Wharton County Junior College

Administrative - Master Syllabus
COVER SHEET

> ***Purpose****: It is the intention of this Administrative-Master Syllabus to provide a general description of the course, outline the required elements of the course and to lay the foundation for course assessment for the improvement of student learning, as specified by the faculty of Wharton County Junior College, regardless of who teaches the course, the timeframe by which it is instructed, or the instructional method by which the course is delivered. It is not intended to restrict the manner by which an individual faculty member teaches the course but to be an administrative tool to aid in the improvement of instruction.*

Course Title - Solid State Devices
Course Prefix and Number - CETT 1429
Department – Electronics Eng. Tech. **Division -** Technology and Business
Course Type: (check one)

- ☐ Academic General Education Course (from ACGM – but not in WCJC Core)
- ☐ Academic WCJC Core Course
- ☒ WECM course (This course is a Special Topics or Unique Needs Course: Y☐ or N☒)

Semester Credit Hours # : Lecture hours # : Lab/Other hours # **4:3:3**

Equated Pay hours for course – 4.5

List Lab/ Other Hours
Lab Hours 3
Clinical Hours
Practicum Hours
Other (list)

Course Catalog Description - A study of diodes, transistor characteristics and other semiconductor devices, including analysis of static and dynamic characteristics, biasing techniques, and thermal considerations. Basic power-supply design and application. Linear and switching circuits. Laboratory realization of lecture topics.

Prerequisites/Co Requisites - CETT 1403. Concurrent enrollment in or credit for MATH 1316

Prepared by David Kucera ***Date*** 06/20/13

Reviewed by Department Head David Kucera ***Date*** 06/10/13

Accuracy verified by Division Chair David Kucera ***Date*** 06/10/13

Approved by Dean or Vice President of Instruction Amy LaPan ***Date***1/30/2014

I. Topical Outline – Each offering of this course must include the following topics (be sure to include information regarding lab, practicum, clinical or other non-lecture instruction):

The following performance will be expected of any student completing this course with a passing grade. There is no absolute time limit on the performance of these objectives, unless noted, but the grade received by the student will depend, in part, on the relative speed and precision of the student's performance in these tasks. Where subjective evaluations are indicated, the instructor will make these judgments based on his or her knowledge of the skills required to place a graduate with the expectation of successful on-job performance.

The student will be expected to perform the following tasks in written examination or laboratory demonstration:

*****Identify the anode and cathode of the diode symbol, and of a diode with typical case markings.

*Draw the Voltage-Current characteristics of a silicon junction diode, marking Ir, Vbeo, and indicating the forward voltage drop.

*Demonstrate ability to successfully test a diode to determine anode and cathode using only an ohmmeter.

*Correctly explain the safety factors involved in the use of hot-chassis power supplies, and how the isolation transformer reduces the shock hazard.

*Calculate the proper size for a simple filter capacitor when given the load current, the line frequency, and the required ripple voltage for a half-wave or full- wave rectifier.

*Draw a correct diagram for a half-wave and a full-wave CT rectifier.

*Draw a correct diagram for the full-wave bridge rectifier.

*Calculate the correct diode PIV necessary in a half- wave or full-wave rectifier.

*Calculate the approximate reduction in ripple voltage provided by a pi-section filter given the input ripple, input frequency, inductor value, and capacitor value.

*Estimate the output voltage for a choke input filter, given the RMS voltage of the transformer secondary.

*Correctly draw the schematic diagrams for the NPN and PNP bipolar transistor.

*Show laboratory skills sufficient to identify the base of a bipolar transistor, given*good transistor and an ohmmeter.

*Show ability to separate good and bad bipolar transistors using only an ohmmeter.

*Correctly measure the beta of a good bipolar transistor, given an ammeter, a voltmeter, power supply, and resistors.

*Find the power dissipation of a bipolar transistor given the circuit values for a common-emitter circuit.

*Design and construct a common-emitter circuit which will produce a given voltage at the collector, given on the beta of the transistor and a power supply voltage.

*Show how changes in beta effects changes in Q-point.

