

Nashville State Community College
School of Science, Technology, Engineering, and Mathematics
Electrical Engineering Technology Program

Fall 2023 Master Course Syllabus
EETC 1370-Transformers/Rotating Machines

(This master course syllabus template is a general guide for providing an overview of each course offered at Nashville State. Each instructor will further clarify specific criteria for grading, classroom procedures, attendance, exams and dates, etc. on their individual course syllabus. Prompts for individual adaptations are italicized and in parentheses; faculty should remove or replace these prompts when creating master syllabi and their own individual syllabi if they have not been removed previously.)

The purpose of the syllabus is to tell you how the course is organized, what the expectations are, and how you will be graded. In addition, there is important information about how the college will operate during severe weather and how the college will communicate with you. The syllabus is not a contract. Instead, it is meant to help you succeed in this course. If any of the content changes during the semester, you will be notified.

Course information:

Course Title: EETC 1370-Transformers/Rotating Machines

Credits: 3

Class Hours: 3

Course Description: *This is an intermediate level course that provides an understanding of electrical machinery.* Topics include transformer theory and application, single-phase and three-phase connections, auto-transformers, special instrument transformers, the development of horsepower, torque, efficiency as related to the operation of D.C. motors and generators, single-phase and three-phase motors, alternators, stepper motors, resolvers, synchros, and comparisons in the performance of machines. Lab exercises are included to demonstrate course topics.

Prerequisite: EETC 1314

Instructor Information:

Name:

Email:

Office Phone:

Office Location:

Office Hours:

Instructor Zoom Room link:

Class Session Zoom Link Information (if virtual):

Required Textbook(s) & Other Materials:

- **Textbook(s):** Electrical Transformers and Rotating Machines, Herman, Thomas/Delmar, 4th edition, 2016, paper, 1305494814, 9781305494817

Reference Materials: Ugly's Electrical Reference, Hart, Burleson/UPA, spiral

Supplies: **Quad Ruled Notebook, Laptop (Can be checked out from the Library), Casio FX115 Scientific Calculator (Amazon Link)**

Once you have registered for your courses, you should make sure you have the correct textbook and materials for each course. Before courses begin, you can do this by looking up your courses on the bookstore's website (<https://www.bkstr.com/nscctestore/shop/textbooks-and-course-materials>) using your A# or by entering your course information. If you are registered with the Access Center and need an alternate format for the textbook and other course materials, please contact the Access Center at 615-353-3721, 615-353-3741, or accesscenter@nscctest.edu.

Honors Option: Honors credit is available in some classes. If you are interested in participating in the Honors Program, please see your instructor within the first four weeks of class.

Course Outcomes:

Course Outcomes:

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

- *Calculate transformer variables based on turns ratios*
- *Explain the parts, functions and characteristics of a DC machine.*
- *Explain the parts, functions and characteristics of both single phase and three phase AC machines.*

Course Competencies:

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

- Draw electrical schematic of proper connection of single phase and three phase, wye and delta, transformer circuits.
- Draw electrical schematic of proper connection of both DC and AC machines.
- Construct and take measurements on single and three phase transformer configurations.
- Construct and take measurements on types of electric motors.
- Explain the theory of mutual inductance.
- Calculate transformer ratio relations.
- Compute transformer equivalent circuits.
- Calculate percent impedance, short circuit calculations.
- Make polarity test for transformer, identify leads.
- Make proper connections on transformers with multiple windings, three-phase delta and wye configurations.
- Correctly size transformers to match load demands.
- Identify the parts dealing with the construction of the DC machine.
- List the different type of winding used in the construction of the DC machine.
- Define the term "commutation".
- Define armature reaction, its effects and solution to the effects.
- Make proper connections (series, shunt and compound).

