Electric Motor Control Systems

TEAM - 1610 101

Course Description

This course teaches control of three-phase AC electric motors found in industrial applications, starting, reversing, jogging, and motor principles. Coverage of motor selection, diagrams, motor control devices, operation, installation, and troubleshooting. This course includes motor starter circuits, contactors, reduced voltage starting techniques, relays, braking, and variable frequency AC drives. It is recommended that students complete TEAM 1050 & TEAM 1060 prior to taking this course.

Semester(s): All

Course Student Learning Outcomes

- Explain requirements for electrical safety in the workplace, protection against electric shock, grounding, and lockout procedures.
- Interpret electrical drawings including various symbols, abbreviations, ladder diagrams, wiring-single line- block diagrams, motor terminal connections, motor nameplate, and terminology.
- Identify motor transformers and distribution systems, power distribution systems, transformer principles, and transformer connections.
- Use various motor control devices including manually operated switches, mechanically operated switches, sensors, and actuators.
- Explain the use and operation of electric motors, including motor principles, direct current motors, three-phase alternating current motors, single-phase alternating current motors, alternating current motor drives, motor selection, motor installation, motor maintenance and troubleshooting.

- Connect and operate various contactors and motor starters including magnetic contactors, considering contactor ratings, enclosures, and solid-state types.
- Install various types of relays including, electromechanical control relays, solid-state relays, timing relays, latching relays, and relay control logic.
- Connect and operate motor control circuits including motor starting, motor reversing, jogging, motor stopping, and motor speed control devices.
- Follow industry guidelines such as National Electrical Code (NEC) for motor installation.
- Define motor torque and horsepower.
- Explain the operation of variable frequency AC drives and applications in industrial processes.
- Test a control transformer.
- Connect and operate a basic electric control circuit using common Input and output devices.
- Connect and operate basic timer control circuits.
- Troubleshoot motor control systems.

College Wide Student Learning Outcomes

- Students acquire substantive knowledge in their intended major
- Students think critically

Course Prerequisites

As listed in catalog

Transfer/Certification/Licensure/Employment Information

As listed in SLTC transfer information.

Engagement Plan

Example language:

- We will respond to email within 24 to 48 hours except Saturday and Sunday. We will offer feedback on major assignments within 24 to 48 hours except Saturday and Sunday] The best way to contact us regarding course work is via the Canvas Inbox, as I will prioritize this email over other modes of communication. Other issues use Outlook.

Keys for Success (how to succeed in the course)

Regular attendance and making daily progress is critical.

Staying on track and working on a regular basis.

Ask for assistance when needed.

Complete all assignments as listed.

Course Content Advisory

PACE Plans are designed to keep you on PACE and making good progress.

Required Text or Materials

Title: As listed in course introduction module

For more information on textbook accessibility, contact Accessibility & Disability Services at ads@slcc.edu.

Brief Description of Assignments/Exams

Grading Criteria & Assessment Definitions
Grading System: The list below is how letter grades will be defined for the course work required
and completed. Each course will have specific requirements as listed in the canvas course site.

Letter Grades Scale:
The SLTC Electronics Department has as a minimum grade requirement of: C+ (77%) as a passing grade for all courses and all course assignments and assessments.

Grades for SLTC Electronics Department are based on the categories
assignment/assessments areas
below: In most courses there are all 4 categories as shown below and the letter grade will be based
upon the average of the applicable categories. There are courses that do not have 4 categories and
those exceptions are below.

4 - Categories

Formative Assessment Cognitive
Formative Assessment Performance-Based
Summative Assessment Cognitive
Summative Assessment Performance-Based

Items
Theory/Quizzes Weight
25%
Skills Based Hands-on Weight
25%
Theory/Quizzes/Exams Weight
25%
Skills Based Hands-on Weight
25%
100%

Criteria
100% of course work @ minimum grade of 77% for each assignment.
100% of course work @ minimum grade of 77% for each assignment.
100% of course work @ minimum grade of 77% for each assignment.
100% of course work @ minimum grade of 77% for each assignment.

Any 3 - Categories Courses - Where there are only a SAC or SAP - but not both. Or not a FAC and/or
FAP. Weight 33.33%
Formative Assessment Cognitive
Formative Assessment Performance-Based
Summative Assessment Cognitive or Summative
Assessment Performance- Based

Items
Theory/Quizzes
Skills Based Hands-on
Theory/Quizzes/Exams Skills Based Hands-on
100%

Criteria
100% of course work @ minimum grade of 77% for each assignment.
100% of course work @ minimum grade of 77% for each assignment.
100% of course work @ minimum grade of 77% for each assignment.

