Douglas College

EFFECTIVE: MAY 2003
CURRICULUM GUIDELINES

A. Division: **Instructional**

Effective Date: May 2003

B. Department / Program Area: **Computing Science**

Revision: [X] New Course: [ ]

If Revision, Section(s) Revised: **F, H, O, Q**

Date of Previous Revision: **August 4, 1997**

Date of Current Revision: **November 18, 2002**

C: Subject & Course No.	**D:** Descriptive Title	**E:** Semester Credits
CMPT-150	**Introduction to Digital Circuits and Assembly Programming**	**3**

F: Calendar Description:

This course introduces the theory and practice of digital circuit design, computer architecture, and assembly language programming. Topics include number representation, Boolean algebra, expression minimization using mapping techniques, asynchronous and synchronous circuits, flip-flops, memories, arithmetic logic units, controllers, and interfacing to computers. Designs are implemented using a commercial software product. Assembly language for one or more microprocessors/microcontrollers such as the 80x86, 68HC11, or the MicroChip PICMicro is introduced, including register transfer, branching, subroutines, and interfacing.

G: Allocation of Contact Hours to Type of Instruction / Learning Settings

Primary Methods of Instructional Delivery and/or Learning Settings:

Lecture / Laboratory

Number of Contact Hours: (per week / semester for each descriptor)

Lecture	**3 hours / week**
Laboratory	**2 hours / week**

Number of Weeks per Semester: **14**

H: Course Prerequisites:
CMPT 110 with a minimum grade of C

I: Course Corequisites:
None

J: Course for which this Course is a Prerequisite:
CMPT 250

K: Maximum Class Size:

Lecture	**25**
Laboratory	**25**

L: PLEASE INDICATE**:**

- [ ] Non-Credit
- [ ] College Credit Non-Transfer
- [X] College Credit Transfer:

SEE BC TRANSFER GUIDE FOR TRANSFER DETAILS (www.bccat.bc.ca)

M: Course Objectives / Learning Outcomes:

The student should be able to:

- **Demonstrate an understanding of the logic blocks composing a microprocessor**
- **Appreciate, via comparisons, the architecture of microprocessors**
- **Demonstrate, by design and implementation, using a software simulator, gate level logic of microprocessor components such as memory, ALU, and controller**
- **Understand, via use, data representation including numbers of various bases and characters**
- **Design and implement assembly language programs**

N: Course Content:

1 Data representation
- **1.1 Number systems**
  - **1.1.1 Decimal, binary, octal, hexadecimal**
  - **1.1.2 one and two's complement arithmetic**
- **1.2 Character representation**
  - **1.2.1 ASCII (others such as EBCDIC and Unicode may be introduced)**

2 Gates and combinational circuits
- **2.1 Simplification techniques**
  - **2.1.1 Boolean algebra**
  - **2.1.2 Karnaugh maps**
  - **2.1.3 Brief survey of other (software) techniques**
- **2.2 Circuits**
  - **2.2.1 Decoders and multiplexers**
  - **2.2.2 ALU**

3 Memory and sequential circuits
- **3.1 flip-flops**
- **3.2 registers**
- **3.3 memory**
- **3.4 counters and synchronous circuits**
- **3.5 sequential machines and controllers**

4 Computer architecture
- **4.1 Machine cycles**
  - **4.1.1 Fetch-decode-execute-increment PC**
  - **4.1.2 instruction cycles and register transfer**

5 Comparison of microprocessor families
- **5.1 architecture**
- **5.2 instruction sets**

6 Assembly language programming
- **6.1 the assembler**
- **6.2 data transfer and addressing modes**
- **6.3 CPU states, flags, and logical operations**
- **6.4 branching and structured programming**
- **6.5 subroutines and parameter passing**

O: Methods of Instruction:

There are three components to the course: lectures, labs., and assignments.

The lecture is used to introduce new material; usually via a sequence of theoretical concepts, examples, and practical considerations. The book is to be used as a close adjunct to the lecture notes and examples.

The two hour weekly lab. is used for the teaching and evaluation of circuit designs using the software product LogicWorks and also the evaluation of assembly language programs implemented by the student.

Assignments include data representation, logic designs using LogicWorks, and assembly language

programming.

P: Textbooks and Materials to be Purchased by Students:

- **Malvino, Brown, Digital Computer Electronics, Macmillan/McGraw-Hill**
- **Portfolio for logic design assignments**
- **Two 3½" high density diskettes**

Q: Means of Assessment:

Evaluation will be carried out in accordance with Douglas College Policy. The final grade will be calculated from a particular distribution from the range below. The exact distribution will be given to the student on the first day of classes along with the course outline.

Distribution Range:

labs. (12 to 14)	**15% - 30%**
assignments (4 to 6)	**20% - 30%**
tests (1 to 2) @ 15% - 25% each	**15% - 50%**
final examination	**20% - 40%**
class participation[1]	**0% - 5%**

Note #1: participation includes (but is not limited to) attendance and/or short pop-quizzes and/or handing-in (part-of) a homework assignment

R: Prior Learning Assessment and Recognition: specify whether course is open for PLAR

Not at this time

Course Designer(s):

Education Council / Curriculum Committee Representative:

Dean / Director:

Registrar: