



**COLORADO SCHOOL OF MINES
ELECTRICAL ENGINEERING & COMPUTER SCIENCE DEPARTMENT**

**EENG 389 – Fundamentals of Electric Machinery
Spring 2017**

Instructor: Dr. Abd A. Arkadan

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Lecture Times: MWF: 9:00 – 9:50 AM

Lecture Room: BB W210

Office Hours: MTW: 10:00 - 11:00 AM

Course Description: This course provides an engineering science analysis of electrical machines. The following topics are included: DC, single-phase and three-phase AC circuit analysis, magnetic circuit concepts and materials, transformer analysis and operation, steady-state and dynamic analysis of rotating machines, synchronous and poly-phase induction motors, and laboratory study of external characteristics of machines and transformers.

- **Credits:** 4 Semester Hours: 3-hours lecture and 3-hours lab.
- **Prerequisite:** EENG282 or EENG382. **Co-requisite:** EENG386
- **Required Text:** *Electric Machinery Fundamentals*, by Stephen J. Chapman, 5th Edition, © 2012

Grading: On the basis of 100%;

- Homework 15% (A total of 8 assignments; lowest grade will be dropped)
- Laboratory Work 20%
- Two Midterm Exams @ 20% each
- Final Exam 25%

The standard grading scale will be used for this course:

A	B	C	D	F
90 – 100	80 – 89	70 – 79	60 – 69	Below 60

Rules for Homework Assignments: Assignments are due at the beginning of class on the designated day and must be *Neat*, presented on 8.5 by 11 paper sheets and *stapled*. Late assignments are *not* accepted.

Attendance: Attending class is essential. Excessive absences will result in a lowered and possibly even failing grade.

Class Preparation: Proper reading of the textbook and working example problems are important part of learning the fundamentals of this course.

Computer Tools: MATLAB and Microsoft Excel, which should be familiar from previous class work, could be used to perform the tedious calculations in the homework assignments.

Class	Date		Topic	Reading Assignments Due Dates	HWK Assignments Due Dates
1.	Jan. 10	T	Outline & Introduction	---	
2.	Jan. 11	W	Introduction & Review	pp. 1-7	
3.	Jan. 13	F	Magnetic Circuits	pp. 8 – 20	
	Jan. 16	M	No Classes - MLK	---	
4.	Jan. 18	W	Magnetic Material	pp. 21-28	HW1; Ch-1: #5, 6, 7, 8
5.	Jan 20	F	Magnetic Fields	pp. 29 – 35	
6.	Jan. 23	M	Single phase power	pp. 47-54	
7.	Jan. 25	W	Transformers	pp. 65 – 76	HW2; Ch-1: #10, 11, 12, 17
8.	Jan. 27	F	Real Transformer	pp. 77 – 85	
9.	Jan. 30	M	Trans. Equivalent Circuit	pp. 86 – 89	
10.	Feb. 1	W	Transformer Tests	pp. 90 – 94	
11.	Feb. 3	F	Per-Unit System	pp. 94 – 99	
12.	Feb. 6	M	Transformer Performance	pp. 100 – 107	
13.	Feb. 8	W	3-Phase Transformers	pp. 116 – 126	HW3; Ch-2: #2, 4, 6, 8, 13, 14
14.	Feb. 10	F	Basics of AC Machines 1	pp. 152 – 169	
15.	Feb. 13	M	Basics of AC Machines 2	pp. 169 – 181	
16.	Feb. 15	W	Exam-I (Ch. 1&2)		
17.	Feb. 17	F	No Class		
	Feb. 20	M	No Classes - Presidents Day		
18.	Feb. 22	W	AC Machine Flow of Power	pp. 182 – 186	
19.	Feb. 24	F	Synch Gen Basics	pp. 191 – 198	HW4; Ch-3: #1,3,6,8
20.	Feb. 27	M	Synch Gen Equivalent Circuit	pp. 198 – 208	
21.	Mar. 1	W	Synch Gen Tests	pp. 208 – 213	
22.	Mar. 3	F	Synch Gen Standalone Operation	pp. 213 – 224	
23.	Mar. 6	M	Synch Gen with Infinite Bus	pp. 233 – 237	
24.	Mar. 8	W	Multiple Synch Gens in Parallel	pp. 238 – 244	
25.	Mar. 10	F	Synchronous Motor Basics	pp. 271 – 275	HW5; Ch-4: #2, 3, 4, 6, 10
26.	Mar. 13	M	Synchronous Motor Operation	pp. 275 – 289	
27.	Mar. 15	W	Synchronous Motor Starting	pp. 290 – 296	
28.	Mar. 17	F	Induction Motor Basics	pp. 307 – 315	HW6; Ch-5: #1, 4, 8, 10, 12
29.	Mar. 20	M	Induction Motor Equivalent Circuit	pp. 316 – 320	
30.	Mar. 22	W	Exam-II (Ch. 3-5)		
31.	Mar. 24	F	No Class		
	Mar. 27-31	M-F	No Classes - Spring Break		
32.	Apr. 3	M	Induction Motor Power Flow	pp. 321 – 328	
33.	Apr. 5	W	Induction Motor Torque	pp. 329 – 343	
34.	Apr. 7	F	Induction Motor Starting	pp. 357 – 362	
35.	Apr. 10	M	Induction Motor Speed Control	pp. 363 – 371	
36.	Apr. 12	W	Induction Motor Tests	pp. 380 – 387	
37.	Apr. 14	F	Induction Generator Basics	pp. 388 – 392	
38.	Apr. 17	M	Basics of DC Machines 1	pp. 404 – 415	HW7; Ch-6: #5, 8, 15,20, 21
39.	Apr. 19	W	Basics of DC Machines 2	pp. 433 – 444	
40.	Apr. 21	F	DC Motors Equivalent Circuit	pp. 464 – 492	
41.	Apr. 24	M	DC Motors Speed-Torque		
42.	Apr. 26	W	DC Motors	---	
43.	Apr. 28	F	Special Topics		HW8; Ch-8: #1, 2, 3, 4, 13, 14, 22
44.	May 1	M	Special Topics	---	
45.	May 3	W	Review (Comprehensive Exam)		