

2000 CTS AMENDMENTS to the Electro-Technologies Guide to Standards and Implementation

Summary of Curriculum Changes

Prerequisite changes:

- ELT2010: Electro-assembly 2 is no long a prerequisite to ELT2060: Digital Technology 2
- ELT2060: Digital Technology 2 is no longer a prerequisite to ELT2070: Computer Technology
- ELT2080: Control Systems 2 is no longer a prerequisite to:
 - ELT2110: Security Systems 2
 - ELT3090: Microprocessor Interface
 - ELT3140: Motors
- ELT2100: Radio Communication is no longer a prerequisite to ELT3130: Data/Telemetry Systems

Section A

- **Remove** pages A.1 to A.8 (1997) and **replace** with pages A.1 to A.8 (Revised 1999).

Section B

- **Remove** pages B.5 to B.8 (1997) and **replace** with new pages B.5 to B.8 (Revised 2000).

Section C

- **Remove** pages C.1 to C.6 (1997) and **replace** with new pages C.1 to C.6 (Revised 2000).

Section E

- **Remove** pages E.19–20, E.23–24, E.39–40, E.45–46 (1997) and **replace** with new pages E.19–20, E.23–24, E.39–40, E.45–46 (Revised 2000).

Section F

- **Remove** pages F.35–36, F.55–56, F.61–62 (1997) and **replace** with new pages F.35–36, F.55–56, F.61–62 (Revised 2000).

Section I

- **Remove** pages I.1 to I.38 (1997) and **replace** with new pages I.1 to I.8 (Revised 2000).

CAREER AND TECHNOLOGY STUDIES

A. PROGRAM RATIONALE AND PHILOSOPHY

Through Career and Technology Studies (CTS), secondary education in Alberta is responding to the many challenges of modern society, helping young people develop daily living skills and nurturing a flexible, well-qualified work force.

In Canada's information society, characterized by rapid change in the social and economic environment, students must be confident in their ability to respond to change and successfully meet the challenges they face in their own personal and work lives. In particular, they make decisions about what they will do when they finish high school. Many students will enter the work force, others will continue their education. All students face the challenges of growing independence and responsibility, and of entering post-secondary programs and/or the highly competitive workplace.

Secondary schools also face challenges. They must deliver, on a consistent basis, high quality, cost-effective programs that students, parents and the community find credible and relevant.

CTS helps schools and students meet these challenges. Schools can respond more efficiently and effectively to student and community needs and expectations by taking advantage of the opportunities in the CTS curriculum to design courses and access school, community and distance learning resources. Students can develop the confidence they need as they move into adult roles by assuming increased responsibility for their learning; cultivating their individual talents,

interests and abilities; and by defining and acting on their goals.

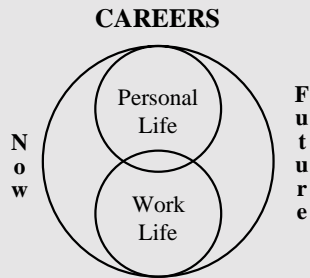
As an important component of education in Alberta secondary schools, CTS promotes student achievement by setting clear expectations and recognizing student success. Students in CTS develop competencies—the knowledge, skills and attitudes they are expected to demonstrate, that is, what they know and what they are able to do.

Acquired competencies can be applied now and in the future as students make a smooth transition into adult roles in the family, community, workplace and/or further education. To facilitate this transition, clearly stated expectations and standards have been defined in cooperation with teachers, business and industry representatives and post-secondary educators.

CTS offers all students important learning opportunities. Regardless of the particular area of study chosen, *students in CTS will:*

- develop skills that can be applied in their daily lives, now and in the future
- refine career-planning skills
- develop technology-related skills
- enhance employability skills
- apply and reinforce learnings developed in other subject areas.

In CTS, students build skills they can apply in their everyday lives. For example, in the CTS program, particularly at the introductory levels, students have the opportunity to improve their ability to make sound consumer decisions and to appreciate environmental and safety precautions.

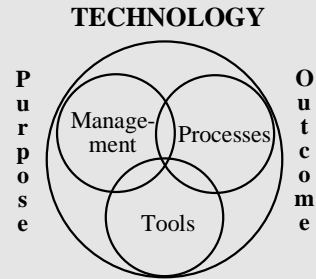


A career encompasses more than activities just related to a person's job or occupation; it involves one's personal life in both local and global contexts; e.g., as a family member, a friend, a community volunteer, a citizen of the world.

The integration of careers throughout the CTS program helps students to make effective career decisions and to target their efforts. CTS students will have the opportunity to expand their knowledge about careers, occupations and job opportunities, as well as the education and/or training requirements involved. Also, students come to recognize the need for lifelong learning.

Students in CTS have the opportunity to use and apply technology and systems effectively and efficiently. This involves:

- a decision regarding which processes and procedures best suit the task at hand
- the appropriate selection and skilled use of the tools and/or resources available
- an assessment of and management of the impact the use of the technology may have on themselves, on others and on the environment.



Integrated throughout CTS are employability skills, those basic competencies that help students develop their personal management and social skills. Personal management skills are improved as students take increased responsibility for their learning, design innovative solutions to problems and challenges, and manage resources effectively and efficiently. Social skills improve through learning experiences that require students to work effectively with others, demonstrate teamwork and leadership, and maintain high standards in safety and accountability.

As well as honing employability skills, CTS reinforces and enhances learnings developed in core and other optional courses. The curriculum emphasizes, as appropriate, the effective application of communication and numeracy skills.

In addition to the common outcomes described above, students focusing on a particular area of study will develop career-specific competencies that support entry into the workplace and/or related post-secondary programs. Career-specific competencies can involve understanding and applying appropriate terminology, processes and technologies related to a specific career, occupation or job.

PROGRAM OUTCOMES

The program outcomes describe the basic competencies integrated throughout the CTS program.

Within an applied context relevant to personal goals, aptitudes and abilities; *the student* in CTS will:

- demonstrate the basic knowledge, skills and attitudes necessary for achievement and fulfillment in personal life
- develop an action plan that relates personal interests, abilities and aptitudes to career opportunities and requirements
- use technology effectively to link and apply appropriate tools, management and processes to produce a desired outcome
- develop basic competencies (employability skills), by:
 - selecting relevant, goal-related activities, ranking them in order of importance, allocating necessary time, and preparing and following schedules (managing learning)
 - linking theory and practice, using resources, tools, technology and processes responsibly and efficiently (managing resources)
 - applying effective and innovative decision-making and problem-solving strategies in the design, production, marketing and consumption of goods and services (problem solving and innovation)
 - demonstrating appropriate written and verbal skills, such as composition, summarization and presentation (communicating effectively)
 - participating as a team member by working cooperatively with others and contributing to the group with ideas, suggestions and effort (working with others)

- maintaining high standards of ethics, diligence, attendance and punctuality, following safe procedures consistently, and recognizing and eliminating potential hazards (demonstrating responsibility).