*List the meaning of, and the advantages of operation in the saturation and cutoff regions of bipolar transistors.

*Define linear operation of the common-emitter circuit.

*Draw diagrams showing the relationship between bias point and output voltage clipping for the common-emitter amplifier.

*Demonstrate ability to design a common- emitter amplifier with simple or voltage-divider biasing to produce a specified Q-point and voltage gain.

*Demonstrate his or her ability to set voltage gain in the common-emitter amplifier independently of stability criteria, by use of the emitter-bypass capacitor.

*Construct a properly biased common-collector circuit.

*Give a valid comparison of the output impedance/voltage gain of the common-emitter and common-collector circuit configurations.

*Find correct input impedance (resistive), voltage gain, and output voltage limits for the simple common-emitter and common-collector circuits.

*Draw a diagram correctly showing collector biasing for the common-emitter circuit.

*Show how multistage circuits can be produced using common-emitter circuits with capacitor coupling, or alternating common-emitter and common-collector circuits with direct coupling.

*Describe the use of the inter-stage coupling transformer.

*Design a three stage transistor amplifier with a voltage gain of 100 +/- 10%, using 2N2222 transistors and a power supply voltage of no more than 15 volts, with input impedance of 20K ohms or greater. This is to be done in three steps, with instructor feedback after each design phase, and lab construction of the final design, with measurement of actual performance.

*List the important characteristics of operational amplifiers.

*Identify the inverting configuration, the non-inverting configuration, and the unity gain buffer configuration for operational amplifier circuits.

II. Course Learning Outcomes

Course Learning Outcome	Methods of Assessment Outcomes 1,2,3 will be assessed by:
Upon successful completion of this course, students will: 1.Analyze various solid state devices and circuits. 2.Troubleshoot various solid state devices and circuits. 3.Construct circuits to test: Design a three stage transistor amplifier with a voltage gain of 100 +/- 10%, using 2N2222 transistors and a power supply voltage of no more than 15 volts, with input impedance of 20K ohms or greater. This is to be done in three steps, with instructor feedback after each design phase, and lab construction of the final design, with measurement of actual performance	• Exams • Homework • Labs • Quizzes • Reassessed in Capstone Experience: CETT 2349

III. Required Text(s), Optional Text(s) and/or Materials to be Supplied by Student.

An appropriate electronics text covering Solid State Devices. Example-Electronic Principles by Malvino 7th edition

Calculator – scientific with Sine, Cosine, Tangent capabilities..

IV. Suggested Course Maximum - 30 lecture, 15 laboratory

V. List any specific spatial or physical requirements beyond a typical classroom required to teach the course.

Lecture facilities for 30 students. Laboratory facilities for 18 students must include 9 bench positions each with a digital meter, logic probe, 20 MHz oscilloscope and probes, bread boarding facility with power supply and signal generator, and a stock of basic AC circuit components.

VI. Course Requirements/Grading System – Describe any course specific requirements such as research papers or reading assignments and the generalized grading format for the course

Evaluation of Performance:

Course grades will be determined by the percentage of course objectives for which the student can demonstrate mastery and by attendance as stated in the Departmental Policy sheet provided to the student. Mastery of course objectives will be determined by written examinations, an attendance grade as described in the Departmental Policy handout, a daily work grade which will include graded homework, graded laboratory work, and a comprehensive final exam.

Approximate Grade Evaluation Summary:

Major tests 60%
Attendance..10%
Lab reports, homework, and quizzes. 15%
Comprehensive Final examination 15%

Grade Scale:

90 to 100: A
80 to 89: B
70 to 79: C
60 to 69: D
0 to 59: F

VII. Curriculum Checklist

☐ - **Academic General Education Course** (from ACGM – but not in WCJC Core)
No additional documentation needed

☐ - **Academic WCJC Core Course**
Attach the Core Curriculum Checklist, including the following:

- Basic Intellectual Competencies
- Perspectives
- Exemplary Educational Objectives

☒ - **WECM Courses**
If needed, revise the Program SCANS Matrix & Competencies Checklist.