

## *COMPUTER TECHNOLOGY FUNDAMENTALS*

### School of Advanced Technology

<b>Course Number:</b> <b>CST8214</b>	<b>Contribution to Program:</b> Core	<b>Educator(s):</b> Ian D. Allen
<b>Applicable Program(s):</b> Computer Engineering Technology – Computing Science	<b>AAL:</b> 01	<b>Approved For:</b> Fall 2007
	<b>Prerequisites:</b> None	<b>Approved By:</b>
<b>Course Hours:</b> Delivered: 60 Normative: 60	<b>Corequisites:</b> None	Claude Brulé, Chair Computer Studies Department
		<b>Approved for Academic Year:</b> 2007-2008

### COURSE DESCRIPTION

This introductory course provides students with the technical concepts and terminology related to software (operating system and applications) interaction with system boards, system buses, input/output devices, memory, microprocessors and peripherals. Computer arithmetic (including number systems), addressing modes, data representation, storage and transfer, CPU architecture, and register-memory operations will be covered in detail.

### RELATIONSHIP TO PROGRAM LEARNING OUTCOMES

<p><b>This is a vocational course that supports the following program vocational learning outcomes:</b>  <a href="http://www.edu.gov.on.ca/eng/general/college/progstan/techno/comp_eng3.html">http://www.edu.gov.on.ca/eng/general/college/progstan/techno/comp_eng3.html</a></p>	<p><b>This course contributes to your program by helping you to achieve the following provincial essential employability skills learning outcomes:</b>  <a href="http://www.edu.gov.on.ca/eng/general/college/progstan/essential.html">http://www.edu.gov.on.ca/eng/general/college/progstan/essential.html</a></p>
1,2,3,4,5,6	3,4,9,10,11

### COURSE CURRICULUM

**I. Course Learning Requirements/Embedded Knowledge and Skills**

Course Learning Requirements	Knowledge and Skills
<p><b>To earn credit for this course, you must reliably demonstrate your ability to:</b></p>	
<p>1. Understand components inside a PC.</p>	<p>Knowledge of motherboard components, BIOS and peripheral ICs Historical development of the Personal Computer</p> <p>Open a PCs case, identify components, busses and connections. Identify form factors of power supply, Draw a simple schematic diagram of a PCs layout. Identify the power connectors.</p>
<p>2. Use the modern CPU as a reference to understand microprocessor architecture, its handling of multimedia tasks.</p>	<p>Understand the role of microprocessors, registers, Clocks, Address, data and control bus</p> <p>Processor Architecture in modern CPUs and its justification</p>
<p>3. Understand Number Systems</p>	<p>Understand binary arithmetic Understand concepts of addressing Justify the need for IEEE 754 Floating point</p> <p>Using binary arithmetic, Converting IEEE 754 FP numbers to decimal, Converting fractions to IEEE 754 floating point numbers</p>
<p>4. Participate in removing and installing memory used in a PC.</p> <p>Identifying RAM types, removing and installing RAM</p>	<p>Differentiate ROM Types. Differentiate RAM used in modern mother boards. Understand the role of CMOS and BIOS in PCs</p> <p>Understanding virtual and real mode. Identifying addresses of parallel and serial ports</p>

Course Learning Requirements	Knowledge and Skills
<p><b>To earn credit for this course, you must reliably demonstrate your ability to:</b></p>	
<p>5. Identify interfaces used to connect media. Configure, and possibly, troubleshoot storage media in a PC</p>	<p>Understand storage requirements in computers. Justify the use of various media such as magnetic, optical, and non-volatile re-writable storage media such as a USB key Understand early interfaces in PC's and identify the interfaces such as IDE, SATA, SCSI Understand address translation in magnetic media CHS, ECHS and LBA</p> <p>Correctly install and configure CD ROM Drive Correctly install and configure Windows 98 to given user specifications</p> <p>Install a Hard Disk</p>
<p>6. Apply the skills to install a sound card on a PC. Differentiate between PCI and AGP video controllers.</p>	<p>Understand Video Display Technologies used in CRT, LCD displays. Identify Connectors used in video VGA, SVGA, DVI</p> <p>Knowledge of Audio Hardware, Data Compression Understand the role of Digital Signal Processors Understand Sampling of analog sound signals and its conversion to digital signals</p> <p>Access and manipulate video memory in text mode using debug</p> <p>Install sound card and drivers</p> <p>Use debug to explore HDD file structures</p>
<p>7. Understand I/O Interfaces</p>	<p>Understand data transfer in serial and parallel mode</p> <p>Knowledge of USB, IEEE-1394 in data transfer</p>