PROGRAM ORGANIZATION

CURRICULUM STRUCTURE

Career and Technology Studies is organized into **strands** and **courses**.

Strands in CTS define competencies that help students:

- build daily living skills
- investigate career options
- use technology (managing, processes, tools) effectively and efficiently
- prepare for entry into the workplace and/or related post-secondary programs.

In general, strands relate to selected industry sectors offering positive occupational opportunities for students. Some occupational opportunities require further education after high school, and some allow direct entry into the workplace. Industry sectors encompass goods-producing industries, such as agriculture, manufacturing and construction; and service-producing industries, such as business, health, finance and insurance.

Courses are the building blocks for each strand. They define what a student is expected to know and be able to do (exit-level *competencies*). Courses also specify prerequisites. Recommendations for course parameters, such as instructional qualifications, facilities and equipment can be found in the guides to implementation.

The competencies a student must demonstrate to achieve success in a course are defined through *general outcomes*. Senior high school students who can demonstrate the general outcomes defined for a CTS course; i.e., who have the designated competencies, will qualify for 1 credit toward their high school diploma.

Specific outcomes provide a more detailed framework for instruction. Within the context of the general outcomes, the specific outcomes further define the knowledge, skills and attitudes the student should acquire.

The following chart shows the 22 strands that comprise the CTS program and the number of 1-credit courses available in each strand.

Strand	No. of Courses
1. Agriculture	33
2. Career Transitions	31
3. Communication Technology	33
4. Community Health	31
5. Construction Technologies	46
6. Cosmetology Studies	58
7. Design Studies	31
8. Electro-Technologies	37
9. Energy and Mines	26
10. Enterprise and Innovation	8
11. Fabrication Studies	41
12. Fashion Studies	29
13. Financial Management	14
14. Foods	37
15. Forestry	21
16. Information Processing	48
17. Legal Studies	13
18. Logistics	12
19. Management and Marketing	20
20. Mechanics	54
21. Tourism Studies	24
22. Wildlife	17

LEVELS OF ACHIEVEMENT

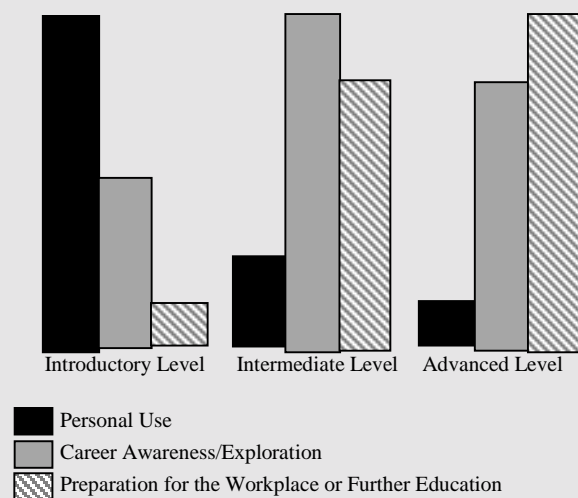
Courses are organized into three levels of achievement: **introductory**, **intermediate** and **advanced**. As students progress through the levels, they will be expected to meet higher standards and demonstrate an increased degree of competence, in both the program outcomes and the general outcomes defined for individual courses.

Introductory level courses help students build daily living skills and form the basis for further learning. Introductory courses are for students who have no previous experience in the strand.

Intermediate level courses build on the competencies developed at the introductory level. They provide a broader perspective, helping students recognize the wide range of related career opportunities available within the strand.

Advanced level courses refine expertise and help prepare students for entry into the workplace or a related post-secondary program.

The graph below illustrates the relative emphasis on the aspects of career planning at each of the levels.



CURRICULUM AND ASSESSMENT STANDARDS

Curriculum standards in CTS define what students must know and be able to do. Curriculum standards are expressed through the program outcomes for CTS, and through general and specific outcomes defined for individual courses within each strand.

Assessment standards define how student performance is to be judged. In CTS, each assessment standard defines the conditions and criteria to be used for assessing the competencies associated with each general outcome. To receive credit for a course, students must demonstrate competency at the level specified by the conditions and criteria defined for each general outcome.

Students throughout the province receive a fair and reliable assessment as they use the standards to guide their efforts, thus ensuring they participate more effectively and successfully in the learning and assessment process. Standards at advanced levels are, as much as possible, linked to workplace and post-secondary entry-level requirements.

TYPES OF COMPETENCIES

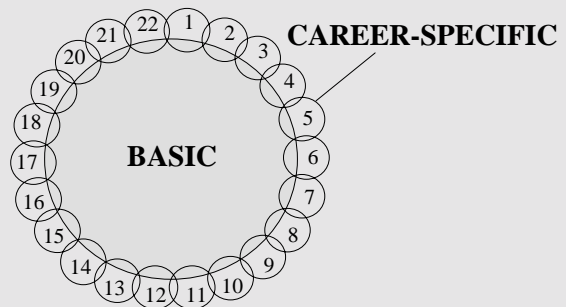
Two types of competencies are defined within the CTS program: basic and career-specific.

Basic competencies are generic to any career area and are developed within each course. Basic competencies include:

- personal management; e.g., managing learning, being innovative, ethics, managing resources
- social; e.g., communication, teamwork, leadership and service, demonstrating responsibility (safety and accountability).

Career-specific competencies relate to a particular strand. These competencies build daily living skills at the introductory levels and support the smooth transition to the workplace and/or post-secondary programs at the intermediate and advanced levels.

The model below shows the relationship of the two types of competencies within the 22 strands of the CTS program.



BASIC COMPETENCIES REFERENCE GUIDE

The chart below outlines basic competencies that students endeavour to develop and enhance in each of the CTS strands and courses. Students' basic competencies should be assessed through observations involving the student, teacher(s), peers and others as they complete the requirements for each course. In general, there is a progression of task complexity and student initiative as outlined in the Developmental Framework★. **As students progress through Stages 1, 2, 3 and 4 of this reference guide, they build on the competencies gained in earlier stages.** Students leaving high school should set themselves a goal of being able to demonstrate Stage 3 performance.