2 - Categories assessments/assignments each will carry 50% of total weight for a total of 100%.

Formative Assessment – During the Learning Cycle
• Formative assessment is a term for any type of assessment or assignment used to gather
student
feedback and improve instruction. Formative assessments occur during the learning process, often
while students are engaged in other activities. Anecdotal records, periodic quizzes or essays,
diagnostic tests and in-class or homework assignments are all types of formative assessment because
they provide information about a student's progress. Any Formative Assessment serves in most cases

as the determining tool that “says” you as a student are ready and able to “Demonstrate Proficiency” of the required course outcomes/objectives.

Therefore, any weakness or missed objectives that need addressing during the Formative cycle will
require some level of remediation before any Summative Assessments are allowed.

You are encouraged to ask for assistance with concepts that are challenging.
Summative Assessment – Demonstration of Proficiency
• Summative assessment occurs at various points in a course and may include both cognitive and
performance-based assessments.
• This is a time that you as a student should be able to complete the assignments and meet the
criteria listed for the assessment.
• Objectives must be performed to the level that would meet industry requirements.

Assignment Schedule

Due Date	Assignment Name	Assignment Type	Points
	Module 11 - Basic Timer Control: On-Delay and Off-Delay - FAC	Assignment	100
	Module 14 - Reduced Voltage Starting (85-MT5B) - 1 Reduced Voltage Starting Circuits - FAC	Assignment	100

Due Date	Assignment Name	Assignment Type	Points
	Module 14 - Reduced Voltage Starting (85-MT5B) - 2 Power Generation and Distribution - FAC	Assignment	100
	Module 16 - Variable Frequency AC Drive (85-MT5C) - 1 Introduction to Variable Frequency AC Drives - LAPs - FAP	Assignment	100
	Module 16 - Variable Frequency AC Drive (85-MT5C) - 2 Variable Frequency AC Drives - Speed and Torque Control - LAPs - FAP	Assignment	100
	Module 16 - Variable Frequency AC Drive (85-MT5C) - 3 Variable Frequency AC Drives - Accel./Decel. and Braking - LAPs - FAP	Assignment	100
	Module 16 - Variable Frequency AC Drive (85-MT5C) - 4 Fault Diagnostics and Troubleshooting - LAPs - FAP	Assignment	100

Due Date	Assignment Name	Assignment Type	Points
	Module 18 - Electronic Sensors (85-MT5D) - 1 Electronic Sensors - LAPs - FAP	Assignment	100
	Module 10 - Automatic Input Devices 1 - FAC	Assignment	100
	Module 12 - Assessment 2 - SAP - Faculty Tool	Quiz	20
	Module 13 - Motor Braking (85-MT5A) - FAC	Assignment	100
	Module 16 - Variable Frequency AC Drive (85-MT5C) - 1 Introduction to Variable Frequency AC Drives - FAC	Assignment	100
	Module 16 - Variable Frequency AC Drive (85-MT5C) - 2 Variable Frequency AC Drives - Speed and Torque Control - FAC	Assignment	100

Due Date	Assignment Name	Assignment Type	Points
	Module 16 - Variable Frequency AC Drive (85-MT5C) - 3 Variable Frequency AC Drives - Accel./Decel. and Braking - FAC	Assignment	100
	Module 18 - Electronic Sensors (85-MT5D) - 1 Electronic Sensors - FAC	Assignment	100
	Module 20 - SCR Speed Control (85-MT5F) - 1 SCR Motor Control - FAC	Assignment	100
	Module 4 - Control Ladder Logic - FAC	Assignment	100
	Module19 - Electronic Counter (85-MT5E) - 1 Timers and Counters - FAC	Assignment	100
	Summative Assessment 3 - Cognitive - SAC	Quiz	15
	Summative Assessment 5 - Cognitive - SAC	Quiz	12
	AMATROL Fault Pro Final submission SAP	Assignment	100
	Introduce Yourself	Discussion	0

Due Date	Assignment Name	Assignment Type	Points
	Introduce Yourself	Discussion	0
	Module 1 - Introduction to Electric Motor Control - LAPs - FAP	Assignment	100
	Module 1 - Introduction to Electric Motor Control - FAC	Assignment	100
	Module 10 - Automatic Input Devices 1 - LAPs - FAP	Assignment	100
	Module 11 - Basic Timer Control: On-Delay and Off-Delay - LAPs - FAP	Assignment	100
	Module 13 - Braking Methods - LAPs - FAP	Assignment	100
	Module 15 - Assessment 3 - SAP - Faculty Tool	Quiz	16
	Module 16 - Variable Frequency AC Drive (85-MT5C) - 4 Fault Diagnostics and Troubleshooting - FAC	Assignment	100
	Module 17 - Assessment 4 - SAP - Faculty Tool	Quiz	16