Course Learning Requirements	Knowledge and Skills
<p><b>To earn credit for this course, you must reliably demonstrate your ability to:</b></p>	
<p>8. Internet connectivity, Computer Security and Networking</p> <p>Identify LAN Hardware, LAN configuration, TCP/IP settings, Establish a connection to the campus network.</p>	<p>Understand the origin of networks and its terminology</p> <p>Basic knowledge of network protocols</p> <p>Understand dial up and broadband connections</p> <p>Differentiate between analog modems, cable modems, DSL and justify its use.</p> <p>Understand home wireless networking.</p>

## II. Learning Resources

### Required Text Book:

1. Bundle of two textbooks: The Essentials of Computer Organization & Architecture, by Linda Null and Julia Labur, 2nd edition, Jones Bartlett, ISBN: 0-7637-3769-0
2. Ecoa Intel Assembly Language Supplement, by ECOA, ISBN: 0-7637-3538-X  
ISBN for bundled textbooks: 0-7637-4482-4

### Required Equipment/Supplies:

1. Antistatic wrist strap \*
2. PC Toolkit \*
3. Six – 3 ½ “ floppy disks \*
4. A lab book

\*(Included in incidental fees and package from the Algonquin College New Technology Store)

## III. Teaching/Learning Methods

The course consists of 2 hours of lectures and 2 hours of lab per week. It is anticipated that you will need to spend an additional 4 hours per week, on average, of your own time for assignments and study.

During this course you are likely to experience:

### Lectures:

Lectures will present the theoretical material of the course.

Students are expected to attend all of the lectures. Students are encouraged to ask questions during lectures and to consult with the professors on topics, which they do not clearly understand. Professors will inform students, at the beginning of the course, of suitable times for consultations.

### Labs:

Students are expected to perform initial analysis and design **before** their scheduled lab, in order to take advantage of the limited lab time. Laboratory assignments will be closely integrated with the lecture material. The students' ability to successfully complete the assigned exercises will directly correlate with their level of success on tests and the final exam.

**Lab attendance involves group work on dedicated PC hardware, and is therefore mandatory.** No allowances are made for those who choose not to attend classes or labs and, as a result, get critically behind in the course. Extra consultation and tutoring assistance is only available to those who are actively participating and still having difficulty.

## **IV. Learning Activities**

Samples of learning activities include:

- Reading and understanding the text material.
- Attending lectures that follow (and supplement) the text material.
- Investigating prescribed web sources to capture additional information.
- Completing assignments, where applicable.
- Completing prescribed lab work.
- Completing additional projects, where applicable.

**Tests and a Final Exam will be conducted on both theory and lab material.**

## **V. Course Content**

### **PC components**

- Motherboard components, BIOS
- Chipsets
- Types of I/O Bus
- Historical development of the Personal Computer

### **CPU**

- Brief history of microprocessors
- ALU, MMU
- Registers, Clocks
- Address, data and control bus
- Architecture in modern CPU's
- Pipelining, Superscalar
- Processor Features – Hyper threading, MMX
- Processor Packaging, Chipsets

### **Number Systems**

- Counting in Binary
- Word, byte

- Binary arithmetic
- Octal and Hexadecimal number systems
- Overflow, Underflow
- Addressing
- Precision, Range
- IEEE 754 Floating point

**Memory**

- ROM Chip Types
- CMOS
- BIOS and BIOS Routines
- RAM Types
- Memory models

**Media**

- Magnetic Media – Floppy, HDD, Tape Drives
- Optical Media - CDROM, DVD
- Flash RAM

**PC Interfaces for Storage**

- Early interfaces in PCs
- IDE and its variations
- ATA and SATA
- CHS, ECHS and LBA
- SCSI

**Video**

- Video Display Technologies – CRT, LCD
- Connectors
- Vertical and Horizontal frequencies
- Display Standards

**Sound**

- Audio Hardware
- Data Compression
- Digital Signal Processors
- Sampling

**Power**

- Battery technology for laptop
- Power supply

**I/O Addresses, Interrupts and IRQs**

- I/O Addresses
- I/O address map
- Tools for looking at resources
- IRQ assignments on PCs and the 16 bit IRQ map

- IRQ Conflicts, PnP

**I/O Interfaces**

- Serial and Parallel ports
- USB
- IEEE-1394
- PS/2 and Keyboard

**Internet connectivity, Computer Networking**

- Origin of networks
- Terminology, topology, network hardware, protocols, media
- Dial up and ISDN
- Analog modems, cable modems, DSL
- Wireless broadband, router based solutions.
- Securing an internet connection.
- Home wireless networking

**VI. Evaluation/Earning Credit**

The following will provide evidence of your learning achievement:

Assessment of student learning will be done by means of two class tests, quizzes, final exam, laboratory exercises and a final practical laboratory exam.