Suggested strategies for classroom use include:

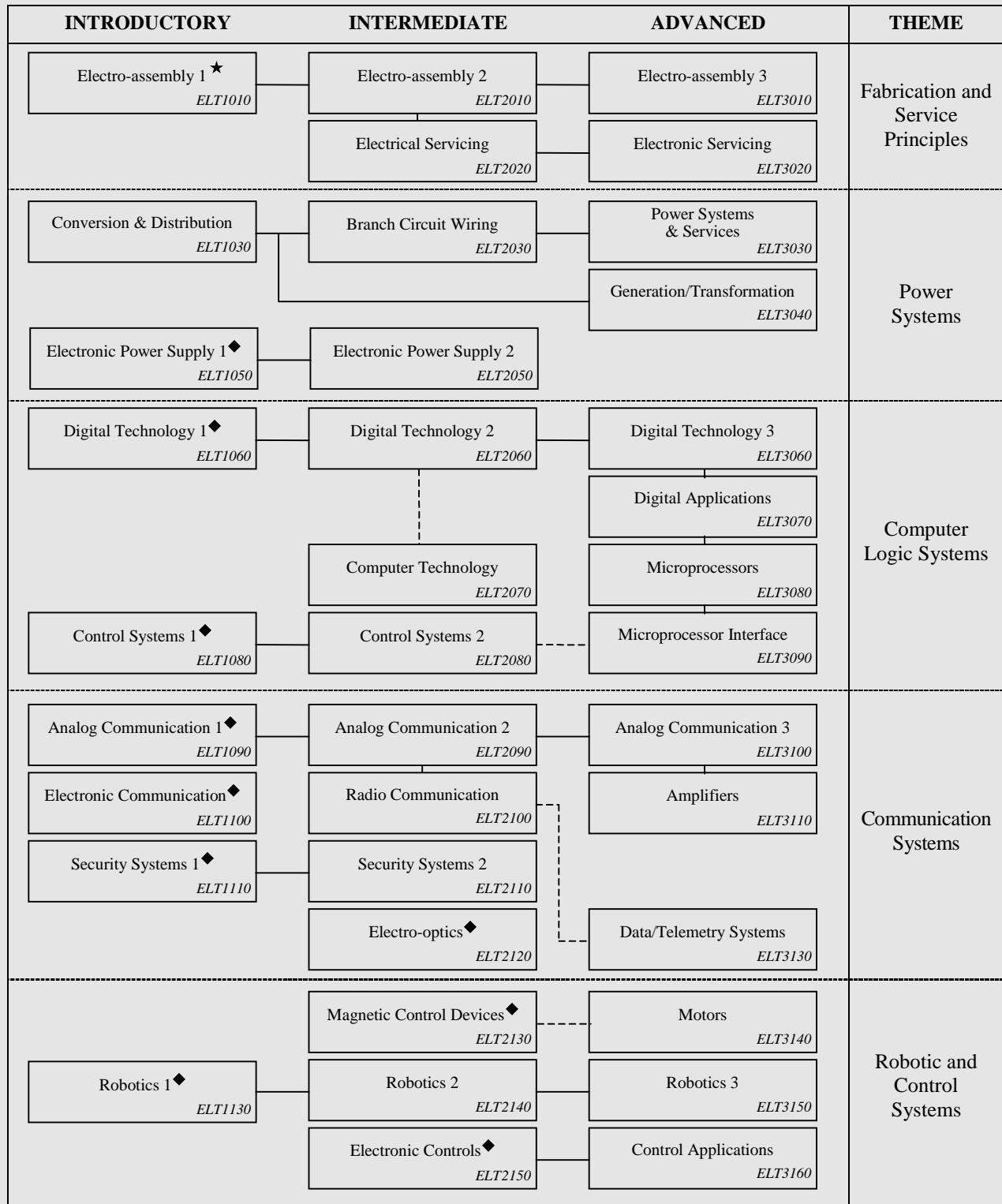
- having students rate themselves and each other
- using in reflective conversation between teacher and student
- highlighting areas of strength
- tracking growth in various CTS strands
- highlighting areas upon which to focus
- maintaining a student portfolio.

Stage 1— <i>The student:</i>	Stage 2— <i>The student:</i>	Stage 3— <i>The student:</i>	Stage 4— <i>The student:</i>
<p>Managing Learning</p> <ul style="list-style-type: none"> <input type="checkbox"/> comes to class prepared for learning <input type="checkbox"/> follows basic instructions, as directed <input type="checkbox"/> acquires specialized knowledge, skills and attitudes <input type="checkbox"/> identifies criteria for evaluating choices and making decisions <input type="checkbox"/> uses a variety of learning strategies 	<p style="text-align: center;"><input type="checkbox"/> → → →</p> <ul style="list-style-type: none"> <input type="checkbox"/> follows instructions, with limited direction <input type="checkbox"/> sets goals and establishes steps to achieve them, with direction <input type="checkbox"/> applies specialized knowledge, skills and attitudes in practical situations <input type="checkbox"/> identifies and applies a range of effective strategies for solving problems and making decisions <input type="checkbox"/> explores and uses a variety of learning strategies, with limited direction 	<p style="text-align: center;"><input type="checkbox"/> → → →</p> <ul style="list-style-type: none"> <input type="checkbox"/> follows detailed instructions on an independent basis <input type="checkbox"/> sets clear goals and establishes steps to achieve them <input type="checkbox"/> transfers and applies specialized knowledge, skills and attitudes in a variety of situations <input type="checkbox"/> uses a range of critical thinking skills to evaluate situations, solve problems and make decisions <input type="checkbox"/> selects and uses effective learning strategies <input type="checkbox"/> cooperates with others in the effective use of learning strategies 	<p style="text-align: center;"><input type="checkbox"/> → → →</p> <p style="text-align: center;"><input type="checkbox"/> → → →</p> <ul style="list-style-type: none"> <input type="checkbox"/> demonstrates self-direction in learning, goal setting and goal achievement <input type="checkbox"/> transfers and applies learning in new situations; demonstrates commitment to lifelong learning <input type="checkbox"/> thinks critically and acts logically to evaluate situations, solve problems and make decisions <p style="text-align: center;"><input type="checkbox"/> → → →</p> <ul style="list-style-type: none"> <input type="checkbox"/> provides leadership in the effective use of learning strategies
<p>Managing Resources</p> <ul style="list-style-type: none"> <input type="checkbox"/> adheres to established timelines; uses time/schedules/planners effectively <input type="checkbox"/> uses information (material and human resources), as directed <input type="checkbox"/> uses technology (facilities, equipment, supplies), as directed, to perform a task or provide a service <input type="checkbox"/> maintains, stores and/or disposes of equipment and materials, as directed 	<p style="text-align: center;"><input type="checkbox"/> → → →</p> <ul style="list-style-type: none"> <input type="checkbox"/> creates and adheres to timelines, with limited direction; uses time/schedules/planners effectively <input type="checkbox"/> accesses and uses a range of relevant information (material and human resources), with limited direction <input type="checkbox"/> uses technology (facilities, equipment, supplies), as appropriate, to perform a task or provide a service, with minimal assistance and supervision <input type="checkbox"/> maintains, stores and/or disposes of equipment and materials, with limited assistance 	<p style="text-align: center;"><input type="checkbox"/> → → →</p> <ul style="list-style-type: none"> <input type="checkbox"/> creates and adheres to detailed timelines on an independent basis; prioritizes task; uses time/schedules/planners effectively <input type="checkbox"/> accesses a range of information (material and human resources), and recognizes when additional resources are required <input type="checkbox"/> selects and uses appropriate technology (facilities, equipment, supplies) to perform a task or provide a service on an independent basis <input type="checkbox"/> maintains, stores and/or disposes of equipment and materials on an independent basis 	<p style="text-align: center;"><input type="checkbox"/> → → →</p> <ul style="list-style-type: none"> <input type="checkbox"/> creates and adheres to detailed timelines; uses time/schedules/planners effectively; prioritizes tasks on a consistent basis <input type="checkbox"/> uses a wide range of information (material and human resources) in order to support and enhance the basic requirement <input type="checkbox"/> recognizes the monetary and intrinsic value of managing technology (facilities, equipment, supplies) <input type="checkbox"/> demonstrates effective techniques for managing facilities, equipment and supplies
<p>Problem Solving and Innovation</p> <ul style="list-style-type: none"> <input type="checkbox"/> participates in problem solving as a process <input type="checkbox"/> learns a range of problem-solving skills and approaches <input type="checkbox"/> practices problem-solving skills by responding appropriately to a clearly defined problem, specified goals and constraints, by: <ul style="list-style-type: none"> – generating alternatives – evaluating alternatives – selecting appropriate alternative(s) – taking action 	<p style="text-align: center;"><input type="checkbox"/> → → →</p> <ul style="list-style-type: none"> <input type="checkbox"/> identifies the problem and selects an appropriate problem-solving approach, responding appropriately to specified goals and constraints <input type="checkbox"/> applies problem-solving skills to a directed or a self-directed activity, by: <ul style="list-style-type: none"> – generating alternatives – evaluating alternatives – selecting appropriate alternative(s) – taking action 	<p style="text-align: center;"><input type="checkbox"/> → → →</p> <ul style="list-style-type: none"> <input type="checkbox"/> thinks critically and acts logically in the context of problem solving <input type="checkbox"/> transfers problem-solving skills to real-life situations, by generating new possibilities <input type="checkbox"/> prepares implementation plans <input type="checkbox"/> recognizes risks 	<p style="text-align: center;"><input type="checkbox"/> → → →</p> <ul style="list-style-type: none"> <input type="checkbox"/> identifies and resolves problems efficiently and effectively <input type="checkbox"/> identifies and suggests new ideas to get the job done creatively, by: <ul style="list-style-type: none"> – combining ideas or information in new ways – making connections among seemingly unrelated ideas – seeking out opportunities in an active manner

