utilized, particularly recognizing the role that computers and industry utilized software packages play in engineering.
   - Students will obtain the ability to design, analyze, and interpret the resulting data of basic energy systems via projects.
   - Students will obtain an ability to communicate effectively through project reports.
   - Students obtain an ability to work in a team setting as they work on various project and design assignments.

13. **Relationship to Program Outcomes:**
   - Program Outcome # 2: Recognize and apply concepts, principles and theories of core electrical/computer engineering topics: basic circuit analysis, signals and systems, electronics, digital logic, microprocessors, control systems, communications, electromagnetics, and electric power

**Student Learning Outcomes**
   - Outline basic power system design techniques and analytical skills using various combinations of power apparatus which include transformers, transmission lines and requisite transmission line parameters, per-unit values, synchronous motors and generators, and induction motors that are connected in wye, delta, and wye/delta configurations.
   - Describe the characteristics and circuit models of AC machines in both short circuit and steady-state modes of operation.
   - Apply basic engineering sciences to the design, analyses and steady-state operation of power apparatus in stable power systems.
   - Apply modern simulation (PowerWorld/Windmill) and mathematical (Mathcad and/or Matlab) tools for the design, analyses, and performance of power system networks.
   - Formulate the requisite problem solving skills associated with power system analysis and design.
   - Design power systems and networks to meet desired operationing conditions and specifications.

14. **Expectations for Academic Conduct/Plagiarism Policy:**
   - Academic Conduct Policy: [http://uwf.edu/cas/aasr/academic_conduct.pdf](http://uwf.edu/cas/aasr/academic_conduct.pdf)
   - Plagiarism Policy: [http://uwf.edu/cas/aasr/Plagiarism.pdf](http://uwf.edu/cas/aasr/Plagiarism.pdf)
   - Student Handbook: [http://www.uwf.edu/uwfmain/stuHandbk/](http://www.uwf.edu/uwfmain/stuHandbk/)

15. **Assistance:**
• Students with special needs who require specific examination-related or other course-related accommodations should contact Barbara Fitzpatrick, Director of Disabled Student Services (DSS), dss@uwf.edu, (850) 474-2387. DSS will provide the student with a letter for the instructor that will specify any recommended accommodations.

16. **Prepared by:** Dr. Dale H. Harrell, October 2004