



# **INSTRUCTIONAL PACKAGE**

EET 227  
Electrical Machinery

Effective Term  
Fall 2024/Spring 2025/Summer 2025

# INSTRUCTIONAL PACKAGE

## Part I: Course Information

Effective Term: Fall 2024/Spring 2025/Summer 2025

COURSE PREFIX: EET 227

COURSE TITLE: Electrical Machinery

CONTACT HOURS: 5

CREDIT HOURS: 3

### **RATIONALE FOR THE COURSE:**

The electronics engineering technology student must have knowledge of the machinery used to convert electrical energy into mechanical energy and vice versa. The student may find themselves involved in industries that either use or produce these devices.

### **COURSE DESCRIPTION:**

This course is a study of AC and DC electro-mechanical energy conversion devices, theory, applications and control. Devices are tested and verified using electrical instruments.

### **PREREQUISITES/CO-REQUISITES:**

Credit level EET 114 Minimum Grade of C or Credit level EET 114 Minimum Grade of TC.

\***Online/Hybrid** courses require students to complete the [Distance Learning Orientation Video](#) prior to enrolling in an online course.

### **REQUIRED MATERIALS:**

Please visit the [BOOKSTORE](#) online site for most current textbook information.

Enter the semester, course prefix, number and section when prompted and you will be linked to the correct textbook.

### **ADDITIONAL REQUIREMENTS:**

Scientific calculator, USB flash drive.

### **TECHNICAL REQUIREMENTS:**

Access to Desire2Learn (D2L), HGTC's learning management system (LMS) used for course materials.

Access to myHGTC portal for student self-services.

College email access – this is the college's primary official form of communication.

## STUDENT IDENTIFICATION VERIFICATION:

Students enrolled in online courses will be required to complete identity verification. Please refer to your Instructor Information Sheet for information regarding this requirement.

## CLASSROOM ETIQUETTE:

As a matter of courtesy to other students and your professor, please turn off cell phones and other communication/entertainment devices before class begins. If you are monitoring for an emergency, please notify your professor prior to class and switch cell phone ringers to vibrate.

## Part II: Student Learning Outcomes

### COURSE LEARNING OUTCOMES and ASSESSMENTS\*:

#### Unit #1

**Materials Covered:** Fundamentals, Fundamentals of Mechanics and Heat.

**\*Assessment(s):** Homework Assignments, Labs, Exam, Participation, Final Exam.

#### Learning Outcomes:

#### Fundamentals

- Describe the International Systems of Units
- Identify Base and Derived Units of the SI
- Employ Unit Conversion Charts
- Apply the Per-Unit System with One Base
- Apply the Per-Unit System with Two Bases
- Compare Conventional and Electron Current Flow
- Describe the Distinction between Sources and Loads
- Apply Sign Notation
- Apply Double-Subscript Notation for Voltages
- Describe the Effective Value of an AC Voltage
- Describe Phasor Representation
- Describe Harmonics
- Analyze Energy in an Inductor
- Analyze Energy in a Capacitor
- Describe Magnetic Field Intensity  $H$  and Flux Density  $B$
- Analyze the  $B$ - $H$  Curve of Vacuum
- Analyze the  $B$ - $H$  Curve of a Magnetic Material
- Describe Relative Permeability
- Apply Faraday's Law of Electromagnetic Induction

- Analyze the Voltage Induced in a Conductor
- Determine the Lorentz Force on a Conductor
- Determine the Direction of the Force Acting on a Straight Conductor
- Describe Residual Flux Density and Coercive Force
- Analyze the Hysteresis Loop
- Determine Hysteresis Loss
- Describe Eddy Currents
- Determine Current in an Inductor
- Apply Kirchhoff's Voltage Law with Double-Subscript Notation
- Analyze Circuits with Hybrid Notation