Stage 1— <i>The student:</i>	Stage 2— <i>The student:</i>	Stage 3— <i>The student:</i>	Stage 4— <i>The student:</i>
<p>Communicating Effectively</p> <ul style="list-style-type: none"> <input type="checkbox"/> uses communication skills; e.g., reading, writing, illustrating, speaking <input type="checkbox"/> uses language in appropriate context <input type="checkbox"/> listens to understand and learn <input type="checkbox"/> demonstrates positive interpersonal skills in selected contexts 	<ul style="list-style-type: none"> <input type="checkbox"/> communicates thoughts, feelings and ideas to justify or challenge a position, using written, oral and/or visual means <input type="checkbox"/> uses technical language appropriately <input type="checkbox"/> listens and responds to understand and learn <input type="checkbox"/> demonstrates positive interpersonal skills in many contexts 	<ul style="list-style-type: none"> <input type="checkbox"/> prepares and effectively presents accurate, concise, written, visual and/or oral reports providing reasoned arguments <input type="checkbox"/> encourages, persuades, convinces or otherwise motivates individuals <input type="checkbox"/> listens and responds to understand, learn and teach <input type="checkbox"/> demonstrates positive interpersonal skills in most contexts 	<ul style="list-style-type: none"> <input type="checkbox"/> negotiates effectively, by working toward an agreement that may involve exchanging specific resources or resolving divergent interests <input type="checkbox"/> negotiates and works toward a consensus <input type="checkbox"/> listens and responds to understand, learn, teach and evaluate <input type="checkbox"/> promotes positive interpersonal skills among others
<p>Working with Others</p> <ul style="list-style-type: none"> <input type="checkbox"/> fulfills responsibility in a group project <input type="checkbox"/> works collaboratively in structured situations with peer members <input type="checkbox"/> acknowledges the opinions and contributions of others in the group 	<ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> cooperates to achieve group results <input type="checkbox"/> maintains a balance between speaking, listening and responding in group discussions <input type="checkbox"/> respects the feelings and views of others 	<ul style="list-style-type: none"> <input type="checkbox"/> seeks a team approach, as appropriate, based on group needs and benefits; e.g., idea potential, variety of strengths, sharing of workload <input type="checkbox"/> works in a team or group: <ul style="list-style-type: none"> – encourages and supports team members – helps others in a positive manner – provides leadership/followership as required – negotiates and works toward consensus as required 	<ul style="list-style-type: none"> <input type="checkbox"/> leads, where appropriate, mobilizing the group for high performance <input type="checkbox"/> understands and works within the context of the group <input type="checkbox"/> prepares, validates and implements plans that reveal new possibilities
<p>Demonstrating Responsibility</p> <p>Attendance</p> <ul style="list-style-type: none"> <input type="checkbox"/> demonstrates responsibility in attendance, punctuality and task completion <p>Safety</p> <ul style="list-style-type: none"> <input type="checkbox"/> follows personal and environmental health and safety procedures <input type="checkbox"/> identifies immediate hazards and their impact on self, others and the environment <input type="checkbox"/> follows appropriate/emergency response procedures <p>Ethics</p> <ul style="list-style-type: none"> <input type="checkbox"/> makes personal judgements about whether or not certain behaviours/actions are right or wrong 	<ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> recognizes and follows personal and environmental health and safety procedures <input type="checkbox"/> identifies immediate and potential hazards and their impact on self, others and the environment <input type="checkbox"/> <input type="checkbox"/> assesses how personal judgements affect other peer members and/or family; e.g., home and school 	<ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> establishes and follows personal and environmental health and safety procedures <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> assesses the implications of personal/group actions within the broader community; e.g., workplace 	<ul style="list-style-type: none"> <input type="checkbox"/> <input type="checkbox"/> transfers and applies personal and environmental health and safety procedures to a variety of environments and situations <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> demonstrates accountability for actions taken to address immediate and potential hazards <input type="checkbox"/> analyzes the implications of personal/group actions within the global context <input type="checkbox"/> states and defends a personal code of ethics as required
<p>★Developmental Framework</p> <ul style="list-style-type: none"> • <i>Simple task</i> • <i>Structured environment</i> • <i>Directed learning</i> 	<ul style="list-style-type: none"> • <i>Task with limited variables</i> • <i>Less structured environment</i> • <i>Limited direction</i> 	<ul style="list-style-type: none"> • <i>Task with multiple variables</i> • <i>Flexible environment</i> • <i>Self-directed learning, seeking assistance as required</i> 	<ul style="list-style-type: none"> • <i>Complex task</i> • <i>Open environment</i> • <i>Self-directed/self-motivated</i>

SCOPE AND SEQUENCE

ELECTRO-TECHNOLOGIES



—— Prerequisite

----- Recommended sequence

★ Course provides a strong foundation for further learning in this strand.