Due Date	Assignment Name	Assignment Type	Points
	Module 2 - Manual Motor Control and Overload Protection - LAPs - FAP	Assignment	100
	Module 2 - Manual Motor Control and Overload Protection. - FAC	Assignment	100
	Module 20 - SCR Speed Control (85-MT5F) - 1 SCR Motor Control - LAPs - FAP	Assignment	100
	Module 21 - Assessment 5 - SAP - Faculty Tool	Quiz	12
	Module 3 - Control Transformers - LAPs - FAP	Assignment	100
	Module 3 - Control Transformers - FAC	Assignment	100
	Module 4 - Control Ladder Logic - LAPs - FAP	Assignment	100
	Module 5 - Control Relays and Motor Starters - LAPs - FAP	Assignment	100
	Module 5 - Control Relays and Motor Starters - FAC	Assignment	100

Due Date	Assignment Name	Assignment Type	Points
	Module 6 - Assessment 1- SAP - Faculty Tool	Quiz	8
	Module 7 - Introduction to Troubleshooting - LAPs - FAP	Assignment	100
	Module 7 - Introduction to Troubleshooting- FAC	Assignment	100
	Module 8 - Systems Troubleshooting - LAPs - FAP	Assignment	100
	Module 8 - Systems Troubleshooting - FAC	Assignment	100
	Module 9 - Reversing Motor Control - LAPs - FAP	Assignment	100
	Module 9 - Reversing Motor Control - FAC	Assignment	100
	Module19 - Electronic Counter (85-MT5E) - 1 Timers and Counters - LAPs - FAP	Assignment	100
	Summative Assessment 1 - Cognitive - SAC	Quiz	25

Due Date	Assignment Name	Assignment Type	Points
	Summative Assessment 2 - Cognitive - SAC	Quiz	25
	Summative Assessment 4 - Cognitive - SAC	Quiz	18

Grading Scale

Grade	Grade Range
A	92-100%
B	77-91%
F	0 to 76%

How to Navigate to Canvas

Institutional Policies

As members of our academic community, we would like to invite you to review the Institutional Syllabus which covers important policies and procedures. This document contains important links for students on the code of student rights and responsibilities, academic integrity, and grading policies, Title IX and other important acknowledgements. By familiarizing yourself with this information, you can help us create a safe and respectful environment for everyone.

For more information, navigate to the Institutional Policies tab on the Institutional Syllabus page.

Learning Support and Tutoring Services

We are pleased to offer a range of tutoring and learning support services to help you achieve your academic goals. Whether you need assistance with a specific subject or want to improve your study skills, you have many options for tutoring or other support.

To learn more about the services we offer and how to access them, visit the Institutional Syllabus page under the Tutoring and Learning Support tab. We encourage you to take advantage of these resources to help you succeed in your studies. If you have any questions or would like to schedule a tutoring session, please don't hesitate to reach out to us. We are here to support you in any way we can.

Advising and Counseling Support Services

At our institution, we are committed to supporting your academic and personal growth. That's why we offer a range of advising and counseling services to help you navigate the challenges of college life. To learn more about the resources available to you and how to access them, visit the Institutional Syllabus page under the Advising and Counseling Support Services tab. Our advising team and the support centers across campus are here to support you in achieving your goals and overcoming any obstacles you may face.

Student Academic Calendar

As students you should be aware of all important dates in the semester, such as the day that courses begin and end, as well as the drop date and the last day to withdraw. To learn more about those dates, navigate to the Student Academic Calendar below:

SLCC Student Academic Calendar

Additional Policies

As listed on SLTC/SLCC web sites as it applies to SLTC students.

Course Work

All course work is to be submitted by mid-night of the last day of the semester.

Any courses not completed within a semester will require the student to begin a fresh, with no credit for previous course work.

The exception to the above is for students that qualify for an "I" incomplete.

All NIDA and Amatrol and similar cloud based work must been completed during the registered semester and all submissions are required to have that respective semester date stamp.

Conditional Procedures. The student in any respective course.

1. If they have started but did not complete the course - due to non-attendance or lack of work. Grade earned at that point should be entered. B,C,D, E. etc.

2. They registered - but did not start or complete any work - after 10 days (including weekends), please use non-attendance drop