



# INSTRUCTIONAL PACKAGE

EET 227

Electrical Machinery

Effective Term  
Summer 2019

# INSTRUCTIONAL PACKAGE

## Part I: Course Information

Effective Term: 2018.30

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.

### **REQUIRED MATERIALS:**

Please visit the Bookstore online site for most current textbook information. Use the direct link below to find textbooks.

[BOOKSTORE](#).

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 student portal for course materials.  
WaveNet and D2L email access.

### **STUDENT IDENTIFICATION VERIFICATION**

Students enrolled in online courses will be required to participate in a minimum of one (1) proctored assignment and/or one (1) virtual event to support student identification 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.

**NETIQUETTE:** is the term commonly used to refer to conventions adopted by Internet users on the web, mailing lists, public forums, and in live chat focused on online communications etiquette. For more information regarding Netiquette expectations for distance learning courses, please visit [Online Netiquette](#).

## **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 ([ACADEMIC CALENDAR](#)). 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.**

**For online and hybrid courses**, check your Instructor's Course Information Sheet for any required on-site meeting times. Please note, instructors may require tests to be taken at approved testing sites, if you use a testing center other than those provided by HGTC, the center may charge a fee for its services.

## Part V: Student Resources



### The Student Success and Tutoring Center (SSTC)

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

- 1. Academic coaches** for most subject areas, **Writing Center Support**, and **college success skills.**
- 2. On-line student success and academic support resources.**

Visit the SSTC website: [Student Success & Tutoring Center](#) and visit the student services tab in your WaveNet account to schedule appointments using TutorTrac. For more information, 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 any time.



## Student Information Center: WaveNet Central (WNC)

WNC offers to all students the following **free** resources:

1. **Getting around HGTC:** General information and guidance for enrollment!
2. Use the [Online Resource Center \(ORC\)](#) for COMPASS support, technology education, and online tools.
3. **Drop-in technology support or scheduled training** in the Center or in class.
4. **In-person workshops, online tutorials and more services** are available.

Visit the WNC website: [Wavenet Central](#). Live Chat and Center locations are posted on the website. Or please call one of the following locations: WNC Conway, 349-5182; WNC Grand Strand, 477-2076; and WNC Georgetown, 520-1473.

## Disability Services:

HGTC is committed to providing an accessible environment for students with disabilities. Inquiries may be directed to Beth Havens, Director of Student Development on the Conway Campus Jaime Davis, Counselor/Advisor on the Georgetown Campus or Kristin Griffin, Counselor on the Grand Strand Campus. These individuals will review documentation of the student's disability and, in a confidential setting with the student, develop an educational accommodation plan.

Note: It is the student's responsibility to self-identify as needing accommodations and to provide acceptable documentation. After a student has self-identified and submitted documentation of a disability, accommodations may be determined, accepted, and provided.

## Statement of Equal Opportunity/Non-Discrimination Statement

Horry-Georgetown Technical College prohibits discrimination and harassment, including sexual harassment and abuse, on the basis of race, color, sex, national or ethnic origin, age, religion, disability, marital or family status, veteran status, political ideas, sexual orientation, gender identity, or pregnancy, childbirth, or related medical conditions, including, but not limited to, lactation in educational programs and/or activities.

Inquiries regarding the non-discrimination policies: Students and prospective student inquiries concerning Section 504, Title II, 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 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, Section 504, Title II, and Title IX

Coordinator, Building 200, Room 212A, Conway Campus, PO Box 261966, Conway, SC 29528-6066, 843-349-5212, [Jacquelyne.Snyder@hgtc.edu](mailto:Jacquelyne.Snyder@hgtc.edu).

**Title IX Requirements**

All students (as well as other persons) at Horry-Georgetown Technical College are protected by Title IX—regardless of their sex, sexual orientation, gender identity, part- or full-time status, disability, race, or national origin—in all aspects of educational programs and activities. Any student, or other member of the college community, who believes that he/she is or has been a victim of sexual harassment or sexual violence may file a report with the college’s Chief Student Services Officer, campus law enforcement, or with the college’s Title IX Coordinator, or designee.

\*Faculty and Staff are required to report incidents to the Title IX Coordinators 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).

<p><b>Inquiries regarding the non-discrimination policies:</b></p>	
<p>Student and prospective student inquiries concerning Section 504, Title II, and Title IX and their application to the College or any student decision may be directed to the Vice President for Student Affairs.</p>	<p>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.</p>
<p><b>Dr. Melissa Batten, VP Student Affairs</b>  <i>Title IX Coordinator</i></p> <p>Building 1100, Room 107A, Conway Campus          PO Box 261966, Conway, SC 29528-6066          843-349-5228  <a href="mailto:Melissa.Batten@hgtc.edu">Melissa.Batten@hgtc.edu</a></p>	<p><b>Jacquelyne Snyder, VP Human Resources</b>  <i>Section 504, Title II, and Title IX Coordinator</i></p> <p>Building 200, Room 212A, Conway Campus          PO Box 261966, Conway, SC 29528-6066          843-349-5212  <a href="mailto:Jacquelyne.Snyder@hgtc.edu">Jacquelyne.Snyder@hgtc.edu</a></p>