♦ Refer to specific courses for additional prerequisites.

COURSE DESCRIPTIONS

Course ELT1010: Electro-assembly 1

Students apply basic fabricating and servicing techniques to construct and test electronic and electromagnetic devices and cables.

Course ELT1030: Conversion & Distribution

Students experiment and work with principles of electrical energy conversion and distribution.

Course ELT1050: Electronic Power Supply 1

Students construct different types of alternating and direct current power supplies, and demonstrate their application in electrical/electronic systems.

Course ELT1060: Digital Technology 1

Students construct and demonstrate logic systems and their unique functions.

Course ELT1080: Control Systems 1

Students construct process control systems, demonstrate their basic operation, and demonstrate procedures for testing them.

Course ELT1090: Analog Communication 1

Students install and demonstrate the fundamentals of various consumer audio integrated systems.

Course ELT1100: Electronic Communication

Students demonstrate the fundamentals of video systems, and describe their uses.

Course ELT1110: Security Systems 1

Students install and demonstrate the fundamentals of sensors, control units and warning devices used in security systems.

Course ELT1130: Robotics 1

Students apply the fundamentals of robotic systems and basic robotic functions.

Course ELT2010: Electro-assembly 2

Students apply electro-assembly technology to manufacture circuit boards.

Course ELT2020: Electrical Servicing

Students demonstrate the fundamental concepts of repairing, servicing and maintaining electrical and electronic equipment.

Course ELT2030: Branch Circuit Wiring

Students demonstrate the fundamentals of branch circuit wiring used in residential/commercial buildings.

Course ELT2050: Electronic Power Supply 2

Students construct and demonstrate the fundamentals of electronic power supply technology.

Course ELT2060: Digital Technology 2

Students demonstrate knowledge of digital principles, by using small-scale transistor-transistor logic (TTL) and complementary metal oxide semiconductor (CMOS) integrated technology.

Course ELT2070: Computer Technology

Students develop the knowledge and skills required to install and configure a disc operating system and to set up a computer network.

Course ELT2080: Control Systems 2

Students demonstrate how process control technology is used in real-world applications.

Course ELT2090: Analog Communication 2

Students demonstrate the fundamental concepts of electronic analog communication systems.

Course ELT2100: Radio Communication

Students demonstrate the fundamental concepts of electromagnetic communication systems.

Course ELT2110: Security Systems 2

Students demonstrate the fundamentals of security technology used in homes, businesses and transportation systems.

Course ELT2120: Electro-optics

Students demonstrate basic knowledge of lasers and other light wave communication applications in various electronic systems.

Course ELT2130: Magnetic Control Devices

Students demonstrate the fundamentals of electromagnetic control devices.

Course ELT2140: Robotics 2

Students demonstrate the fundamental concepts of sensor devices and control systems, by building an electronic circuit to control a direct wire or mobile robot.

Course ELT2150: Electronic Controls

Students demonstrate the fundamentals of ladder/relay logic programming, and demonstrate how the program's logic controller system operates.

Course ELT3010: Electro-assembly 3

Students apply photographic processes to construct a printed circuit for an electronic project.

Course ELT3020: Electronic Servicing

Students develop and apply basic processes and skills to service and repair consumer-based electronic products.

Course ELT3030: Power Systems & Services

Students construct, operate, analyze and evaluate various single-phase and three-phase power systems and services.

Course ELT3040: Generation/Transformation

Students operate, experiment with and analyze alternators and transformers used in power generation and distribution.

Course ELT3060: Digital Technology 3

Students demonstrate knowledge of digital principles by using medium-scale transistor-transistor logic (TTL) and complementary metal oxide semiconductor (CMOS) integrated technology.

Course ELT3070: Digital Applications

Students experiment with large-scale and very large-scale integrated circuits, and demonstrate their applications to practical situations.

Course ELT3080: Microprocessors

Students compare the internal architecture of microprocessors and program them, using instruction sets.

Course ELT3090: Microprocessor Interface

Students demonstrate how to interface microprocessors/microcontrollers with real-world applications.

Course ELT3100: Analog Communication 3

Students demonstrate the principal concepts of electronic analog communication systems.

Course ELT3110: Amplifiers

Students demonstrate knowledge of various types and classes of amplifiers.

Course ELT3130: Data/Telemetry Systems

Students demonstrate the fundamentals of various data/telemetry systems, and demonstrate their applications to the real world.

Course ELT3140: Motors

Students demonstrate knowledge of electric motor operation and loading characteristics.

Course ELT3150: Robotics 3

Students demonstrate remote/autonomous control systems, by constructing circuits to control robotic behaviour.

Course ELT3160: Control Applications

Students demonstrate the fundamentals of programmed controls, and demonstrate how sensing devices are integrated to control output devices.

SECTION C: PLANNING FOR INSTRUCTION

CTS provides increased opportunity for junior and senior high schools to design courses based on the needs and interests of their students and the circumstances within the school and community. Some strands may be appropriately introduced at the junior high school level. Other strands are more appropriately introduced at the senior high school level or to Grade 9 students. Refer to Sample 1 and 2 in Section C for recommendations regarding the Electro-Technologies strand, or the *Career & Technology Studies Manual for Administrators, Counsellors and Teachers* for a summary of the recommended grade levels for each strand.

PLANNING FOR CTS

Defining Courses

Schools determine which strands and courses will be offered in a particular school, and will combine 1-credit CTS courses into multiple-credit CTS offerings.

Each 1-credit course was designed for approximately 25 hours of instruction. However, this time frame is only a guideline to facilitate planning. The CTS curricula are competency based, and the student may take more or less time to gain the designated competencies within each course.

A multiple-credit CTS offering will usually consist of 1-credit courses primarily from the same strand but, where appropriate, may include courses from other CTS strands. Refer to the *Guide to Education: ECS to Grade 12* (Appendix 1) for more information on course names and course codes.

Course selection and sequencing should consider:

- prerequisite(s)
- supporting course(s) (other CTS courses that may enhance the learning opportunity if offered with the course)
- course parameters
 - instructional qualifications, if specialized

- equipment and facility requirements, if specialized.

The course parameters are defined in Sections D, E and F of this Guide.

Degree of Flexibility

The CTS program, while designed using the modular structure to facilitate flexible timetabling and instructional delivery, does not mandate the degree of flexibility a school or teacher will offer. The teacher and school will determine the degree of flexibility available to the student. Within the instructional plan established by the school, the student may:

- be given the opportunity to progress at a rate that is personally challenging
- have increased opportunity to select courses that develop competencies he or she finds most relevant.

