PELLISSIPPI STATE COMMUNITY COLLEGE
MASTER SYLLABUS

INDUSTRIAL ELECTRICITY
EET 1055

Class Hours: 2  Credit Hours: 3
Laboratory Hours: 3  Date Revised: Fall 2012

Catalog Course Description:

An introductory course in industrial power systems, AC and DC motor theory and applications, motor control techniques, and variable-speed drive applications. Topics include phasor concepts, single and three-phase power system components and computations, delta and wye circuits, transformer theory and applications, AC motors (induction, wound rotor, synchronous), and DC motors (series, shunt, compound motors).

Entry Level Standards:

Students entering this course must have college-level math skills.

Prerequisites:

None

Corequisites:

None

Textbook(s) and Other Course Materials:


I. Week/Unit/Topic Basis:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
</table>
| 1    | Lecture: AC Fundamentals  
      | Lab: Introduction to power system safety |
| 2    | Lecture: Phasors and Reactance  
      | Lab: Phasors |
| 3    | Lecture: Phasors and Reactance  
      | Lab: Reactance |
| 4    | Lecture: AC Power  
      | Lab: AC Power |
| 5    | Lecture: AC Power  
      | Exam #1 |
| 6    | Lecture: AC Generation  
      | Lab: AC Generation |
II. Engineering Technology General Outcomes (Educational objectives)

I. Apply basic engineering theories and concepts creatively to analyze and solve technical problems.

II. Utilize with a high degree of knowledge and skill equipment, instruments, software, and technical reference materials currently used in industry.

III. Communicate effectively using developed writing, speaking, and graphics skills.

IV. Assimilate and practice the concepts and principles of working in a team environment.

V. Obtain employment within the discipline or matriculate to a four year program in engineering or industrial technology.

III. Engineering Technology Concentration Competencies*

Students will:

A. Apply the knowledge, techniques, skills, and modern tools for the concentration of study to specifically defined engineering technology activities.

B. Demonstrate the knowledge of mathematics, science, engineering and technology to engineering technology problems using developed practical knowledge.

C. Conduct and report the results of standard tests and measurements, and conduct, analyze and interpret experiment or project results.

D. Function effectively as a member of a technical team.
E Identify, analyze and solve specifically defined engineering technology-based problems

F Employ Written, oral and visual communication in a technical environment

- At the program level all 6 competencies apply to roman numerals I – V of the Engineering Technology General Outcomes (Educational objectives) listed above.

IV. Course Goals*

The course will

1. Expand student understanding of the power flow of a basic industrial power system from generation to the load. (A, B)

2. Expand student understanding of the basic single phase three wire power circuit and three phase three wire and four wire power circuits. (A, B)

3. Enhance student understanding of the three phase transformer delta and wye connections, and the voltage or current relationships for each. (A, B, C, E)

4. Improve student ability to know the difference in an induction motor, a wound rotor motor, and a synchronous motor, and their components. (A, B, E)

5. Improve student ability to comprehend the operating characteristics of AC motors using theory and supplemental experiments. (A, B, C, D, E, F)

6. Improve student ability to comprehend the difference in series, shunt, and compound DC motor connections and the operating characteristics of each through theory and supplemental experiments. (A, B, C, D, E, F)

7. Enhance student ability to identify the basic components of a DC motor: commutator, brushes, armature winding, and field winding. (A, B, C)

8. Learn basic motor troubleshooting and maintenance skills. (C, F)

9. Know the application of variable speed drives for AC and DC motors. (A, B, C, E)

10. Know the basic motor control methods for AC and DC motors. (A, B, C, E)

11. Expand student understanding of important power system safety principles, including Arc Flash and Ground Fault protection. (A, B, E)

12. Learn the importance of safety codes. (A, E)

13. Expand student understanding power generation and alternative energy sources. (A, B, E)

14. Work in a team environment during laboratory sessions and develop written reports to communicate the principles learned through the experiment. (C, D)

*Capital letters after course goals reference the competencies of the Engineering Technology concentrations listed above.