- Explain the loading characteristics of each connection.
- Explain counter-emf in the DC motor and counter-emf relationship to speed.
- Define speed, torque, and horsepower relationships.
- Define modes of operation, constant torque variable hp, constant hp variable torque.
- Identify the parts dealing with the construction of the three-phase induction motor.
- Explain the theory of operation of the squirrel cage and wound rotor induction motor, including how torque is developed and the relationship between torque, speed, and slip.
- Identify the type of single-phase induction motors, explain the theory of operation for each.
- Explain the operation of the stepper motor: list applications.
- Explain the theory of operation of the resolver, synchro, and demonstrate a knowledge in the application for each.

Topics to Be Covered:

1. The Ideal Transformer
 - a. Voltage induced in a coil
 - b. Turns ratio
 - c. No load and full load conditions
 - d. Shifting impedance, equivalent circuit
2. Transformers
 - a. Polarity test
 - b. Dual-voltage
 - c. Special transformers
3. Review of Three-phase Systems
 - a. 3 wire, 4 wire Wye configuration
 - b. 3 wire, 4 wire Delta configuration
 - c. three-phase power and power factor correction
4. Three-phase Transformers
 - a. Wye connection
 - b. Delta connection
 - c. Wye-delta, delta-wye connection
 - d. Open delta, 4 wire high leg connection
5. The DC Machine (construction)
 - a. Pole piece
 - b. Series, shunt and interpole windings
 - c. The armature winding
 - d. The commutator, brushes (maintenance)
6. DC Generators
 - a. Ratings
 - b. Shunt, Series, Compound connection, differential, cumulative connection
7. DC Motors
 - a. Development of torque, horsepower
 - b. Counter EMF
 - c. Shunt, Series, Compound connection, differential, cumulative connection

8. DC Motors (Continued)
9. Three-phase Induction Motors
 - a. Construction
 - i. Stator windings
 - ii. Rotor construction (scim, wrim)
 - b. Theory of operation
 - c. Synchronous speed, rotor speed and slip
 - d. Torque and slip
 - e. Effect of rotor resistance
10. Three-phase Induction Motors (Continued)
11. The Synchronous Generator
 - a. Construction, salient, cylindrical poles
 - b. Excitation
 - c. Frequency: number of poles, rpm
 - d. Synchronous impedance
 - e. Loading effects, hard load, active load
 - f. The infinite bus.
12. The Synchronous Motor
 - a. Starting procedures
 - b. Pull-in torque
 - c. No load, full load (torque angle)
 - d. Power-factor correction
13. The Single-phase Motor
 - a. The Split-phase Induction Motor
 - i. resistance start
 - ii. capacitor start
 - b. Capacitor Start, Capacitor Run
 - c. Universal Motor
 - d. Hysteresis Motor
14. Special Motors
 - a. Step-motor
 - b. Synchro unit, resolvers
15. Review and Final

Laboratory Projects:

1. Transformer polarity, lead identification and turns ratio.
Equipment requirements: 3 kva transformer, multi-meter and ammeter.
2. Transformer dual voltage connections, auto-transformer connections.
Equipment requirements: same
3. Three-phase wye and three-phase delta connection.

Required equipment: same.

4. Three-phase delta-wye, wye-delta, open delta, and high leg delta connection.

Required equipment: same.

5. The DC Generator.

Required equipment: Hampden D.C. Generator, Hampden Three-phase Induction Motor, D.C. power supply, multi-meter, ammeter, and tachometer.

6. The DC Motor.

Required equipment: Hampden D.C. Motor, Hampden D.C. Generator, power supply, multi-meter, ammeter, tachometer, and dynamometer.

7. The Three-phase Induction Motor.

Required equipment: Hampden Induction Motor, Hampden D.C. generator, multi-meter, ammeter, power supply, and tachometer.

8. The Synchronous AC Generator.

Required equipment: Hampden Synchronous Machine, Hampden Three-phase Induction Motor, multi-meter, ammeter, power-factor meter, power supply, and tachometer.

9. The Synchronous AC Motor.

Required equipment: Hampden Synchronous Machine, Hampden DC Generator, Tachometer, power factor meter, multi-meter, ammeter, and DC power supply.