### **Fundamentals of Mechanics and Heat**

- Analyze Force
- Analyze Torque
- Analyze Mechanical work
- Analyze Power
- Analyze Power of a Motor
- Describe Transformation of Energy
- Analyze the Efficiency of a Machine
- Describe Kinetic Energy of Linear Motion
- Describe Kinetic Energy of Rotational Motion
- Describe Power Flow in a Mechanically-Coupled System
- Discuss Heat and Temperature
- Describe Temperature Scales
- Determine Heat Required to Raise the Temperature of a Body
- Discuss Transmission of Heat by Conduction, Convection, and Radiation
- Analyze Heat Losses

## **UNIT #2**

**Materials Covered:** Direct Current Generators, Direct-Current Motors

**\*Assessment(s):** Homework Assignments, Labs, Exam, Participation, Final Exam

### **Learning Outcomes:**

#### **Direct Current Generators)**

- Describe Generating an AC Voltage
- Describe Direct-Current Generator
- Compare Differences between AC and DC Generators

- Describe Improving the Waveshape
- Describe Induced Voltage
- Describe Neutral Zones
- Determine Value of the Induced Voltage
- Describe the DC Generator Under Load
- Determine Armature Reaction
- Describe Shifting The Brushes to Improve Commutation
- Describe Commutating Poles
- Describe Operation of the Separately Excited Generator
- Analyze the No-Load Operation and Saturation Curve
- Describe the Shunt Generator
- Describe Controlling the Voltage of a Shunt Generator
- Describe the Separately Excited Generator Under Load
- Describe Shunt Generator Under Load
- Describe the Compound Generator
- Describe the Differential Compound Generator
- Describe Generator Specifications
- Describe the Construction of Direct-Current Generators
- Discuss the Ideal Commutation Process
- Discuss the Practical Commutation Process

### **Direct-Current Motors**

- Analyze Counter-Electromotive Force (CEMF)
- Discuss Acceleration of the Motor
- Analyze Mechanical Power and Torque
- Determine Speed of Rotation
- Describe Armature Speed Control
- Describe Field Speed Control
- Discuss the Shunt Motor under Load
- Describe the Series Motor
- Describe Series Motor Speed Control
- Discuss Applications of the Series Motor
- Describe the Compound Motor
- Discuss Reversing the Direction of Rotation
- Describe Starting a Shunt Motor
- Describe the Face-Plate Starter
- Discuss Stopping a Motor

- Describe Dynamic Braking
- Describe Plugging
- Analyze Dynamic Braking and Mechanical Time Constant
- Discuss Armature Reaction
- Discuss Flux Distortion Due to Armature Reaction
- Describe Commutating Poles
- Discuss Compensating Windings
- Describe Basics of Variable Speed Control
- Describe Permanent Magnet Motors

### **UNIT #3**

**Materials Covered:** Three-Phase Induction Machines, Synchronous Generators, Synchronous Motors, Single-Phase Motors

**\*Assessment(s):** Homework Assignments, Labs, Exam, Participation, Final Exam

#### **Learning Outcomes:**

##### **Three-Phase Induction Machines**

- Describe Principal Components
- Discuss Principle of Operation
- Describe the Rotating Field
- Determine Direction of Rotation
- Analyze Number of Poles - Synchronous Speed
- Describe Starting Characteristics of a Squirrel-Cage Motor
- Describe Acceleration of the Rotor - Slip
- Analyze Motor under Load
- Analyze Slip and Slip Speed
- Describe Voltage and Frequency Induced in the Rotor
- Discuss Characteristics of Squirrel-Cage Induction Motors
- Estimate the Currents in an Induction Motor
- Describe Active Power Flow
- Discuss Torque versus Speed Curve
- Analyze Effect of Rotor Resistance
- Describe the Wound-Rotor Motor

##### **Synchronous Generators**

- Discuss Commercial Synchronous Generators
- Analyze Number of Poles

- Describe Main Features of the Stator
- Describe Main Features of the Rotor
- Discuss Field Excitation and Exciters
- Describe Brushless Excitation
- Analyze Factors Affecting the Size of Synchronous Generators
- Analyze the No-load Saturation Curve
- Describe Short-Circuit Ratio
- Describe Synchronous Generator under Load
- Analyze Regulation Curves
- Discuss Synchronization of a Generator
- Describe Control of Active Power

