

**Nashville State Community College
Science, Technology, Engineering, and Math
Electrical Engineering Technology**

Master Course Syllabus

EETC 2333 Industrial Electronic Controls

Course Information:

Course Title: EETC 2333 Industrial Electronic Controls

Credits: 3

Class Hours: 3

Course Description:

Advanced study of control circuits and electronic devices used in operating machines and processes in industry. Topics include design of control circuits using relay logic and solid-state logic, solid-state control of DC motors, AC motors, and stepper motors, power supplies, operational amplifiers, thyristors, transducers, timers, optical and thermal devices, and other components such as programmable controllers to show how automated equipment can be accurately controlled. Lab exercises are included to demonstrate course topics

Prerequisites: EETC 1314

Instructor Information:

Name: Don Pelster

Email: don.pelster@nsc.edu

Office Phone: 615-353-3514

Office Location: W-46

Office Hours: See Instructor Schedule in D2L

Required Textbook(s) & Other Materials:

Textbook(s): Electric Motors and Control Systems, 3rd edition, 2020, Petruzella, McGraw Hill

ISBN: 9781260258059

Reference Materials:

Supplies:

Once enrolled, all students should verify that they have the correct textbook and materials information by consulting the D2L/NS Online shell for the course. If you are registered with the Access Center and require an alternate format for the textbook and other course materials, please contact the Access Center at 615-353-3721, 615-353-3741, or accesscenter@nsc.edu.

Course Outcomes:

Upon successful completion of this course, students should be able to:

- *Explain the operation of an electronic control system in block diagram form.*
- *Identify and explain the operation of industrial electrical control devices.*
- *Identify and explain how ladder logic control systems are used in advanced automated industrial control systems.*

Course Competencies:

The following are detailed course competencies intended to support the course outcomes:

- Write simple ladder logic diagrams, and implement them
- Explain the operation of power control devices
- Explain the operation of motors and motor starting circuits lab
- Create and correctly wire relay ladder logic circuits
- Correctly wire motor starter power circuits
- Understand the operation and mathematical analysis of solid-state devices such as switching transistors, integrated circuits and industrial diodes.
- Explain (in response to both essay and quantitative questions) the theory, construction and circuit uses for SCR's, triacs, and other thyristors.
- Become familiar with the theory and operation of sensors and transducers found commonly in industrial measurement and control systems.
- Describe the operation of solid-state power control systems using switching transistors for proportional AC and DC power control.
- Explain the operation of Start/Stop control, Dynamic Braking, PWM AC motor speed control, SCR DC motor speed control, and reduced voltage starting.
- Explain the operational concepts involved in PID closed loop control for speed, level, flow, temperature, and pressure. Become familiar with basic PID algorithms.
- Explain the methods and effects of power distribution of Industrial Electronic Controls.
- Correctly size NEMA combination starter.
- Correctly size overload protection for rotating machinery
- Recognize control device symbols and read relay logic control diagrams.
- Design control circuits using relay logic.
- Use a systematic approach in the trouble shooting from an electrical drawing.
- List the modes of operations, constant horsepower variable torque, constant torque variable horsepower, and define the application for each mode.
- Define quadrant control.
- Explain the operating characteristics of the thyristor in AC and DC control.
- Explain the operation of single-phase and three-phase solid-state controlled rectifier.
- Identify the parts (blocks) of a solid-state DC controller; explain the operation of each part.
- Explain the various methods of feedback (voltage, tach, rpg).
- Define the theory of operation of the solid-state inverter.
- Explain the operation of the inverter in the control of AC rotating machinery (voltage/frequency ratio).
- Explain the differences between the current feed inverter and the voltage feed inverter.
- Explain methods of force commutation.

- Explain the operation of the Brushless DC motor.
- Define the control of the step-motor: half step, full step mode and micro stepping.

The following are general education competencies intended to support the course outcomes:

Topics to Be Covered:

(List topics in relevant order)

Course Assessments:

The following performance assessments will be used to demonstrate students' understanding, knowledge, and skills:

Knowledge assessments will be given on the lecture and reading material. A written technical report is required on a course related topic. The report is presented in class using Power Point. The presentation is evaluated on a 100 point rubric that is standard for the Electrical Engineering Technology program. Mastery of the material is also evaluated by the successful completion of hands-on labs.

Grading Policy:

Area	Percent
Report	5
Homework	5
Labs	40
Quizzes	20
Final	30
Total	100

Late Work Policy & Make-up Procedures for Missed Assignments and Work:

All work must be completed and turned in by the due date. No work will be accepted after the last class meeting.

