ELEC 53.14 Course Outline as of Spring 2004

CATALOG INFORMATION

Dept and Nbr: ELEC 53.14 Title: BASIC ROTATING MACHINERY
Full Title: Basic Rotating Machinery for Maintenance Technicians
Last Reviewed: 1/31/2005

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	2.00	Lecture Scheduled	4.00	8	Lecture Scheduled	32.00
Minimum	2.00	Lab Scheduled	0	8	Lab Scheduled	0
		Contact DHR	0		Contact DHR	0
		Contact Total	4.00		Contact Total	32.00
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 64.00 Total Student Learning Hours: 96.00

Title 5 Category:	AA Degree Applicable
Grading:	Grade Only
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	ELEC299.43

Catalog Description:
Basics of rotating machinery including both DC and AC motors and generators. Includes three phase and single phase rotating machinery.

Prerequisites/Corequisites:

Recommended Preparation:
Course Completion of ELEC 53.13 (or ELEC299.42)

Limits on Enrollment:

Schedule of Classes Information:
Description: Basics of rotating machinery including both DC and AC motors and generators. Includes three phase and single phase rotating machinery. (Grade Only)
Prerequisites/Corequisites:
Recommended: Course Completion of ELEC 53.13 (or ELEC299.42)
Limits on Enrollment:
Transfer Credit: CSU;
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**			Effective:	Inactive:
CSU GE:	**Transfer Area**			Effective:	Inactive:
IGETC:	**Transfer Area**			Effective:	Inactive:
CSU Transfer:	Transferable	Effective:	Spring 2004	Inactive:	Spring 2012
UC Transfer:		Effective:		Inactive:	

CID:

Certificate/Major Applicable:
Certificate Applicable Course

COURSE CONTENT

Outcomes and Objectives:
Upon completion of the course the student will be able to:
1. Analyze the operating principles of several different types of AC and DC motors.
2. Compile proper safety procedures for working around motors and rotating machinery.
3. Originate and apply proper tag-out procedures when working on electrical equipment.
4. Evaluate and repair commutator and slip ring problems.
5. Evaluate & repair defective rectifiers in alternators.
6. Identify and evaluate various motor starting problems.
7. Describe the operation and principles of squirrel cage rotators in induction motors.

Topics and Scope:

1. Safety
2. Magnetism
   a. poles
   b. fields
   c. repulsion
   d. attraction
   e. permeability
   f. residual magnetism
3. Electromagnetism
   a. flux density
   b. field strength
   c. hysterisis
   d. effect of current increase and decrease
4. Counter current generation back EMF, Lenz's Law connection
5. Generators, basics of generating electric current, effects of magnetic field strength, speed of magnetic field cutting with a conductor,

number of wires cut by magnetic fields
6. AC generation, (alternators) single phase machines
  a. slip rings-brushes
  b. rotating armature, stationary fields
  c. rotating fields, stationary armature
  d. self excitation
  e. external excitation
7. AC generation, (alternators) poly phase machines
  a. rotating armature, stationary fields
  b. rotating fields, stationary armature
  c. self excitation
  d. external excitation
8. Alternators with DC outputs
  a. rectification, single phase and poly phase
9. Types of machines
  1. series wound
    a. adding fields
    b. opposing fields
  2. shunt wound
  3. compound wound
    a. series-parallel
    b. parallel-series
10. DC Motors
  a. Series motors characteristics
  b. Shunt motor characteristics
  c. Compound motor characteristics
11. AC Motors, series (universal motors)
  a. characteristics
  b. comparison to DC series motors
12. AC Motors, induction
  a. Rotating magnetic fields-generation of
  b. Single phase rotating fields-generation of
  c. Poly-phase rotating fields-generation of
  d. Transformers and transformer action
  e. Eddy currents
  f. Stators
  g. Rotors
  h. Squirrel cage rotors
  i. Starting current
  j. Stall current
  k. Run current
13. Starting Single Phase Motors
  a. Synchronous motors
  b. Shaded pole motors
  c. Capacitor start
  d. Resistance start
14. Motor Controllers
  a. DC
  b. AC

Assignment:

Application of concepts and problem solving in the following areas:
1. Compare, in writing, the operating principles of AC and DC motors.
2. Demonstrate and utilize proper safety techniques when working with motors.
3. Inspect and repair commutators, slip rings and rectifiers.
4. Assess the operation of squirrel cage rotators use in induction motors.

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Written homework	Writing 5 - 10%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework problems	Problem solving 20 - 50%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Class performances, Performance exams	Skill Demonstrations 20 - 50%

Exams: All forms of formal testing, other than skill performance exams.

Multiple choice, True/false, Matching items, Completion	Exams 10 - 30%

Other: Includes any assessment tools that do not logically fit into the above categories.

None	Other Category 0 - 0%

Representative Textbooks and Materials:
Representative Texts:
1. Industrial Motor Control Fundamentals (current edition), Robert L. McIntyre and Rex Losee, Glenco, McGraw-Hill.
2. Electric Machines and Power Systems, Syed A. Nasar and S. A. Nasar, 1999, McGraw-Hill.
3. Rotating Electrical Machines and Power Systems, Dale R. Patrick and Stephen W. Fardo, 2000, Prentice-Hall.