### **Synchronous Motors**

- Describe Construction
- Discuss Starting a Synchronous Motor
- Describe Pull-in Torque
- Analyze Motor under Load
- Discuss Excitation and Reactive Power
- Describe Power Factor Rating
- Explain Stopping Synchronous Motors
- Discuss the Synchronous Motor versus the Induction Motor

### **Single-Phase Motors**

- Describe Construction of a Single-Phase Induction Motor
- Discuss Synchronous Speed
- Analyze Torque-Speed Characteristic
- Discuss Principle of Operation
- Analyze Locked-Rotor Torque
- Describe the Resistance Split-Phase Motor
- Describe the Capacitor-Start Motor
- Describe the Capacitor-Run Motor
- Discuss Reversing the Direction of Rotation
- Describe the Universal Motor

***\*Students – please refer to the Instructor’s Course Information sheet for specific information on assessments and due dates.***

## Part III: Grading and Assessment

### EVALUATION OF REQUIRED COURSE MEASURES/ARTIFACTS\*:

Students' performance will be assessed, and the weight associated with the various measures/artifacts are listed below.

#### EVALUATION\*

Exams .....	30%
Labs.....	30%
Homework Assignments.....	20%
Class Participation .....	5%
Final Exam.....	<u>15%</u>
	100%

***\*Students, for the specific number and type of evaluations, please refer to the Instructor's Course Information Sheet.***

### GRADING SYSTEM:

HGTC has a standardized, recommended grading scale for academic courses. The grading scale requires that grades within the indicated range be defined as follows:

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

The following grades are used:

A - EXCELLENT: used in GPA calculations; carries a value of 4 quality points and earns credit hours.

B - ABOVE AVERAGE: used in GPA calculations; carries a value of 3 quality points and earns credit hours.

C - AVERAGE: used in GPA calculations; carries a value of 2 quality points and earns credit hours.

D - BELOW AVERAGE: used in GPA calculations; carries a value of 1 quality point and earns credit hours.

F - FAILURE: used in GPA calculations; carries a value of 0 quality points and earns 0 credit hours. (Hours attempted are used in GPA calculations.)

I - INCOMPLETE: does not affect GPA calculations; defaults to "F" automatically after one term if the incomplete work has not been completed and generates 0 quality points and 0 credit hours. (See special note below.)

WF - WITHDRAWN FAILURE: used in GPA calculations; carries a value of 0 quality points and earns 0 credit hours. (Hours attempted are used in GPA calculations.)

W - WITHDRAW: not used in GPA calculations; carries a value of 0 quality points and earns 0 credit hours. May be utilized when extenuating circumstances warrant.



Note: Regarding a grade of "I" (Incomplete): A grade of Incomplete ("I") is assigned when the student does not complete work or take the final exam due to illness or for other reasons over which the student has no control. This grade is given only with the approval of the professor involved. An incomplete must be completed by the end of the following term. Otherwise, the grade becomes an automatic failure ("F").

Grades earned in courses impact academic progression and financial aid status. Before withdrawing from a course, be sure to talk with your instructor and financial aid counselor about the implications of that course of action. Ds, Fs, Ws, WFs and Is also negatively impact academic progression and financial aid status.

The Add/Drop Period is the first 5 days of the semester for **full term** classes. Add/Drop periods are shorter for accelerated format courses. Please refer to the [academic calendar](#) for deadlines for add/drop. You must attend at least one meeting of all of your classes during that period. If you do not, you will be dropped from the course(s) and your Financial Aid will be reduced accordingly.

## Part IV: Attendance

Horry-Georgetown Technical College maintains a general attendance policy requiring students to be present for a minimum of 80 percent (80%) of their classes in order to receive credit for any course. Due to the varied nature of courses taught at the college, some faculty may require up to 90 percent (90%) attendance. Pursuant to 34 Code of Federal Regulations 228.22 - Return to Title IV Funds, once a student has missed over 20% of the course or has missed two (2) consecutive weeks, the faculty is obligated to withdraw the student and a student may not be permitted to reenroll. **Instructors define absentee limits for their class at the beginning of each term; please refer to the Instructor Course Information Sheet.**

## Part V: Student Resources



### THE STUDENT SUCCESS AND TUTORING CENTER (SSTC):

The SSTC offers to all students the following **free** resources:

1. **Academic tutors** for most subject areas, **Writing Center support**, and **college success skills**.
2. Online **tutoring** and academic support resources.
3. Professional and interpersonal communication **coaching** in the EPIC Labs.