10. The Single-phase Induction Motor.

Required equipment: Hampden Resistance Start, Capacitor Start Motor.

11. Synchros: Required equipment: Synchro transmitter and receiver.

12. The Stepper-Motor.

Required software: Slo-Syn Stepper Motor Selection Software.

13. Stepper-Motor Control.

Required software: Slo-Syn Motion Control Software

Course Assessments: We will use the following assessments to demonstrate your 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.

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	10
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

The College is not an attendance taking institution as defined by 34 CFR 668.22(b)(1) in the Code of Federal Regulations; however, students are expected to attend all scheduled classes and laboratories.

- Absences in a course may affect a student's final grade.
- Tardiness may also affect a student's final grade.
- Students are responsible for all work/tests that occur during any missed class session(s) regardless of reason(s) for absence.
- Students who are sick or not well enough to attend class must notify the instructor as soon as possible before the scheduled class time, unless incapacitated or unable to do so. In that case, students must contact the instructor as soon as reasonably possible.
- If a student has an unavoidable conflict with a scheduled class session, students must notify the instructor, preferably before the class session, or as soon as possible.

For purposes of financial aid continued attendance is determined via engagement in the course. This can be accomplished in several ways including, but not limited to, continued attendance and/or participation in on-ground class sessions, participating in D2L as prompted (e.g., responding to an instructor's email, posting to a discussion board), and/or completing and submitting assignments.)

To the extent that attendance is kept in this class it is not for the purpose of the College but is instead associated with the instructor's individual grading rubric. The attendance policy for this class is: (*add attendance policy*).

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, an FA is awarded to students who do not officially withdraw from a course and do not attend after the cut-off date provided in the academic calendar. Please refer to the current academic calendar available on the Nashville State web site, looking for the date that indicates it is the “Last Day to Earn F for Attendance (FA).” Students who stop attending on or before this date receive an FA; students who stop attending after this date receive an F.

For online courses, attendance is defined by submission of assignments. Students who fail a course and whose last assignment is submitted on or before the FA date will earn an FA for the course. Students who fail a course and whose last assignment is submitted after the FA date will earn an F for the course. An FN is assigned to students who do not submit any assignments.

(While the above information should appear in all syllabi, faculty are encouraged to make additional statements that would clarify the policy for students and provide the applicable FA date for their section.)

FN

An FN is awarded to students who never attended class.

Instructor’s Policy

The attendance policy for this course is: *(add instructor’s attendance policy)*

For financial aid purposes, **attendance** is measured by participation in the course. Instructors can determine your level of participation in several ways. Some of those ways are:

- continued attendance
- participation in on-ground or virtual class sessions
- participating in D2L as prompted
- responding to an instructor’s email
- posting to a discussion board
- completing and submitting assignments

Technology Statement

- All classes at the College are web enhanced. “Web enhanced” means that components of the course, such as assignments and online discussions, may be located online in the class D2L/NS Online course shell and used in the course, even if the course meets in a classroom on ground.
- You must have access to a computer and an internet connection to complete assignments, engage in online discussions, and access various course materials through D2L/NS Online course shells.
- You may also be required to use free video conferencing platforms (examples: Zoom, Teams, etc.) for course sessions and meetings.
- You will be responsible for appropriate dress while on video. This means that you are expected to dress as if you were in a classroom.

- You will be responsible for a distraction free environment while on video. This means that the professor and others in the course should not be able to hear noise in your home, such as cell phones, TVs, or barking dogs. The best way to do this is to keep yourself on “mute” until you need to speak.
- You will be responsible for making sure your background is neutral. Keep in mind that students and professors come from all around the world, and you are all a part of our community. Therefore, please avoid having images in your background that may be offensive to your classmates.
- Certain publisher materials, such as textbook figures, may not work on cellphones and may require a laptop or a tablet.
- If you have questions or concerns regarding access to a computer or internet resources, please contact your instructor. Additional information is available on the [access to internet and technology website](#).