Attendance Policy

Students are expected to attend all scheduled classes and laboratories. Absences in a course may affect a student's final grade. The student is responsible for all assigned work in the course regardless of excused or unexcused absences. Tardiness may also affect a student's final grade.

In online courses, attendance is signaled by logging on to the D2L/NS Online shell, participating as prompted (e.g., responding to an instructor's email, posting to a discussion board) and/or completing and submitting assignments. Campus closures do not affect attendance and assignment completion in online courses.

(Each instructor will provide policy, especially how attendance influences student assessment and grading.)

Grading Scale:

Letter Grade	Percentage Range
A	90 – 100
B	80 – 89
C	70 – 79
D	60 – 69
F	Less than 60

FA

According to NSCC policy, if a student fails a course, but has not officially withdrawn from the course, and her/his last date of attendance is before the last date to withdraw (*Nov 1*), the student will receive a grade of FA (i.e., “Failure for Attendance Reasons”).

FN

An FN is awarded to students who never attended class.

Technology Statement

Nashville State's classes are considered to be web-enhanced. Faculty have an expectation that students will use a computer and the Internet to complete assignments, engage in online discussions, and access various course materials through D2L/NS Online course shells. Computers are available for student use at each campus during campus open hours.

D2L/NS Online and myNSCC

It is students' responsibility to check D2L/NS Online course shells for all enrolled courses and myNSCC, including student email, on a regular basis. These are the official communication channels between the college and students, who are responsible for the information communicated through those channels. D2L/NS Online contains specific course information and myNSCC contains information important for other purposes.

ADA Compliance Statement

Nashville State complies with the Americans with Disabilities Act (ADA). If you require accommodations for any courses in which you are enrolled, contact the Access Center at 615.353.3741 or 615.353.3721, or e-mail accesscenter@nsc.edu. If you are registered with the Access Center and require an alternate format for the textbook and other course materials, please contact the Access Center.

Classroom Misconduct

Nashville State Community College has a zero-tolerance policy for disruptive conduct in the classroom. Students whose behavior disrupts the classroom will be subject to disciplinary measures. Please review the [Nashville State Student Code of Conduct policy](#). Please be aware that children are not allowed in class or to be left unattended on campus.

Academic Misconduct

Any form of academic dishonesty, cheating, plagiarizing, or other academic misconduct is prohibited. Students are responsible for understanding and abiding by the [Academic Misconduct Policy](#) in the Nashville State Student Code of Conduct. In addition to other possible disciplinary measures that may be applied through regular college procedures as a result of academic dishonesty, the instructor has the

authority to assign an “F” or a “zero” for the exercise, paper, or examination, or to assign an “F” for the course. Students may appeal through the appropriate college grade appeal procedures.

Academic Early Alert System

Nashville State Community College uses an Early Alert System to let students know of a faculty member’s concern in one or more of these academic areas: lack of attendance, lack of classroom participation, late or missing assignments, and/or poor performance on assignments/tests. *Please note that Early Alerts do not affect a student’s academic standing. If you receive an Early Alert email, please see your instructor and your academic advisor as soon as possible.

RAVE Emergency Alert System

Emergency events can happen at any time and Nashville State Community College wants to be able to notify students if and when they occur. For this reason, all students have been enrolled in the free RAVE alert system. If you have not already done so, please log in at <https://www.getrave.com/login/nscc> to confirm and update your contact information and notification preferences. It is critical that your information be correct so that you will receive any emergency notifications. Your RAVE Username is your NSCC email address. If you've never received an email from RAVE with your password, or if you need to reset your password, select “Forgot your password?” and a new password will be emailed to you. Should the RAVE system indicate “user not found”, select Register and create your own RAVE account.

Inclement Weather & Campus Closings

Nashville State will use the RAVE alert system to send a text message to students, staff, and faculty about adjusted hours of operation and/or closings at individual campuses. All students should check the Nashville State web site home page at www.nsc.edu for announcements on campus closures, which may vary from campus to campus. Campus closures will also be announced on local television stations. Students should use their own best judgment in determining whether to report to campus during inclement weather when classes are not cancelled.

Even when campuses are closed, students are still responsible for completing all assigned work. When classes are cancelled, faculty will post online assignments and any additional instructions in the D2L/NS Online course shell. Check D2L/NS Online for a message from your instructor regarding your online assignment requirements. Faculty have discretion over adjusting deadlines or due date for assignments, but students are responsible for completing all assigned work by the due date established by the instructor.

Class Cancellation Policy

If the class is cancelled, the instructor will notify all students by posting in the D2L/NS Online course, e-mailing through D2L/NS Online, and/or by posting a sign on the classroom door. In the event of class cancellation, students must access D2L/NS Online to complete classwork and the assignment that will be posted in the course D2L site.