

CENTER FOR INNOVATIVE TECHNOLOGIES
MASTER COURSE DOCUMENT

EMET 252 Motors and Motor Controls

FA 2023

Note: The contents of this outline are subject to change.

I Instructor and Office Hours

Note: Office hours are subject to change, please look on Starfish for up to date office hours.

Larry Feist, Program Chair and Professor for the Electro-Mechanical Engineering Technology Program
Email me or call me anytime with a question, comment or concern.

Email: larry.feist@cincinnatiatstate.edu

Phone: 513-569-1428

To make an appointment call the **CIT Office: 513-569-1743** or use **Starfish**

A course on DC and AC motors and motor control circuits and devices including the Variable Frequency Drive (VFD). Topics include: brushed and brushless motors and generators, Pulse Width Modulation (PWM), variable speed drives, speed/torque/power characteristics, industrial control circuits, electrical safety, and troubleshooting.

Prerequisites: EET 132 (minimum grade C), EMET 150 (or 140)

Lecture Hours: 2	Lab Hours: 3	Credit Hours: 3
Lab Fee: 60	Supplemental Fee: 0	Purpose:
<input type="checkbox"/> Transfer Assurance Guide Course (TAG)	<input type="checkbox"/> Transfer Module Course (TM)	
Course Format: Lec/Lab	Grading: A/B/C/D/F/I	
Delivery Method: <input type="checkbox"/> Web	<input checked="" type="checkbox"/> Hybrid	<input checked="" type="checkbox"/> Classroom
Semesters Offered: <input checked="" type="checkbox"/> Fall	<input checked="" type="checkbox"/> Spring	<input type="checkbox"/> Summer

Course Primary Text:

Title: Electrical Motor Controls for Integrated Systems	Edition: 5th
Author(s): Gary Rockis, Glen A. Mazur	
Publisher: ATP	

Supplemental Materials:

Course Learning Outcomes and Objectives:

1	Discuss the operating principle of three-phase and single-phase AC motors.
2	Understand the differences between brushed and brushless AC and DC motors.
3	Demonstrate common industrial motor control circuits, including programming a Variable Frequency Drive (VFD).

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4	Calculate torque, speed, and power of an electro-mechanical drive system
5	Practice electrical safety following NEC guidelines with special caution for high voltage circuits, including Lockout/Tagout.

Program Learning Outcome

1	The student will demonstrate an appropriate mastery of circuit analysis.
2	The student will demonstrate an appropriate mastery of CAD.
3	The student will demonstrate an ability to identify, analyze, and creatively solve technical and design problems.
4	The student will demonstrate an appropriate mastery of programmable controllers.
5	The student will demonstrate an appropriate mastery of motor control systems.
6	The student will demonstrate an appropriate mastery of programming robots.
7	The student must complete and pass an OSHA 10 General Industry course.

Course Content:

Topics	Lecture Topics	Chapter(s)	Assignment(s)
1	Review of electricity & magnetism, energy & power, test instruments	1, 3	Assignment 1 – Electrical Review Assignment 2 – Intro Electromagnetism
2	Introduction to motor principles, construction and troubleshooting of series-wound DC motor	13	Lab 1 – Series wound DC motor build & troubleshoot
3	Fundamentals of electromagnetic energy conversion machines, i.e. the motor/generator	9, 10	Lab 2 – Motor identification practice
4	Overview of DC brushed motor types, characteristics, and performance curves	13	Lab 3 – DC motor characterization (in three parts)
5	Testing, characterization, and validation of motor performance	--	Lab 3 – DC motor characterization <i>continued</i>
6	Overview of AC brushless/brushed motor types, characteristics, and performance curves	14, 18	Lab 4 – 3 ϕ AC synchronous machine “alternator” study
7	Fundamentals of solenoids and relays; time-delay relays; concept of power factor	7, 8	Lab 5 – Inspection of control relays EXAM 1
8	Contactors and motor starters; Industrial and electrical safety; Lockout/Tagout	4, 12	Lab 6 – Inspection of the magnetic motor starter
9	Introduction to industrial control circuits, field devices, symbols, standard wire colors, etc.	2, 5, 6	Lab 7 – 2-wire motor starter with 1 ϕ AC induction motor
10	Starting circuits, “three-wire” motor starter; solid-state relays	25	Lab 8 – 3-wire motor starter with 3 ϕ induction motor
11	Time delay circuits; additional input field devices	16	Lab 9 – Time-delay motor starter with limit switch

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12	Reversing motor starter; motor “soft start” and stop techniques	15, 17, 19	Lab 10 – Reversing motor starter with 3 ϕ induction motor EXAM 2
13	Introduction to the Variable Frequency Drive (VFD) for 3-phase motors, DC motor drives	26, VFD manual	Lab 11 – VFD introduction Lab 12 – VFD with remote control and analog input
14	Using the VFD digital and analog inputs & outputs, and “speed” versus “torque” modes	26, VFD manual	Lab 13 – VFD motor/generator control application
15	Motor and control troubleshooting, preventative maintenance	29, 30	Lab 14 – PLC motor/generator interface EXAM 3

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Lecture Material Format:

The lectures will be available in different formats. Example, I may put the lectures on the whiteboard, in Blackboard with PowerPoint, Word and/or PDF formats. Also, there may be handouts from time to time.