Computer Labs

Computers are available for all Nashville State students to use at each campus during open hours. Open computer lab availability may vary from campus to campus.

You should check the NSCC website for current hours of operation.

D2L/NS Online and myNSCC

It is your responsibility to check your email in **both** D2L/NS Online course shells and your @my.nsc.edu (student email) on a regular basis. These are the official communication channels between the college and you. You are responsible for the information communicated through these email channels. D2L/NS Online emails contain specific course information and @my.nsc.edu emails contain important information from college offices, such as Financial Aid.

ADA Compliance Statement

If you need accommodations due to a disability, please do not hesitate to reach out to our Access Center. Disabilities for which you can receive accommodations include documented physical, emotional, and/or learning conditions. Nashville State is committed to supporting your success, and we encourage you to get assistance if needed. If you require accommodations for any courses in which you are enrolled, contact the Access Center at 615.353.3363, or e-mail accesscenter@nsc.edu.

Classroom Misconduct

Disruptive conduct is not allowed in the classroom. Disruptive conduct is any behavior that prevents students from learning and interferes with the ability of the instructor to teach. This may change from course to course; therefore, your individual instructors will give you guidance on what qualifies as “disruptive conduct” in their courses. 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

You have started this academic journey to prepare for a future career. Because of this, it is important that you learn the materials being presented in your courses. For this reason, cheating, in any form, robs

you of your opportunity to learn and master the material that will enable you to succeed in that future career. Nashville State has a clear Academic Misconduct Policy that you are expected to follow. In addition, your instructors will clarify what Academic Misconduct looks like and the consequences for violations in each course that you take. The instructor has the authority to assign an “F” or a “zero” for such violations or for the semester grade.

(Each instructor will outline his/her expectations for academic integrity and provide individualized information about consequences for academic misconduct.)

Academic Early Alert System

If you are not doing well in your course, your instructor may send you an Early Alert through your @my.nsc.edu email. This email will go to your academic advisor and Student Success advisor, as well. If you get an Early Alert, contact your instructor immediately. Instructors send these when they want to help you figure out how to get extra support to pass the course. An Early Alert does not mean that you have already failed the course. Rather, it means you are in danger of failing the course if you do not change your learning strategy. Please use an Early Alert to your advantage and as an opportunity to improve your grade.

RAVE Emergency Alert System

You can log in to this free alert system to receive text messages about emergencies related to NSCC campuses: <https://www.getrave.com/login/nsc>. The instructions for this are listed below.

- 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.

Student Wellness

Your well-being is important to us. With this in mind, the college has several resources available to provide support when needed:

- Free tutoring provides assistance beyond the classroom to help you make the most of your college education.
- These resources include NSCC email, scheduling, online courses, textbooks, tech check out and support, computer labs on campuses, academic advising, financial advising, COVID-19 information and procedures on campuses.
- Services that help with bus passes, food, childcare, textbooks, housing, financial counseling, personal counseling, suicide prevention, health insurance.

Equity Statement

Nashville State Community College strives to ensure that each student receives what that student needs to be successful, with goals of success beyond the classroom. We understand and practice ideals of equity and inclusion for our students by embracing a full spectrum of experiences, viewpoints, and intellectual approaches in order to overcome barriers to success.

Inclement Weather & Campus Closings

You get notices about campus closings in these places: text messages from RAVE and www.nsc.edu. Even when campuses are closed, you are still responsible for completing all assigned work. Check D2L/NS Online for a message from your instructor so you do not miss important assignments and due dates, which may change due to the campus closure.

Class Cancellation Policy

Our instructors post messages about cancelling classes in the D2L/NSOnline course shells and/or on the classroom door on campus. These messages can be found in the News and Content section or the Email tab in the online shell. Please check these to be sure that you take advantage of opportunities for learning and points toward your grade.