Laboratory attendance is compulsory, and absence from three or more laboratory sessions without the prior consent of the professor will result in a final grade of “F”. Students are responsible for keeping a record of the number of laboratory sessions they have missed. Professors will not inform students of an impending failure because of missed laboratory sessions.

All laboratory assignments must be successfully completed in order to obtain course credit. Late assignments will be penalized and receive a mark of zero, but they must still be completed. Any missed evaluation points will result in a grade of “0”. In the case of a documented emergency the professor, in consultation with the Chair, will determine how the marks will be made up and/or final grade adjusted.

The Computer Studies Department requires that all course assignments (homework exercises, laboratory work, projects, etc) be submitted by students using a standard which could be specific to one or more courses. Professors will ensure, at the beginning of the term, that students are advised of the exact details of these course specific submission requirements. Professors will also post them online alongside the course outline. Student submissions that do not meet the course published submission standards may not be marked, and may incur a penalty of up to 100% of the submission mark.

The factors in the final grade are:

1. Tests (2) and quizzes 30%
2. Lab Exercises 15%
3. Lab Exam 15%
4. Final Exam 40%

To pass the course, you must achieve a minimum of:

- **50% of the available marks from Item #1 and #4 (i.e. 35 of the 70 points)**  
**AND**
- **50% of the available marks for Item #2 and #3 (i.e. 15 of the available 30 points)**
- **must also pass final exam as a separate item (i.e. 20 of the 40 points available)**

### **Lab evaluation details:**

Lab exercises and lab exam is conducted by the lab professor, and contributes 30% to your final grade. For this course, the following criteria must be satisfied in order to obtain a non-zero lab mark:

1. Satisfactory attendance and participation in the lab.
2. Satisfactory workmanship and behaviour in the lab.
3. Satisfactory adherence to rules prescribed for the lab facility.
4. Being properly equipped for lab work while in the lab.

Due to the requirement for group work and sharing of computer hardware within a group, the lab professor reserves the right to suspend or deny further access to the lab at any time if attendance and participation criteria are not being met. No allowances are made in the course for students whose access to the lab is suspended or denied for any reason.

Lab evaluation is a mix of objective and subjective methodologies applied to different activities that demonstrate skill or produce a tangible product or result outcome. The scoring scheme for any particular skill demonstration, task completion, or product creation activity in the lab will generally take the following form:

- 3 - Superior capability, superior product/result.
- 2 - Satisfactory capability, acceptable product/result.
- 1 - Marginal capability, substandard product/result.
- 0 - No capability, unacceptable product/result.

A practical lab examination will make up 50% (15/30) of the lab mark. It will be a hands-on group exam, based on all material from the semester's labs. Students will be expected to have any necessary utilities, boot disks, and tools required to complete the practical lab examination.

The final lab score will be a compilation of the above ratings across all measurable lab activities prescribed (and weighted) by the Lab Instructor. The aggregate lab assessment will be converted to a final mark that contributes up to 30% to the final mark.

The lab evaluation will not be included in the final grade unless the student achieves at least a grade of 50% or **"D-"** on the combined tests, quizzes, and final exam. (Students who have a failing grade on the combined tests, quizzes and the exam will receive a grade of **"F"**.)

All students are required to write the final exam. There are no provisions for "making up" a missed final exam. If, as a result of being off-track in your program or some unforeseen circumstance, you note that there is a scheduling conflict in your final exam schedule, it is your responsibility to alert your course professor no later than one week before final exams start, to allow for any special arrangements.



## VII. Related Information

**Retention of course material.** It is your responsibility to retain copies of all assignments, labs and mid-term tests (returned from the professor), and any other evaluations and pertinent records (except for final exams, which are not returned) in case you become involved in an appeal hearing at a later date.

It is also your responsibility to retain course outlines for possible future use to support applications for transfer of credit to other educational institutions.

See College Directives E15 or E24 for details in your Instaguide.

**College email account.** Algonquin College provides all full-time students with an email account. This is the address that will be used when the College, your professors, or your fellow students communicate important information about your program or course events. It is your responsibility to ensure that you know how to send and receive email using your Algonquin College account, and check it regularly.