Visit the [Student Success & Tutoring Center](#) website for more information. To schedule tutoring, contact the SSTC at [ssc@hgtc.edu](mailto:ssc@hgtc.edu) or self-schedule in the Penji iOS/Android app or at [www.penjiapp.com](http://www.penjiapp.com). Email [ssc@hgtc.edu](mailto:ssc@hgtc.edu) or call SSTC Conway, 349-7872; SSTC Grand Strand, 477-2113; and SSTC Georgetown, 520-1455, or go to the [Online Resource Center](#) to access on-demand resources.



### STUDENT INFORMATION CENTER: TECH Central

TECH Central offers to all students the following free resources:

1. **Getting around HGTC:** General information and guidance for enrollment, financial aid, registration, and payment plan support!
2. **In-person and remote assistance** are available in Desire2Learn, Student Portal, Degree Works, and Office 365.
3. **Chat with our staff on TECH Talk**, our live chat service. TECH Talk can be accessed on the student portal and on TECH Central's website, or by texting questions to (843) 375-8552. Visit the Tech Central website for more information. Live Chat and Center locations are posted on the website. Or please call (843) 349 – TECH (8324), Option # 1.



### HGTC LIBRARY:

Each campus location has a library where HGTC students, faculty, and staff may check out materials with their HGTC ID. All three HGTC campus libraries are equipped with computers to support academic research and related school work; printing is available as well. Visit the [Library](#) website for more information or call (843) 349-5268.

### STUDENT TESTING:

Testing in an **online/hybrid** course and in **make-up exam** situations may be accomplished in a variety of ways:

- Test administered within D2L.
- Test administered in writing on paper.
- Test administered through Publisher Platforms (which may have a fee associated with the usage)

Furthermore, tests may have time limits and/or require a proctor.

Proctoring can be accomplished either face-to-face at an approved site or online through our online proctoring service. To find out more about proctoring services, please visit the [Online](#)

[Testing](#) section of the HGTC's Testing Center webpage.

The **Instructor Information Sheet** will have more details on test requirements for your course.

### **DISABILITY SERVICES:**

HGTC is committed to providing an accessible environment for students with disabilities. Students seeking accommodations are encouraged to visit HGTC's [Accessibility and Disability Service webpage](#) for detailed information.

It is the student's responsibility to self-identify as needing accommodations and to provide appropriate documentation. Once documentation is submitted, the student will participate in an interactive process with Accessibility and Disability Services staff to determine reasonable accommodations. Students may begin the accommodations process at any time; however, accommodations are **not retroactive** and will only be applied from the point at which they are approved. Students must contact the office **each semester** to renew their accommodations.

For assistance, please contact the Accessibility and Disability Services team at [disabilityservices@hgtc.edu](mailto:disabilityservices@hgtc.edu) or 843-796-8818 (call or text).

### **COUNSELING SERVICES:**

HGTC Counseling Services strives to optimize student success through managing personal and academic concerns that may interfere with achieving educational goals. Staff are available to every student for assistance and guidance on personal matters, academic concerns and other areas of concern. HGTC offers free in-person and telehealth counseling services to students. For more information about counseling services, please reach out to [counseling@hgtc.edu](mailto:counseling@hgtc.edu) or visit the website the [Counseling Services webpage](#).

### **STATEMENT OF EQUAL OPPORTUNITY/NON-DISCRIMINATION STATEMENT:**

Our sincere commitment to both effective business management and equitable treatment of our employees requires that we present this Policy Statement as an embodiment of that commitment to the fullest.