Integrating Basic Competencies

The basic competencies relate to managing learning and resources, problem solving and innovation, communicating effectively, working with others and demonstrating responsibility are developed throughout the CTS program, and within each 1-credit course.

Assessment of student achievement on the basic competencies is integrated throughout the other general outcomes. Refer to Section G (Assessment Tools) of this Guide for the description of student behaviours expected at each of the four developmental stages defined for the basic competencies.

Assessment of basic competencies could include input and reflection involving the student, teacher(s), peers and others. Description of the observed behaviour could be provided through a competency profile for the course. Positive, ongoing interaction between the student and teacher will support motivation for student growth and improvement.

Assessing Student Achievement

Assessing the student's competency is a process of gathering information by way of observations of process, product and student interaction.

Where appropriate, assessment tools have been defined to assist the teacher and student in the assessment. Refer to Section G (Assessment Tools) of this Guide for copies of the various tools (worksheets, checklists, sample questions, etc.).

A suggested emphasis for each general outcome has also been established. The suggested emphasis is a guideline to help teachers determine time allocation and/or the appropriate emphasis for each general outcome and the student grade.

Recognizing Student Achievement

At the high school level, successful demonstration of the exit-level competencies in a course qualifies the student for one credit. Refer to Section A for more detailed information about how curriculum and assessment standards are defined in CTS. Refer to the *Career & Technology Studies Manual for Administrators, Counsellors and Teachers* for more information on how student achievement can be recognized and reported at the school and provincial levels.

Portfolios

When planning for instruction and assessment, consider a portfolio as an excellent tool to provide evidence of a student's effort, progress and achievement. Portfolios will aid students in identifying skills and interest. They also provide the receiving teacher, employer and/or post-secondary institution proof of a student's accomplishments. The make-up and evaluation of the portfolio should be a collaborative agreement between the student and teacher.

Resources

A comprehensive resource base, including print, software and audio-visual, has been identified to support CTS strands. It is intended that these resources form the basis of a resource centre, encouraging teachers and students to access a wide selection of resources and other information sources throughout the learning process. Unless

otherwise noted, these resources are considered to be suitable for both junior and senior high school students.

Refer to Section I (Learning Resource Guide) to obtain directions for accessing up-to-date information about learning resources that have been identified to support the delivery of CTS courses in this strand.

Sample Student Learning Guides

In addition to the resources, Sample Student Learning Guides are available (refer to Section J of this Guide). These samples, designed for individual student or small group use, provide an instructional plan for selected courses and include the following components:

- Why take this course?
- What are the entry-level competencies?
- What are the exit-level competencies?
- What resources may be accessed?
- What assignments/activities must be completed?
- What are the timelines?
- How will the final mark be calculated?

Sample Student Learning Guides have been developed for the following courses in Electro-Technologies:

- ELT1010 Electro-assembly 1
- ELT1130 Robotics 1.

PLANNING FOR ELECTRO-TECHNOLOGIES

Safety

In Career and Technology Studies, health and safety are given a high priority. Teachers of Electro-Technologies program should make every effort to provide a safe environment for students. Facilitators should have knowledge of safety hazards in the program and how best to minimize accidents.

In Electro-Technologies, when student-fabricated projects involve circuitry with live (110 volts or higher) voltages, instruction must be supervised by persons with a journeyman or equivalent status. These projects must be connected, when tested, to live voltages through a ground fault interrupter (GFI) circuit breaker.

Projects may also be designed and constructed for Class 1 voltages (less than 30 volts) or simulated through the use of interactive software packages. When these delivery strategies are used, journeyman status would not be required. For specific safety concerns, refer to the course parameters and specific outcomes relating to safety.

Related Legislation

The Electro-Technologies strand delivers many of the competencies that exist in the following Alberta compulsory trade areas: Appliance Serviceman, Electrician, Electronic Technician; and some of the competencies in the following optional trade areas: Communication Electrician, Electrical Rewind Mechanic and Instrument Mechanic.

The *Alberta Apprenticeship and Industry Training Act* provides detailed explanations regarding the delivery of apprenticeship programs in Alberta. The Act specifically addresses who can or cannot work in compulsory and optional trade areas. The Act states: *A person shall not work in a compulsory or optional trade area unless that person:*

- a. *holds a trade certificate*
- b. *is an apprentice in the specified trade*
- c. *is authorized under Section 23 to work or perform one or more tasks in the trade*
- d. *is a student in a student work training program in that trade.* (Note: CTS related.)

In addition, optional certificated trades, if a person is employed by another person, that individual may work in or perform one or more tasks, activities or functions if the employer is satisfied that the person possesses the skill and knowledge in the trade as would be expected from one who would be in possession of a trade certificate.

It should be noted that the Act spells out that the ratio of journeyman to apprentices is a minimum of one apprentice to each journeyman employed. This ruling applies to Registered Apprentice students during off-campus learnings.

Instructional Qualifications

Responsibility for instructional planning and delivery of courses in Electro-Technologies will be assumed by Alberta certified teachers having expertise in classroom and electricity/electronics laboratory experience. See specific courses for detailed information regarding instructional qualifications. Note that portions of courses requiring special instructional qualifications can also be delivered through off-campus learnings. Or, projects may be accomplished using Class 1 voltages (less than 30), at which time no journeyman instructional qualifications would be required.

Selecting Courses

The scope and sequence chart in Section B provides an overview of the Electro-Technologies courses, indicating prerequisites and theme areas. Brief descriptions of each of the courses follow the scope and sequence chart in Section B.

The Electro-Technologies curriculum allows teachers the flexibility to design programs based on the needs and interests of their students and other mitigating factors within the school and/or community.

Electro-Technologies courses may be offered as multiple-credit CTS offerings; i.e., they may be grouped with other courses in this strand or from other strands into 3-, 4-, 5- or 6-credit CTS offerings.

The following groupings are samples of possible multiple-credit offerings.

Sample 1

Junior High Program

Courses
ELT1010 Electro-assembly 1 ELT1030 Conversion & Distribution MEC1010 Modes & Mechanisms
Rationale/Learnings
Students understand and appreciate electrical/electronic systems and will be motivated toward further learnings. This program complements the junior high science program. It also links with other CTS strands such as Design Studies, Construction Technologies and Fabrication Studies.

Sample 2

Senior High Program

Courses
ELT1010 Electro-assembly 1 ELT1050 Electronic Power Supply 1 ELT1060 Digital Technology 1
Rationale/Learnings
The successful completion of these courses will provide students with introductory skills and knowledge in fabrication and service, power systems and computer logic systems. This program complements the high school science program units “Understanding Technology – Electricity,” “Energy and Change,” “Electromagnetic Energy” and “Electric Forces and Fields.” This program also complements mathematics and language arts programs as well as other CTS strands.

Courses could also be grouped according to themes, thereby accommodating special interest. Many courses may be offered in combination with service and fabrication courses to accommodate individual construction projects, or with Career Transitions project courses where more challenging projects are selected requiring additional skills and time.

