

# EASTERN SCHOOL DISTRICT

Course Descriptor Summary

(Interim September 2005)

1. **Subject Area:** Technology Education
2. **Course:** Computer Technology 3200
3. **Program Description/Guiding Principles:**

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## 1. GENERAL OVERVIEW

This 120-hour, (typically two semester) course is the most advanced of courses in the Computer Education Program instituted by the Department of Education (DoE), Government of Newfoundland and Labrador. It involves a comprehensive treatment of microcomputers, some programming methods, communications, interfacing of computers with other machines or sensors, and related technologies, and insights on career opportunities in this exciting field.

The curriculum specifications for this course as prescribed by the DoE, were developed in 1993 – over a decade ago. Given the rapidly changing frontier of technology, the original course content is rather outdated. Nevertheless, the four core areas are as contemporary now as when the curriculum guide was first prepared. This document does not faithfully represent the original required curriculum. Enhancements to the required curriculum, such as through using more contemporary versions of the software or hardware involved and updated methods are included in this course description, to encourage modernization. The five core units are:

Core Units	Weight	Hours
UNIT 1: Computer Architecture	10%	12
UNIT 2: Programming	30%	36
UNIT 3: Interfacing	30%	36
UNIT 4: Computer Applications	20%	24
UNIT 5: Careers in ICT	10%	12
Totals	100%	120

Within the core units are some core (required) and optional modules. Irrespective of which optional modules are chosen to fulfill the curriculum outcomes of this course, the weightings in time and evaluation should follow those in the table above.

This course has a major project as part of the final grade and it is to be related to careers. This Unit can be conducted throughout the course. The nature of this career-directed project is, however, wide open, within the field of ICT and depends on the interests and abilities of the student, or some need which the student(s) can fill outside the school. Some examples are:

- web page design and maintenance, or computer upgrade and maintenance for a student website or another agency;
- student coaching of one or more computer applications or interface technologies to peer students or in junior schools;
- development of programs, computer graphics or animations for school or other clients;
- participation in a provincial or national technology competition organized by such agencies as Skills Canada ([www.skillscanada.com](http://www.skillscanada.com));
- review of a career and development of an extensive career profile in an area of technology.

Depending on the interest and capabilities of the student, advanced skills in computer animation, web-page design and development, desk-top publishing / computer graphics, computer assisted design (CAD), geographic information systems (GIS) development, programming in Q-Basic, V-Basic, and C++ and industrial robotic control, may be acquired through a special project for the course.

## **2. PARTICIPANTS - RECOMMENDED:**

This course was originally conceived as the high school exit course in computer technology for students anticipating careers in this area. It is designed for students who expect to continue in the field of technology and computer science upon graduation. It will appeal to students who have an interest in the application of the microcomputers in science and technology and who may pursue careers in ICT.

## **3. COURSE OBJECTIVES:**

The objectives of this course are:

- to develop an awareness of the use of computers in high technology applications, provincially, nationally and globally;
- to acquire all the information needed for intelligent career decision-making related to computer-based technologies;
- to acquire a knowledge of the major components of computer systems and how they interact with one another and peripheral devices;
- to understand basic concepts of programming using high-level structured language;
- to understand the fundamental concepts of interfacing (sensing & control) using digital and analog signals;
- to become familiar with simple solid state devices that are involved in these processes;
- to use a high-level language, as well as applications software, to conduct interfacing;
- to apply this understanding to sensing and control as used in science and technology;
- to provide the opportunity for students to explore various applications in the private and public sectors which are current examples of computer technology;

- to provide an opportunity for students to develop advanced computer technology skills through exploring commercial-level software;
- to encourage students to engage in work placements in the IT sector as a 'foot-in-the-door' method of launching their careers in computer technology.

#### 4. COURSE CONTENT - CORE UNITS:

##### UNIT I. COMPUTER ARCHITECTURE

#### MODULE 1. (CORE) HARDWARE COMPONENTS AND INTEGRATION (5%)

- Safety
- Tools
- Components of the computer
- Component installation and testing
- Microcomputer systems
- Basic skills in electronics
- System tear down and assembly
- Operating systems
- Processors
- Memory systems
- Peripherals
- Visual display hardware
- Fixed and floppy drive systems
- Logical architecture
- Bits, Bytes & Codes
- Manipulating data

#### MODULE 2. (CORE) NETWORKING DEVICES AND PERIPHERALS (5%)

- Installing network cards
- Connecting computers and peripherals
- Formatting hard drives
- Installing OS with Windows Networks (NT)
- Setting up a LAN using the OS
- Demonstrating the functionality of all components

