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 - Digital Fundamentals
Course Prefix and Number - CETT 1425
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 - An entry-level course in digital electronics covering number systems, binary mathematics, digital codes, logic gates, Boolean algebra, Karnaugh maps, and combined logic. Emphasis on circuit logic analysis and troubleshooting digital circuits. Introduction to flip flops. Laboratory realization of logic circuits using TTL and CMOS gates. Laboratory use of logic probes, meters, and oscilloscopes for digital troubleshooting

Prerequisites/Co requisites – Credit for or Concurrent enrollment in CETT 1403 & MATH 1316

Prepared by David Kucera ***Date*** 06/20/12

Reviewed by department head David Kucera ***Date*** 06/20/12

Accuracy verified by Division Chair David Kucera ***Date*** 08/03/12

Approved by Dean of Vocational Instruction or Vice President of Instruction Lac ***Date*** 11-9-12

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:

*Define, give examples of, and clearly differentiate between "digital" and "analog" systems, their advantages and disadvantages.
*Correctly write the counts from 1 to 64 (decimal) in binary, octal, BCD, and hexadecimal.
*Convert a number of any reasonable size from binary, octal, decimal, hexadecimal, or BCD to any of the other number systems without using a calculator.
*Convert a number of any reasonable size from binary, octal, decimal, hexadecimal, or BCD to any of the other number systems using a calculator with appropriate conversion functions.
*Write the reasons for use of octal and hexadecimal number systems.
*Explain the difference between a place-weighted number system and a code.
*List compare and list respective advantages and disadvantages of BCD and binary numbers.
*Perform addition, direct subtraction, multiplication, and division on any two binary numbers of 16 digits.
*Perform subtraction on binary numbers by ones complement and twos complement methods.
*Draw the traditional and IEEE symbols for the inverter, AND, OR, NAND, NOR, and EXCLUSIVE OR gates.
*Write the truth-tables for the three-input AND, OR, NAND, and NOR functions.
*Write the truth-tables for the inverter and the EXCLUSIVE-OR functions.
*Write the Boolean equation for an arbitrary combinational network of 15 gate complexity.
*Use Boolean algebra to simplify an expression of not over five terms in three variables.
*Use Karnaugh maps to simplify a SOP expression of not over four variables.
*Convert to NAND realization an AND-OR Boolean expression in three variables of five terms.
*Demonstrate laboratory competency in the use of the simple logic probe.
*Given a Boolean equation of no more than five terms in four variables, build and prove the TTL or CMOS implementation of the equation given pinouts for the necessary gates, power supply, protoboard, and necessary wire.
*Demonstrate laboratory troubleshooting ability by locating a single stuck gate input in the laboratory implementation of a five-term, four-variable TTL Boolean equation using only the simple logic probe.
*Construct the truth table for a Boolean equation of no more than five terms in four variables.
*Given a stated problem in logic involving no more than four variables in three terms, produce a truth table and Boolean equation corresponding to the statement of the problem.
*Draw the diagram and write the truth table for the parallel full adder; describe the interconnection of full adders to produce multi-bit adders.
*Write the definition of combinational logic and the definition of sequential logic.
*Draw the NOR realization of an S-R latch.
*Write the truth-table for an S-R latch.
*Given an arbitrary input timing diagram for an S-R latch, draw the output waveform.
*Write the truth-table for a T flip-flop.
*Given an arbitrary input timing diagram for a T flip-flop, draw the output waveform.
*Write the truth-table for a J-K flip-flop.
*Given an arbitrary input timing diagram for a J-K flip-flop, draw the output waveform.

II. Course Learning Outcomes

Course Learning Outcome	Method of Assessment
Demonstrate appropriate use of test equipment. Identify various logic gates in circuits; analyze circuits using appropriate mathematical formulas. Troubleshoot various digital circuits.	Assessed in Capstone Experience: CETT 2370 Final Project course.

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

An appropriate electronics text covering Digital circuits. Example-Digital Systems principles and applications by- Tocci, Widmer, and Moss 11th 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%

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.