**Harassment/Discrimination/Violence will not be tolerated.** Any form of harassment (sexual, racial, gender or disability-related), discrimination (direct or indirect), or violence, whether involving a professor and a student or amongst students, will not be tolerated on the college premises. Action taken will start with a formal warning and proceed to the full disciplinary actions as outlined in Algonquin College Directive - A8.

Harassment means one or a series of vexatious comment(s) (whether done verbally or through electronic means), or conduct related to one or more of the prohibited grounds that is known or ought reasonably to be known to be unwelcome/unwanted, offensive, intimidating, derogatory or hostile.

This may include, but is not limited to: gestures, remarks, jokes, taunting, innuendo, display of offensive materials, offensive graffiti, threats, verbal or physical assault, stalking, slurs, shunning or exclusion related to the prohibited grounds.

For further information, a copy of the official policy statement can be obtained from the Student Association.

**The School of Advanced Technology's Standard Operating Procedure on Plagiarism and Academic Honesty** defines plagiarism as an attempt to use or pass off as one's own idea or product, work of another without giving credit. Plagiarism has occurred in instances where a student either directly copies another person's work without acknowledgement; or, closely paraphrases the equivalent of a short paragraph or more without acknowledgement; or, borrows, without acknowledgement, any ideas in a clear and recognizable form in such a way as to present them as one's own thought, where such ideas, if they were the student's own would contribute to the merit of his or her own work.

Plagiarism is one of the most serious academic offences a student can commit. Anyone found guilty will, on the first offence, be given a written warning and an "F" on the plagiarized work. If the student commits a second offence, an "F" will be given for the course along with a written warning. A third offence will result in suspension from the program and/or the college.

For further details on this directive, consult the Algonquin College Directive – E43 in your Instaguide, and the  
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School of Advanced Technology's Standard Operating Procedure on Plagiarism and Academic Dishonesty.

### **Violation of the Copyright Act.**

- General – The Copyright Act makes it an offence to reproduce or distribute, in whatever format, any part of a publication without the prior written permission of the publisher. For complete details, see the Government of Canada website at <http://www.cb-cda.gc.ca/info/act-e.html> . Make sure you give it due consideration, before deciding not to purchase a textbook or material required for your course.
- **Software Piracy.** The Copyright Act has been updated to include software products. Be sure to carefully read the licensing agreement of any product you purchase or download, and understand the term and conditions covering its use, installation and distribution (where applicable). Any infringement of licensing agreement makes you liable under the law.

**The Use of Electronic Devices** during classes, other than those sanctioned by the course professor is strictly prohibited. In particular, cell phones are not to be used to communicate during a class. The use of any electronic devices during exams and mid-term tests, other than those sanctioned by the faculty in charge of the examination is strictly prohibited.

Anyone caught using a prohibited device will be considered to have plagiarized, and will be treated as such in accordance with College Plagiarism Policy. For further details on this directive, consult the Algonquin College Directive E39 on the use of Electronic Devices in Class and Exams.

**Disruptive Behaviour** is any conduct, or threatened conduct, that is disruptive to the learning process or that interferes with the well being of other members of the College community. It will not be tolerated.

Members of the College community, both students and staff, have the right to learn and work in a secure and productive environment. The College will make every effort to protect that right.

Incidents of disruptive behaviour must be reported in writing to the departmental Chair as quickly as possible. The Chair will hold a hearing to review available information and determine any sanctions that will be imposed. Disciplinary hearings can result in penalties ranging from a written warning to expulsion.

For further details, consult the Algonquin College Directive - E27 in your Instaguide.

**Students with Disabilities.** If you are a student with a disability that affects your learning ability, and wish to receive special dispensation or academic accommodation, you are first required to identify your needs to the Centre for Students with Disabilities (CSD) so that support services can be arranged for you.

If, as a result of that consultation process, you are issued a letter from the CSD office prescribing certain special academic accommodations for that academic term, it is your responsibility to present this letter to each of your course professors, in order to obtain the special dispensation you are entitled to.

For further details, consult the Algonquin College Directive – E4 in your Instaguide.

**Prior Learning Assessment (PLA)**

See College Directive E35 for details on eligibility and process.

For this course, evidence of learning achievement for PLA candidates will include the successful completion of:

- A challenge exam with a breadth of coverage and level of difficulty equivalent to the final examination in the course;
- A hands-on or practical component to ensure that the requisite skill level has been achieved; and
- A computer programming (where applicable) assignment comparable to a representative assignment in the course.