##### UNIT II PROGRAMMING (30%)

#### MODULE 3. (CORE) QUICK BASIC (15%)

- Using the QuickBASIC environment
- Developing programs that use:
 

simple variables	array variables
value variables	calculations
operators	output statements
- Writing simple programs
- Developing programs using string processing

#### MODULE 4. (CORE) COMPUTER PROGRAMMING VISUAL BASIC (15%)

- Introduction to the use of Visual Basic version 5 / 6 object-based programming
- Developing GUI's
- Developing programs that contain similar functions as the Quick Basic programming

- language
- Developing programs using string processing
- Interfacing the VB programming with databases

**MODULE 5. (OPTIONAL) COMPUTER PROGRAMMING C++**

*(if three modules are completed in Unit 2 each is weighted at 10%)*

- Introduction to the use of C++ programming language as a first step to exploring the Advanced Placement course in Computer Science
- This module includes operands, strings, interfacing with external mechanisms.
- Interfacing the C++ programming with databases and mechanical devices

UNIT III COMPUTER INTERFACING (30%)

**MODULE 6. (CORE) BASIC ELECTRONICS AND INSTRUMENTATION (15%)**

- Digital input
- Digital Output
- Analog input
- Analog Output
- A/D conversion
- Probes and sensors
- Data loggers
- High-tech instruments
- Sensor inputs
- Actuator control (rheostat and PWM)

This segment for the course will be focused on the use of simple programming to control motors, sensors, robots and other electro-mechanical devices.

**MODULE 7. (CORE) BASIC PRODUCTION or AUTONOMOUS ROBOTICS (15%)**

- Robotic design and assembly using interface cards and control labs or LEGO Dacta
- Autonomous programming using LEGO Mindstorms and RoboLab

UNIT IV. APPLICATIONS (20%)

Twenty (20) percent of the course is to be focused on computer applications. These applications should be as contemporary as possible, and ideally are applications which are currently used in commercial, industrial or research settings. This can include four (4) of the optional modules (as shown below) each of which is allocated 5% of the time and evaluation, or by electing more or fewer of the modules and allocating time and evaluation proportionately (e.g.: 5 modules at 4%, 2 modules at 10%, depending on the time and software available).

**MODULE 8 (CORE) HYPER-TEXT MARK-UP LANGUAGE (HTML) (5%)**

- Use of HTML to program a simple web page.
- The topic must be of educational value and approved by the teacher

**MODULE 9. (OPTIONAL) COMPUTER ASSISTED DESIGN (5%)**

- Architectural design using a 3-D rendering program such as Punch Home Design which, when mastered, is to be followed by :
- Architectural design using AutoCAD LT 97
- Mechanical design using AutoCAD 2000

**MODULE 10 (OPTIONAL) COMPUTER ANIMATION (5%)**

- Basic computer animation using Disney Vision, Animation Shop in Adobe Photoshop Pro
- This leads to more advanced computer animation using 3-D Studio R-Max or Maya
- Computer drawn characters and backgrounds are to be used.
- Character animation is required, not just background effects.

**MODULE 11 (OPTIONAL) OFFICE APPLICATIONS (5%)**

- Use of presentations software to prepare a comprehensive exposure to current office applications of word processing, spread sheets, databases, presentation software.

**MODULE 12 (OPTIONAL) ARCVIEW GEOGRAPHIC INFORMATION SYSTEMS (5%)**

- Tutorial guided learning of this commercially respected GIS application software.
- Preparation of maps and querying of databases form the GIS

**MODULE 13 (OPTIONAL) ADVANCED WEB PAGE DESIGN (5%)**

- Use of advanced web page design tools to prepare a commercial standard product.
- The topic must be of educational value or be for a commercial or non-profit client and approved by the teacher
- The product must be a significant advancement over educational level standards in senior high school.
- It must use more advanced tools and be compellingly attractive and structured
- It may use contemporary software such as Java, Flash, PHP, etc.

**UNIT V. CAREERS / SPECIAL PROJECT (10%)**

In the careers section of the course, the student will have the opportunity to either:

- research generally the career options available in ICT
- experience the use of ICT in a commercial or industrial environment through a student internship after school.
- develop their expertise in one of the module topics encountered in the course which they particularly enjoyed and might form the basis of the a career
- coach other people or students in the use of ICT in a structured forum

Students will choose one of the following MODULES as a career-related special project. The special project must be approved by the teacher through a brief, two-page proposal developed by the student. The student must submit this proposal by December 1<sup>st</sup>. It will be reviewed by the teacher and discussed with the student prior to the student starting work on the project..

The objective of the Special Project will be to have the student develop a higher level of expertise in some Information and Communication Technology (ICT) area.