Organizing for Learning

Once courses have been selected and the instructional period defined, teachers will plan how students will learn. This will involve:

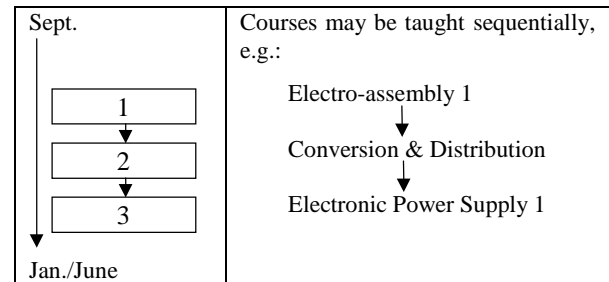
- reviewing general outcomes and specific outcomes for each course selected

- assessing the competencies that students bring to the course and determine if a course challenge is warranted, or allow students to waive some of the activities/projects if competencies have already been acquired
- directing the students to proceed to another course if all competencies are met
- determining the level of flexibility students will have in selecting and progressing through courses
- determining the resources, including student learning guides required
- determining how basic competencies will be integrated into the program
- determining instructional strategies to be used (see *CTS Manual for Administrators, Counsellors and Teachers*)
- determining how student achievement will be assessed including tools and emphasis (refer to section G of this Guide).

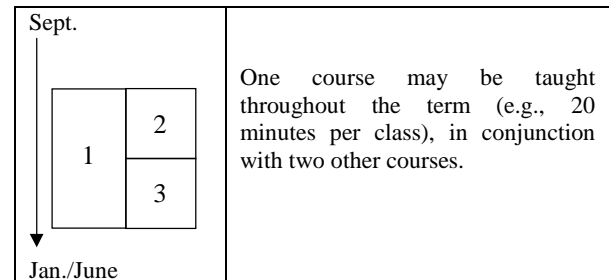
Before selecting courses, teachers should check the course parameters outlined in each course (see Sections D, E and F of this Guide).

Individual 1-credit courses can be delivered sequentially, concurrently or combined.

Scenario A

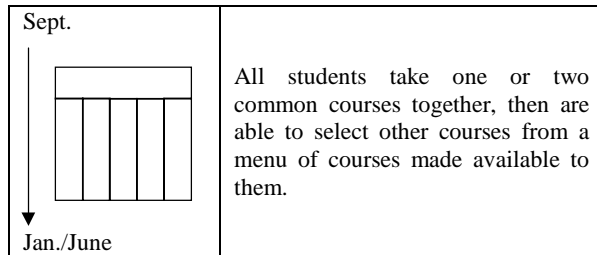


Scenario B



Teachers can also allow students to progress at a rate that is personally challenging; e.g.:

Scenario C



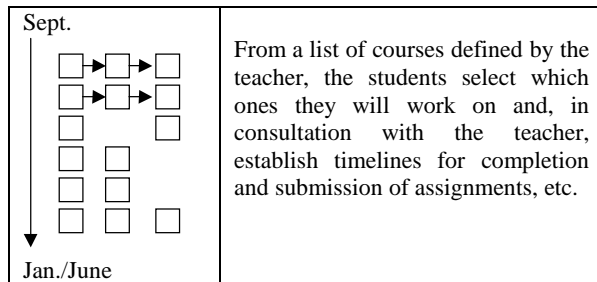
Transition from High School to the Workplace and/or Related Post-secondary Programs

To assist students in making smooth transitions, consideration should be given to the development of a portfolio.

Refer to Section H of this Guide for potential transitions that students may make into:

- the workplace
- related apprenticeship programs
- related post-secondary programs or other avenues for further learnings.

Scenario D



Identifying Linkages

Programs in Electro-Technologies may be designed by:

- combining courses from one or more strands (e.g., Mechanics, Design Studies, Construction Technologies, Career Transitions)
- combining courses with science programs.

Section H of this Guide describes linkages with CTS strands and with core and other complementary programs.

Project and practicum courses are **not** designed to be offered as distinct courses and should **not** be used to extend Work Experience 15, 25 and 35 courses.

COURSE ELT2060: DIGITAL TECHNOLOGY 2**Level:** Intermediate**Theme:** Computer Logic Systems**Prerequisite:** ELT1060 Digital Technology 1**Description:** Students demonstrate knowledge of digital principles, by using small-scale transistor–transistor logic (TTL) and complementary metal oxide semiconductor (CMOS) integrated technology.**Parameters:** Digital logic trainer, oscilloscope, function generator and related resources.**Supporting Course:** ELT2010 Electro-assembly 2**Curriculum and Assessment Standards**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • identify and interface components with TTL and CMOS small-scale integrated circuit (IC) families 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • use TTL and CMOS small-scale integrated technology ICs to: <ul style="list-style-type: none"> – identify the IC by number on the case and identify the family it belongs to using data manuals, CD ROMs, data programs – identify the pinouts concerning ground and voltage of both TTL and CMOS ICs using data manuals or CD ROMs, data programs – experiment with both CMOS and TTL ICs involving AND, NAND, NOR, OR, X-NOR, NOT gates using computer simulation or logic trainers – interface between various TTL and CMOS ICs – develop boolean expressions for all basic gates used in TTL and CMOS technology – develop truth tables for basic gates used in both TTL and CMOS ICs – explain various numbering systems and binary codes. <p><i>Assessment Tool</i> <i>ELTLAB–3: Assessment Checklist: Laboratory Practice, Part 1</i></p> <p><i>Standard</i> <i>Performance rating of 2 for each applicable task</i></p>	40

COURSE ELT2060: DIGITAL TECHNOLOGY 2 (continued)

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • identify components and construct a prototype of typical small-scale and complex logic networks, using TTL and CMOS families of ICs • demonstrate established laboratory procedures and safe work practices • demonstrate basic competencies. 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • given both TTL and CMOS small-scale and complex logic networks, the student will: <ul style="list-style-type: none"> – identify each according to gate function, type of Flip-Flop or counter or register according to number system and data reference manuals or computer programs – experiment with various gates connected into a logic network (actual or computer simulation) – develop boolean expression for gate networks – demonstrate simplification of boolean expressions, gate minimization, Karnaugh mapping – experiment with devices, such as registers, decoders, converters, multiplexes, etc. • using small-scale logic networks, prototype the solution using digital logic circuits in combination and sequential logic design <ul style="list-style-type: none"> – construct and fabricate the circuit. <p><i>Assessment Tool</i> <i>ELTLAB–3: Assessment Checklist: Laboratory Practice, Parts 1 and 2</i></p> <p><i>Standard</i> <i>Performance rating of 2 for each applicable task</i></p> <ul style="list-style-type: none"> • observed performance in following: <ul style="list-style-type: none"> – established laboratory procedures – correct procedures when working with electrostatic charges and grounding straps – recommended voltage and current rating of IC families. <p><i>Assessment Tool</i> <i>ELTPSP: Assessment Checklist: Laboratory Procedures and Safety Practices</i></p> <p><i>Standard</i> <i>Performance rating of 2 for each applicable task</i></p> <ul style="list-style-type: none"> • observations of individual effort and interpersonal interaction during the learning process. <p><i>Assessment Tool</i> <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p>55</p> <p>5</p> <p>Integrated throughout</p>

