PELLISSIPPI STATE COMMUNITY COLLEGE
MASTER SYLLABUS

INDUSTRIAL ELECTRICITY

EET 1055

Class Hours: 2 Credit Hours: 3

Laboratory Hours: 3 Date Revised: Fall 2016

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).

Prerequisites

EET 1012

Textbook(s) and Other Course Materials

Industrial Electricity. Michael Brumbach, Delmar Learning. Latest Edition.

Week/Unit/Topic Basis

Week Topic

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
7. Lecture: Three Phase Systems/Lab: Three Phase Systems
8. Lecture: Transformers/Lab: Transformers
9. Lecture: AC Motors/Lab: Squirrel Cage Motor
10. Lecture: AC Motors/Lab: AC Motor Tests

11. Lecture: Motor Control/Lab: Motor Control
12. Lecture: Motor Control/Lab: Motor Control
13. Lecture: DC Motors/Lab: DC Motors
14. Lecture: Drives/Lab: Variable Frequency Drives/Exam #3
15. Final Exam Period

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

Engineering Technology Concentration Competencies

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

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

Course Goals

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

The course will

1 Expand student understanding of the power flow of a basic industrial power system from

2 generation to the load. (A, B)

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

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

5 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)

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

7 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)

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

9 Improve student ability to troubleshoot and maintain motors and motor systems. (C, F)

10 Enhance student understanding of variable speed drive applications for AC and DC motors. (A, B, C, E)

11 Expand student knowledge on basic motor control methods for AC and DC motors. (A, B, C, E)

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

13 Enhance student understanding of electrical safety codes. (A, E)

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

15 Enable student development in teamwork during laboratory sessions and in written reports to communicate the principles learned through the experiment. (C, D)

Expected Student Learning Outcomes

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

The student will

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)

Evaluation

Testing Procedures: 80% of grade

Chapter Tests	40%
Quizzes	20%
Final Exam	20%

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%

Field Work

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

Other Evaluation Methods: None

Grading Scale

93 – 100	A
88 - 92	B+
83 - 87	B
78 - 82	C+
70 – 77	C
60 - 69	D
0 - 59	F

Policies

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.

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.

Accommodations for disabilities

Students that 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 Disability Services (DS)

in order to receive accommodations in this course. Disability Services (http://www.pstcc.edu/sswd/) may be contacted via Disability Services email or by visiting Alexander 130.