Nashville State Community College
Computer and Engineering Technologies Division
Electrical Engineering Technology

Master Course Syllabus

EETH 2010 Industrial Electronic Controls
3 Credits
3 Class Hours
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.

Prerequisites: EETH 1110

Instructor Information:
Name:
Email:
Office Phone:
Office Location:
Office Hours:

Textbook and Other Materials:
ISBN: 9780826912268

Reference Materials:
Supplies:

Course Outcomes:
Upon successful completion of this course, students should be able to:
- Explain the operation of industrial electrical control devices
- Write simple ladder logic diagrams, and implement them
- Explain the operation of power control devices
- Explain the operation of motors and motor starting circuits

Course Competencies:
The following are detailed course competencies intended to support the course outcomes
- Explain the operation of an electronic control system in block diagram form.
- Identify and explain the operation of industrial electrical control devices.
• 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 and use of typical industrial motors, including the torque, horsepower, and speed characteristic curves.

• Identify and explain the purposes for the use of various electrical power control devices used in the starting and control of high power industrial motors.

• Identify and explain how ladder logic control systems are used in advanced automated industrial control systems.

• 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.

• Convert relay logic into solid state logic.

• 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 A.C. and D.C. 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.

Course Assessments:
The following performance assessments will be used to demonstrate students' understanding, knowledge and skills:
Quizzes and final exam will be administered consisting of both quantitative questions based on assigned homework and conceptual essay type questions where the student will explain in his own words an understanding of the material. These essays are graded for both technical accuracy and clarity. A written technical report is required on a topic requiring more depth of information and must additionally be presented to the class in a PowerPoint format to demonstrate his or her understanding of the material. This presentation is evaluated on a 100 point sheet that is standard for the Electrical Engineering Technology program.

Grading Policy
Homework 20%
Quizzes 60%
Final 20%

Grading Scale:
A (90-100%), B (80-89%), C (70-79%), D (60-69%), F (less than 60%)

Topics to Be Covered:

Attendance Policy
A student is expected to attend all scheduled classes and laboratories. Each instructor will formulate an attendance policy and provide it on the course syllabus. Absences are counted from the first scheduled meeting of the class, and it is the responsibility of each student to know the attendance policy of each instructor in whose class he/she is enrolled. If a student is absent from a class, he/she should give an advanced explanation to the instructor. 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.
Failure to attend class will result in a final course grade of “FA” or “FN” (see explanation below) depending on the individual instructor’s course policy.
FA= failure, attendance-related (unofficial withdrawal) Last recorded date of attendance required.
FN= failure, never attended class (unofficial withdrawal)

Student Communication Channels
It is the student’s responsibility to check D2L and MyNSCC email on a regular basis. These are the official communication channels between the college and students. Students are responsible for the information communicated through those channels. D2L contains specific course information and MyNSCC contains information important for other purposes.

Early Warning System
Nashville State Community College has implemented an Early Warning System to notify students via e-mail about academic problems such as poor classroom attendance, poor performance on assignments/tests, poor communication skills, late/missing assignments, and/or lack of classroom participation. Please note that Early Warning Alerts do not affect a student’s academic standing.

ADA Compliance Statement
Nashville State complies with the Americans with Disabilities Act. Please contact the Access Services Coordinators at 615-353-3721 or 615-353-3741 if you would like to arrange ADA accommodations.

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 sanctions. Please consult your Student Handbook for more specific details.
The instructor has primary responsibility for control over classroom behavior and maintenance of academic integrity. He/she can order temporary removal or exclusion from the classroom of any student engaged in disruptive conduct or in conduct which violates the general rules and regulations of the College.
Disruptive behavior in the classroom may be defined as, but is not limited to, behavior that obstructs or disrupts the learning environment (e.g., offensive language, harassment of students and professors, repeated outbursts from a student which disrupt the flow of instruction or prevent concentration on the subject taught, failure to cooperate in maintaining classroom decorum, etc.), the continued use of any electronic or other noise or light emitting device which disturbs others (e.g., disturbing noises from beepers, cell phones, palm pilots, lap-top computers, games, etc.).
Please be aware that children are not allowed in class or unattended on campus.

Academic Dishonesty (Honor Code)
Any form of academic dishonesty, cheating, plagiarizing, or other academic misconduct is prohibited. “Plagiarism may result from: (1) failing to cite quotations and borrowed ideas, (2) failing to enclose borrowed language in quotation marks, and (3) failing to put summaries and
paraphrases in your own words (A Writer’s Reference 331). Academic dishonesty may be defined as, but is not limited to, intentionally trying to deceive by claiming credit for the work of another person, using information from a web page or source without citing the reference, fraudulently using someone else’s work on an exam, paper, or assignment, recycling your own work from another course, purchasing papers or materials from another source and presenting them as your own, attempting to obtain exams/materials/assignments in advance of the date of administration by the instructor, impersonating someone else in a testing situation, providing confidential test information to someone else, submitting the same assignment in two different classes without requesting both instructor’s permission, allowing someone else to copy or use your work, using someone else’s work to complete your own, altering documents, transcripts or grades, and forging a faculty/staff member’s signature.

In addition to other possible disciplinary sanctions that may be imposed 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.

**Inclement Weather Policy**

In the event of an inclement weather event, check the Nashville State web site home page at www.nscc.edu for announcements on campus closures. Campus closures will also be announced on local television stations (channels 2, 4, 5, and 17).

When classes are cancelled, an online assignment will be posted in NS Online. Check your NS Online email for a message from your instructor regarding your online assignment requirements. Even though classes may be cancelled, some areas, i.e. Testing Center, may be open. However, you should check before commuting to campus.

The Vice President for Academic Affairs and the Director of Security are responsible for cancellation decisions during an inclement weather event for the Nashville State main campus and the Southeast campus. Cookeville, Waverly, and Dickson Campus Directors will make class cancellation decisions based on conditions in their respective areas. Decisions about class cancellations are based on actual conditions, not forecasts. The perspective used for making decisions is that of the college as an employer, not as a K-12 institution. Students should use their own best judgment in determining whether to report to campus during inclement weather when classes are not cancelled.

**NOTE:** This syllabus is meant simply as a guide and overview of the course. Some items are subject to change or may be revised at the instructor’s discretion. Each instructor will further clarify their criteria for grading, classroom procedures, attendance, exams and dates, etc. on his/her course syllabus.