SOUTH SEATTLE COMMUNITY COLLEGE

Academic Programs

COURSE OUTLINE

Revision: Mike Steffancin, February 2008

DEPARTMENT:	Academic Programs/Engineering
CURRICULUM:	Digital Logic/Electrical Engineering
COURSE TITLE:	Digital Logic Design
COURSE NUMBER:	ENGR 271
TYPE OF COURSE:	Academic Transfer
COURSE LENGTH:	1 quarter
CREDIT HOURS:	6
LECTURE HOURS:	44
LAB HOURS:	44
CLASS SIZE:	24
PREREQUISITES:	CSC 142 or instructor permission

COURSE DESCRIPTION:

Introduction to digital logic, Boolean algebra, combinational and sequential circuits and logic design, programmable logic devices, and the design and operation of digital computers, including ALU, memory, and I/O. Weekly laboratories. Prerequisite: CSC 142.

STUDENT LEARNING OUTCOMES ADDRESSED:

1. Communication – Weekly laboratories and homework will require complex write-ups and cooperation between students.
2. Computation - These are done as an integral and routine part of the material taught. Theory is always presented in the context of its application to real world problems and its limitations under real world constraints.

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STUDENT LEARNING OUTCOMES ADDRESSED: (cont.)

3. Human Relations – Students will have to use social interactive skills to work in groups effectively.
4. Critical Thinking and Problem Solving – Coursework requires written analysis and design of complex real-world engineering situations.
5. Technology – Students will simulate, design, and implement sophisticated hardware designs using a hardware description language and programmable logic device software packages.
6. Personal Responsibility – Through homework and labs students will not only have to take responsibility for learning but will also have to be responsible to other students working in their group.
7. Information Literacy – Students will access and evaluate information from a variety of sources and contexts, including the Internet and other complex technical documents provided by the instructor.

GENERAL COURSE OBJECTIVES:

At the end of the course the student will:

1. Understand fundamental concepts in the design of digital circuits and systems.
2. Understand and have a working knowledge of Boolean algebra and its application to combinational logic circuits.
3. Understand and have a working knowledge of small scale integration (SSI) and medium scale integration (MSI) combinational logic elements and how to use such elements to implement combinational circuits of medium complexity in the laboratory.
4. Understand and have a working knowledge of sequential circuitry and finite state machines and how to implement such circuits in the laboratory.
5. Understand and have a working knowledge of real world timing problems and alternative solutions in both combinational and sequential circuits.
6. Understand and have a working knowledge of elementary (registered) programmable logic devices.
7. Understand basic behavioral modeling of digital systems using design languages such as Verilog or VHDL.

GENERAL COURSE OBJECTIVES: (cont.)

8. Understand the basic components of the von Neumann computer architecture.
9. Understand how a simple problem progresses through a von Neumann machine.

TOPICAL OUTLINE: APPROX. HOURS: 88 (including labs)

I. Introduction to computers: history, classes, levels and organization of computers, hardware vs. software. (1 hour)

II. Number systems: positional number system, binary coded decimal (BCD), negative number representation, alphanumeric codes (3 hours).

III. Boolean algebra: logic gates, basic theorems of Boolean algebra, minimization by formulas, minimization by Karnaugh maps, incompletely specified functions (10 hours)

IV. Combinational circuit design; integrated circuit characteristics, SSI and MSI circuit design of combinational circuits, arithmetic logic unit and its design, multipliers, encoders, decoders, data converters, multiplexers, arithmetic operations (20 hours)

V. Sequential logic design: asynchronous vs. synchronous operations, latch, D Flip Flop, SR Flip Flop, JK Flip Flop, T Flip Flop, edge-triggered vs. master-slave Flip Flop, shift registers, latches, counters, design of sequential circuits (state diagram, state table, state assignment and circuit synthesis), applications of sequential circuits (24 hours)

VI. Programmable logic devices: Programmable Array Logic (PAL), Programmable Logic Array (PLA), Programmable Logic Sequencer (PLS), applications of programmable logic devices (24 hours)

VII. Computer Architecture: Introduction to the classic von Neumann architecture including control and sequencing, arithmetic and the arithmetic and logic unit (ALU), registers, memory, bus structures, and instruction formats (6 hours).

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DATE: February 2008

SLO #	Included in Course Objective Number	SSCC Student Learning Outcomes
SLO 1.1	1-7	Communication - Read and listen actively
SLO 1.2		Communication - Speak and write effectively
SLO 2.1	1-7	Computation - Use mathematical operations
SLO 2.2	1-7	Computation - Apply quantitative skills
SLO 2.3	2,7	Computation - Identify, interpret, and utilize higher level mathematical and cognitive skills
SLO 3.1		Human Relations - Use social interactive skills to work in groups effectively
SLO 3.2		Human Relations - Recognize the diversity of cultural influences and values
SLO 4.1	1-7	Critical Thinking and Problem Solving -
SLO 5.1	1-7	Technology - Select and use appropriate technological tools
SLO 6.1		Personal Responsibility - Be motivated and able to continue learning and adapt to change
SLO 6.2		Personal Responsibility - Value one's own skills, abilities, ideas and art
SLO 6.3		Personal Responsibility - Take pride in one's work
SLO 6.4		Personal Responsibility - Manage personal health and safety
SLO 6.5		Personal Responsibility - Be aware of civic and environmental issues
SLO 7.1	1-7	Information Literacy - Access and evaluate information
SLO 7.2	1-7	Information Literacy - Use information to achieve personal, academic, and career goals, as well as to participate in a democratic society

PREPARED BY: Mike Steffancin
DATE: May 2008