Homework, Labs and Test

Homework and labs will be PowerPoint, Word and/or PDF formats and the answers submitted via Blackboard **or In-Person. This may vary week to week, assignment-by-assignment.**

There will be 5% off per day late and a 0% after a week.

Required Student Materials:

During COVID-19 Pandemic ALL students are to wear a face covering in the class room at all times. This face covering must cover mouth and nose.

Grade Criteria /Scale:

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

Program Policies/Notices:

Students are responsible for material that may be assigned on this syllabus as well as additional information announced in class. The instructor will not rely exclusively on material from the textbook(s).

Good note taking is highly encouraged and helps makes learning successful. Often class sessions are conversational in nature with much of the information presented orally. Students are advised to capture key ideas and instructions on paper as formal notes will generally not be presented on the board.

Electronic-mail (e-mail) is a valuable communication tool and especially useful in distance learning and online education programs. The ease of sending e-mail however has encouraged the loss of writing etiquette and social courtesy. Good message composition has given way to fragments and absent punctuation. I encourage students to read *E-Mail Etiquette: The Do's and Don'ts* in hardcopy or online. *At a minimum, when sending e-mail messages please include in the subject line the class number and section. And, in the body, open with a greeting and close with a salutation including your name.*

The instructor will only correspond via email using your Cincinnati State account. This account should be checked at least once daily.

No Show Policy:

A student who enrolls but does not attend face-to-face class sessions or does not complete course work in online classes during the first two weeks of a 15 week course (or equivalent on flexible schedules) and does not officially drop or withdraw from the class, or withdraws from a course without having attended the class, will be designated as a "no show" (NS). Being marked a no show can have serious financial implications and cannot be reversed unless the NS is assigned in error. Consult the Cincinnati State Catalog for additional information.

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Adding, Dropping, or Withdrawing from a Course

The College's [Important Dates Chart](#), available on the College website, lists the dates when students may add, drop, or withdraw from a course after completing their initial registration. Student transactions to add, drop, or withdraw from a course are not official unless processed using the MyServices section of the Cincinnati State website or through the Office of the Registrar.

The appropriate forms and instructions for registration activity can be obtained in the Office of the Registrar or in the [Registration](#) section of the College website.

The following procedures apply to full-semester courses with start and end dates that coincide with the first and last days of the regular (15-week) semester schedule.

Flexibly scheduled courses (with start and/or end dates that do not coincide with the first and last days of the regular semester schedule) use similar procedures, but may have a different timeline. More information is available from the Office of the Registrar.

Adding a full-semester course

- Prior to the first course meeting of the semester, no approval is required to add an open course, unless the course has an "instructor consent" requirement.
- Once a course has met, the approval of the course instructor must be obtained.
- The fifth class day of the semester is the last day to add a course.

Dropping a full-semester course

- Courses dropped from the time of registration through the fourteenth calendar day of the semester do not need additional approval to be processed.
- The fourteenth calendar day of the semester is the last day to drop a course. In an instance when the fourteenth day falls on a weekend or holiday, the last day to drop a course is the preceding business day.

Withdrawing from a course - available online via MyServices

- The withdrawal period for full-semester courses begins each semester the day after the last day to drop a course (14th calendar day of the semester) and ends on the fifty-sixth instructional day. No additional approval is required to withdraw from a course during this period.
- The withdrawal period for flexibly scheduled courses begins after the day designated as the Last Day to Drop a Course for that course section, through the day designated as the Last Day to Withdraw from that course section. More information is available from the Office of the Registrar.
- Only in circumstances beyond the student's control will a withdrawal be permitted after the fifty-sixth instructional day. All official late withdrawals must be approved by the course instructor and the division dean.
In cases where late withdrawal is not approved, the student receives the grade assigned by the instructor.

Non-Attendance Leading to Administrative Withdrawal

A student who is enrolled in a course and does not attend any class session of that course for the consecutive equivalent of 20% of the total course length at any time during the semester may be

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administratively withdrawn from the course. Please consult individual instructors' class policies for information on how attendance is taken and how many class sessions comprise 20% of the course

College Communication:

All Cincinnati State students have a SurgeMail account. Students should check email frequently for important announcements and communications from faculty members, advisors, and service offices. Students should conduct all email communication with faculty and staff of the College using SurgeMail or Blackboard.