**CHOOSE ONE OF THE FOLLOWING MODULES:**

**MODULE 14 CAREERS IN COMPUTER SCIENCE & INDUSTRY (10%)**

- Decision-making process for careers
- Compilation of career-related information (employment outlooks, education requirement)
- Reporting on this topic using multi-media resources
- Demonstrate knowledge of the importance of computer-based technology industries to the welfare of our province and our country.

**MODULE 15 EXPERT LEVEL ACHIEVEMENT IN ONE OF THE CORE MODULES (10%)**

- The student may choose any one of the above CORE UNIT MODULES, as the topic for the demonstration of expertise.
- The choice should be a MODULE in which the student has a great interest and would benefit from attaining an expert level of ability.
- The topic or project chosen within the CORE MODULE must be approved by the teacher.
- The criterion of attaining a level of expertise will be the participation in a regional or provincial competition in one of the computer applications skills area for Skills Canada ([www.skillscanada.com](http://www.skillscanada.com))
- In either case, the student will maintain a daily log of activities (a journal) in which he/she engaged in preparation for and within the competition. This log/journal will be the basis of evaluation for the module.
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**MODULE 16 TECHNOLOGY COACHING (10%)**

- You will develop skills in one particular computer application of interest to you.
- You will undertake to coach this skill in a school or seminar setting under the guidance of a teacher or ICT specialist.
- You will develop a schedule of activities, and complete a daily journal of activities and observations which evaluates the effectiveness of the coaching and recommends enhanced methods of coaching the use and application of computer technology.
- This log/journal will be the basis of evaluation for the module.

**MODULE 17 TECHNOLOGY WORK-TERM PLACEMENT (10%)**

- 20 hours volunteer work on a defined project or work within a public or private sector agency which provides goods, services or expertise within the computer technology sector.
- These work placements must be approved by the Course Instructor/ Teacher, and must have a responsible adult as the on-site supervisor.
- Work placements activities must be related to the course curriculum and conducted after school hours.
- A daily log of hours and activities will be maintained to facilitate the grading of this work-term placement.

## 5. EVALUATION:

General guidance on evaluation includes:

- The course provides hands-on computer learning opportunities for students.
- Many of the course objectives are amenable to practical assessment of process and product.
- Teachers will use evaluation techniques which emphasize the practical and activity-based nature of the course.
- Grades will be assigned for each of the MODULES completed throughout the year, based on the rubric below.
- Practical assessments of projects and applications constitute the major percentage of the evaluation.
- Performance evaluation methods in the course should reflect the following relative weights.

Categories	Weighting
Knowledge of content / concepts	20%
Problem-solving skills	25%
Research Skills	20%
Production (product)	25%
Career-based knowledge and skills	10%

Evidence of student achievement can be measured by a range of tasks, from such sources as:

- observations
- check lists or rating scales
- interviews
- self evaluation or peer evaluation in the group
- projects
- presentations
- work samples
- portfolios
- journals
- written tests
- research
- peer evaluation

The criteria for evaluation of student achievement in activity-based technology courses include:

- initiative (independent work and engagement)
- engagement (time on task – the amount of supervision required to maintain this)
- teamwork skills (cooperative work with others in a group activity)
- product (solution of the problem or stages in the progression of the problem)

## 6. INSTRUCTIONAL STRATEGIES

The normal Instructional sequence for the modules within this course includes:

- the teacher introduces the topic and gives an overview of its theoretical aspects ;
- the teacher provides any required knowledge, skills training, demonstrations or safety cautions and equipment required to work on a related project;
- the student works independently, in pairs or in small groups with manuals, tutorials, texts or web resources to develop the knowledge to achieve the tasks outlined in the module;
- the student completes the module project tasks under the guidance and of the teacher.

Independent learning and hands-on activities provide experiential learning and should be the primary instructional strategy.

## 7. CLASSROOM ENVIRONMENT

The basic logistic requirements for teaching this course include:

- Desks or tables with adequate space to place manuals or interface equipment.
- Computers on the basis of 1 / student pair at a minimum or ideally 1 per student.
- At least five (5) computers which will run the Windows XP operating system
- The remainder of the computers which will run the Windows 2000 Millennium OS
- A variety of software as determined by the preferred modules to be taught at any school, in the most recent versions possible.
- Manuals and digital tutorials to enable students to explore each topic at their own pace and learn asynchronously.

Although this course was originally recommended to be taught one unit at a time, to the whole class, the structure of the course also lends itself to modular teaching where single purpose stations can be established using inexpensive single installation software. Individual students or teams of two (2) students rotate through the modules on a prescribed schedule.

In the Modular format of teaching, the evaluation of each module occurs just prior to the rotation of students.

Comprehensive tutorials and original curriculum guide materials on the core modules are available on the Department of Education's website:

<http://www.ed.gov.nl.ca/edu/sp/techedu.htm>