V. Expected Student Learning Outcomes*

Students will: be able to:

a. Identify the components of a power system: Generation, Transmission, Distribution. (1)
b. Perform power system analysis using phasors. (1, 2)

c. Identify standard industrial power system utilization voltages. (1, 2)

d. Wire a transformer for wye or Delta (3)

e. Perform industrial power calculations and interpret industrial power measurements, such as industrial power demand, power factor, reactive power, and energy. (1, 2, 3)

f. Calculate power, power factor, and energy. (1, 2)

g. Explain basic motor characteristics such as torque, full load amps, locked rotor amps, and others. (4, 5)

h. Perform computations using DC motor principles as applied to shunt, series, and compound motor connections. (6, 7)

i. Connect an AC induction motor for operation. (4, 5, 8)

j. Verify the load characteristics of an AC induction motor. (5)

k. Apply capacitors for power factor improvement for an AC induction motor load. (2, 5, 8)

l. Connect a DC shunt motor for operation. (6, 7)

m. Connect a DC series motor for operation. (6, 7)

n. Connect a DC compound motor for operation. (6, 7)

o. Measure the resistance of a series winding and a shunt winding. (6, 7, 8)

p. Construct a variety of motor control methods. (10)

q. Configure a variable speed drive for a variety of control actions. (9)

r. Identify some basic safety codes. (12)

s. Explain the basic operations of a generator. (13)

t. Identify alternative methods of generating power: solar, wind, etc… (13)

u. Communicate important power system principles in written or graphical form. (14)

* Numbers after Expected Student Learning Outcomes reference the course goals listed above.

VI. Evaluation:

A. Testing Procedures: 80% of grade

   Chapter Tests 40%
   Quizzes 20%
   Final Exam 20%

B. Laboratory Expectations: 20% of grade

The laboratories for all EET courses are an essential part of conveying the concepts to the student. The labs would closely follow the classes in content and in time of presentation so that
the student is actually verifying these concepts to his or her self. The student will be able to
apply the theory learned in class. The laboratory grade will be determined by a combination of
performance within the lab and the quality and demonstrated comprehension of the lab report.
There will be at least twelve labs during the semester to go along with the classroom material.
Performance in labs (subjective) 50%
Lab Reports (neatness and content) 30%
Laboratory Test 20%

C. Field Work:

Students shall participate in one class field trip. A report will be required that will be part of
the laboratory grade.

D. Other Evaluation Methods:

None

E. Grading Scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>93 - 100</td>
</tr>
<tr>
<td>B+</td>
<td>88 - 92</td>
</tr>
<tr>
<td>B</td>
<td>83 - 87</td>
</tr>
<tr>
<td>C+</td>
<td>78 - 82</td>
</tr>
<tr>
<td>C</td>
<td>70 - 77</td>
</tr>
<tr>
<td>D</td>
<td>60 - 69</td>
</tr>
<tr>
<td>F</td>
<td>Below 60</td>
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VII. Policies:

A. Attendance Policy:

Pellissippi State expects students to attend all scheduled instructional activities. As a minimum,
students in all courses (excluding distance learning courses) must be present for at least 75
percent of their scheduled class and laboratory meetings in order to receive credit for the
course. Individual departments/programs/disciplines, with the approval of the vice president of
Academic Affairs, may have requirements that are more stringent. In very specific
circumstances, an appeal of the policy may be addressed to the head of the department in which
the course was taken. If further action is warranted, the appeal may be addressed to the vice
president of Academic Affairs.

B. Academic Dishonesty:

Academic misconduct committed either directly or indirectly by an individual or group is
subject to disciplinary action. Prohibited activities include but are not limited to the following
practices:
• Cheating, including but not limited to unauthorized assistance from material, people, or
devices when taking a test, quiz, or examination; writing papers or reports; solving problems;
or completing academic assignments.
• Plagiarism, including but not limited to paraphrasing, summarizing, or directly quoting
published or unpublished work of another person, including online or computerized services,
without proper documentation of the original source.
• Purchasing or otherwise obtaining prewritten essays, research papers, or materials prepared
by another person or agency that sells term papers or other academic materials to be presented
as one’s own work.
• Taking an exam for another student.
• Providing others with information and/or answers regarding exams, quizzes, homework or
other classroom assignments unless explicitly authorized by the instructor.
• Any of the above occurring within the Web or distance learning environment.

Please see the Pellissippi State Policies and Procedures Manual, Policy 04:02:00
Academic/Classroom Conduct and Disciplinary Sanctions for the complete policy.

C. Accommodations for disabilities:

Students who need accommodations because of a disability, have emergency medical
information to share, or need special arrangements in case the building must be evacuated
should inform the instructor immediately, privately after class or in her or his office. Students
must present a current accommodation plan from a staff member in Services for Students with
Disabilities (SSWD) in order to receive accommodations in this course. Services for Students
with Disabilities may be contacted by going to Goins 127, 132, 134, 135, 131 or by phone:
539-7153 or TTY 694-6429. More information is available at http://www.pstcc.edu/sswd/.