Information Technology Help Desk:

The College's Information Technology Services Help Desk can assist online students with technical problems related to Blackboard, email, or other College technology services. Help Desk assistance is available at (513) 569-1234 and by email at itshelpdesk@cincinnatiastate.edu.

Academic Integrity:

Ethical conduct is the obligation of every member of the Cincinnati State community. Violations of academic integrity that constitute serious breaches of ethical behavior include, but are not limited to cheating, fabrication, facilitating academic dishonesty, and plagiarism. If an instructor has reason to believe a violation of academic integrity has occurred, the Academic Integrity Violations Procedure will start in the classroom as outlined by the instructor's syllabus. Penalties imposed by the instructor are limited to those actions whose ramifications fall within the confines of the class, such as failure of the assignment or failure of the course. The instructor has the option of filing a report of the incident with the Provost for documentation purposes. Only the Provost can impose suspension or dismissal from the College.

Disability Services:

The Office of Disability Services (ODS) ensures that students with special needs receive the academic accommodations they need in their courses of study. Any student or prospective student who has a disability, as defined under the Americans with Disabilities Act (ADA) of 1990 or the guidelines for section 504 of the Rehabilitation Act of 1973, may register with ODS. Students who are eligible or think they might be eligible for may visit the office in Main 129 or contact ODS by phone (513) 569-1775 or email disabilities@cincinnatiastate.edu.

Title IX:

Title IX is a federal civil rights law that prohibits discrimination on the basis of sex in the College's programs and activities. Sexual harassment, including sexual violence and retaliation, are forms of discrimination prohibited by Title IX. Staff and faculty have a **"duty to report and a duty to act"** in instances of situations or observations that would meet discriminatory and/or harassment guidelines under Title IX. If you are unsure of someone's duties and abilities to maintain privacy, ask them before speaking to them. To assure confidentiality in instances that might qualify, problems may be reported to College Counseling Services. Reports of sexual violence, assault, discrimination, or harassment may also be reported by contacting the Director of Human Resources at (513) 569-1565 or hr@cincinnatiastate.edu. Incident reports may also be filed online: <https://publicdocs.maxient.com/incidentreport.php?CincinnatiState>.

Program Policies/Notices: Plagiarism: (Produced by Writing Tutorial Services)

What is Plagiarism and Why is it Important?

In college courses, we are continually engaged with other people's ideas: we read them in texts, hear them in lecture, discuss them in class, and incorporate them into our own writing. As a result, it is very important that we give credit where it is due. Plagiarism is using others' ideas and words without clearly acknowledging the source of that information.

How Can Students Avoid Plagiarism?

To avoid plagiarism, you must give credit whenever you use

- another person's idea, opinion, or theory;
- any facts, statistics, graphs, drawings—any pieces of information—that are not common knowledge;
- quotations of another person's actual spoken or written words; or
- paraphrase of another person's spoken or written words.

Absence for Religious Observance:

Students are permitted to request up to three days each semester for an excused absence from class for observance of a religious holiday (or to take part in organized activities conducted under the auspices of a religious or spiritual belief system) that is part of your sincerely held religious beliefs and practices. You must notify me in writing within fourteen (14) days of the first day of instruction of this course if you plan to be absent for a religious holiday, and you must talk to me about a process and schedule for making up required work you miss. Additional information about this policy is on the College website (<https://www.cincinnati-state.edu/catalog-academic-policies/religious-observance-policy>).

Financial Aid Recipients:

The following actions have eligibility implications for financial aid recipients: nonattendance, dropping courses, withdrawing from courses, repeating courses, academic progress, and the number of credit hours attempted and completed. You are strongly encouraged to seek financial aid advising throughout the semester if you have any questions about eligibility implications. Call (513) 569-1530 or email fa@cincinnati-state.edu.

Additional Support Services

- You are encouraged to use support services available such as those listed below. Please call the number provided for services on Main or at other College locations as well.
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| ✓ Tutoring Center | 513-569-1614 | Main 261 |
| ✓ Writing Center | 513-569-1736 | Main 235 |
| ✓ Math Center | 513-569-1614 | Main 228B |
| ✓ Counseling Center | 513-569-5779 | Main 171 |
| ✓ ESL Resources | 513-569-4769 | Main 196 |

COVID 19 INFORMATION: <https://www.cincinnati-state.edu/COVID-19#>

STUDENT STATEMENT of PERSONAL RESPONSIBILITY: <https://www.cincinnati-state.edu/wp-content/uploads/2021/04/Cincinnati-State-Student-Personal-Responsibility-Statement-REV-Apr2021.pdf>

Works Cited

Produced by Writing Tutorial Services, Indiana University, Bloomington, IN. [Plagiarism: What It is and How to Recognize and Avoid It](http://www.indiana.edu/~wts/pamphlets/plagiarism.shtml). 24 April 2004. <<http://www.indiana.edu/~wts/pamphlets/plagiarism.shtml>>.

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