Discrimination is conduct that includes unjust or prejudicial treatment based upon an individual's sex, race/color, religion, national origin, age, disability, service in the uniformed services (as defined in state and federal law), veteran status, political ideas, marital or family status, pregnancy, childbirth, or related medical conditions, including, but not limited to, lactation, genetic information, genetic identity, gender expression, or sexual orientation that excludes an individual from participation in, denies the individual the benefits of, treats the individual differently, or otherwise adversely affects a term or condition of a person's working or learning

environment. This includes failing to provide reasonable accommodation, consistent with state and federal law, to persons with disabilities.

## **INQUIRIES REGARDING THE NON-DISCRIMINATION/TITLE IX POLICIES:**

**Student and prospective student** inquiries concerning Section 504, Title II, Title VII, and Title IX and their application to the College or any student decision may be directed to the Vice President for Student Affairs.

**Dr. Melissa Batten, VP Student Affairs**

*Title IX, Section 504, and Title II Coordinator*

Building 1100, Room 107A, Conway Campus

PO Box 261966, Conway, SC 29528-6066

843-349-5228

[Melissa.Batten@hgtc.edu](mailto:Melissa.Batten@hgtc.edu)

**Employee and applicant** inquiries concerning Section 504, Title II, and Title IX and their application to the College may be directed to the Vice President for Human Resources.

**Jacquelyne Snyder, VP Human Resources**

*Affirmative Action/Equal Opportunity Officer and Title IX Coordinator*

Building 200, Room 205B, Conway Campus

PO Box 261966, Conway, SC 29528-6066

843-349-5212

[Jacquelyne.Snyder@hgtc.edu](mailto:Jacquelyne.Snyder@hgtc.edu)

## **TITLE IX REQUIREMENTS:**

Title IX of the Education Amendments of 1972 protects students, employees, applicants for admission and employment, and other persons from all forms of sex discrimination.

HGTC prohibits the offenses of domestic violence, dating violence, sexual assault, and stalking and will provide students, faculty, and staff with necessary information regarding prevention, policies, procedures, and resources.

Any student, or other member of the college community, who believes that they have been a victim of sexual harassment, domestic violence, dating violence, sexual assault, or stalking may file a report with the college's Title IX Coordinator or campus law enforcement\*.

\*Faculty and Staff are required to report these incidents to the Title IX Coordinator when involving students. The only HGTC employees exempt from mandatory reporting are licensed mental health professionals (only as part of their job description such as counseling services).

**Student and prospective student** inquiries concerning Title IX and its application to the College or any student decision may be directed to the Vice President for Student Affairs.

**Dr. Melissa Batten, VP Student Affairs**

*Title IX, Section 504, and Title II Coordinator*  
Building 1100, Room 107A, Conway Campus  
PO Box 261966, Conway, SC 29528-6066  
843-349-5228  
[Melissa.Batten@hgtc.edu](mailto:Melissa.Batten@hgtc.edu)

**Employee and applicant** inquiries concerning Title IX and its application to the College may be directed to the Vice President for Human Resources.

**Jacquelyne Snyder, VP Human Resources**

*Affirmative Action/Equal Opportunity Officer and Title IX Coordinator*  
Building 200, Room 205B, Conway Campus  
PO Box 261966, Conway, SC 29528-6066  
843-349-5212  
[Jacquelyne.Snyder@hgtc.edu](mailto:Jacquelyne.Snyder@hgtc.edu)

## **PREGNANCY ACCOMMODATIONS**

Under Title IX, colleges must not exclude a pregnant student from participating in any part of an educational program. Horry-Georgetown Technical College is committed to ensuring that pregnant students receive reasonable accommodations to ensure access to our educational programs.

Students should advise the Title IX Coordinator of a potential need for accommodations as soon as they know they are pregnant. It is extremely important that communication between student, instructors, and the Title IX Coordinator begin as soon as possible. Each situation is unique and will be addressed individually.

Title IX accommodations DO NOT apply to Financial Aid. Financial Aid regulations do not give the College any discretion in terms of Financial Aid eligibility.

Certain educational programs may have strict certification requirements or requirements mandated by outside regulatory agencies. Therefore, in some programs, the application of Title IX accommodations may be limited.

To request pregnancy accommodations, please complete the *Pregnancy Intake Form* that can be found [here](#).