COURSE ELT2070: COMPUTER TECHNOLOGY**Level:** Intermediate**Theme:** Computer Logic Systems**Prerequisite:** None**Description:** Students develop the knowledge and skills required to install and configure a disc operating system and to set up a computer network.**Parameters:** A working computer, modem, printer, cables, software, basic hand tools and related resources.**Supporting Course:** ELT2060 Digital Technology 2**Curriculum and Assessment Standards**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • disassemble/assemble a working computer, and perform basic troubleshooting procedures 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • identifying the various subsystems of a computer • disassembling a computer into its subsystems • assembling a computer from the above parts • setting the system configurations switches • installing monitor/keyboard • demonstrating basic computer troubleshooting techniques • demonstrating consumer maintenance • reformatting a hard disk drive. <p><i>Assessment Tool</i> <i>ELTLAB-1: Laboratory Practice, Parts 2, 3 and 4</i></p> <p><i>Standard</i> <i>Performance rating of 2 for each applicable task</i></p>	30

COURSE ELT2100: RADIO COMMUNICATION**Level:** Intermediate**Theme:** Communication Systems**Prerequisite:** ELT2090 Analog Communication 2**Description:** Students demonstrate the fundamental concepts of electromagnetic communication systems.**Parameters:** Frequency generator, counter, digital multimeter, hand tools and related resources.**Curriculum and Assessment Standards**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • describe the principles of electromagnetic communication systems 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • drawing block diagrams to explain the following communication systems: <ul style="list-style-type: none"> – AM, FM radio – TV – short-wave radio – satellite communication – cellular telephone – cable television – two-way radio • explaining electromagnetic communication terms, such as: <ul style="list-style-type: none"> – carrier modulation/demodulation – amplitude modulation – frequency modulation – frequency spectrum – stereo – decoder – sidebands – oscillators. <p><i>Assessment Tool</i> <i>ELT2100–1: Presentations/Reports:</i> <i>Electromagnetic Communication Systems</i></p> <p><i>Standard</i> <i>Performance rating of 2 for each applicable task</i></p>	<p>20</p>

COURSE ELT2110: SECURITY SYSTEMS 2**Level:** Intermediate**Theme:** Communication Systems**Prerequisite:** ELT1110 Security Systems 1**Description:** Students demonstrate the fundamentals of security technology used in homes, businesses and transportation systems.**Parameters:** Digital multimeter, soldering station, breadboard, power supply, hand tools and related resources.**Supporting Course:** ELT2080 Control Systems 2**Curriculum and Assessment Standards**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> identify and describe elements of a security system 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> identification and description of the components of a security system and how they interface, such as: <ul style="list-style-type: none"> – control panel – detection device – notification device. <p><i>Assessment Tool</i> <i>ELT2110–1: Presentations/Reports: Security Systems</i></p> <p><i>Standard</i> <i>Performance rating of 2 for each applicable task</i></p>	10

COURSE ELT2110: SECURITY SYSTEMS 2 (continued)

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • identify detection and notification devices • fabricate and operate a detection and notification alarm system for home or car use • demonstrate established laboratory procedures and safe work practices 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • identifying the following detection devices: <ul style="list-style-type: none"> – proximity switch – contact switch – vibration detector – glass breakage detector – photoelectric beam – ultrasonic motion detector – microwave motion detector – infrared motion detector – dual technology detector – various alarms using computer simulation and instruction, actual devices or experimental boards. <p><i>Assessment Tool</i> <i>ELT2110–1: Presentations/Reports: Security Systems</i></p> <p><i>Standard</i> <i>Performance rating of 2 for each applicable task</i></p> <ul style="list-style-type: none"> • designing/fabricating and operating an electronic security system for personal use. <p><i>Assessment Tool</i> <i>ELTLAB–2: Assessment Checklist: Laboratory Practice, Part 2</i></p> <p><i>Standard</i> <i>Performance rating of 2 for each applicable task</i></p> <ul style="list-style-type: none"> • observed performance in following: <ul style="list-style-type: none"> – established laboratory procedures – voltage and current requirements of a security system – correct handling and charging batteries. <p><i>Assessment Tool</i> <i>ELTPSP: Assessment Checklist: Laboratory Procedures and Safety Practices</i></p> <p><i>Standard</i> <i>Performance rating of 2 for each applicable task</i></p>	<p>10</p> <p>75</p> <p>5</p>

COURSE ELT3090: MICROPROCESSOR INTERFACE**Level:** Advanced**Theme:** Computer Logic Systems**Prerequisite:** ELT3080 Microprocessors**Description:** Students demonstrate how to interface microprocessors/microcontrollers with real-world applications.**Parameters:** Microprocessor trainer, interfacing trainer, with accompanying CAI package and related resources.**Supporting Course:** ELT2080 Control Systems 2**Curriculum and Assessment Standards**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • describe microprocessor interface output and input circuits 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • explaining the following <ul style="list-style-type: none"> – input/output circuits as they apply to microprocessors – the two main methods of I/O operation in microprocessors – a simplified microprocessor interface – the term “interrupt” – the difference between various interface devices – how to interface a D/A converter to a microprocessor system. <p><i>Assessment Tool</i> <i>ELT3090–1: Presentations/Reports:</i> <i>Microprocessor Interface</i></p> <p><i>Standard</i> <i>Performance rating of 3 for each applicable task</i></p>	<p>10</p>

COURSE ELT3090: MICROPROCESSOR INTERFACE (continued)

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • explain the operation of a serial interface device • interface a digital-to-analog (D/A) and analog-to-digital (A/D) converter to a microprocessor • connect a microprocessor to a sensor device used in home, industrial and/or transportation applications 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • explaining the following: <ul style="list-style-type: none"> – an interface device and its relationship to data, control circuits and data direction registers – how serial data can be represented using both amplitude and frequency modulation techniques – the difference between asynchronous and synchronous serial data transmission – convert serial data to parallel and vice versa. <p><i>Assessment Tool</i> <i>ELT3090–1: Presentations/Reports: Microprocessor Interface</i></p> <p><i>Standard</i> <i>Performance rating of 3 for each applicable task</i></p> <ul style="list-style-type: none"> • constructing a student project that will be interfaced to a microprocessor, using D/A and A/D converter. <p><i>Assessment Tool</i> <i>ELTLAB–3: Assessment Checklist: Laboratory Practice, Parts 1 and 2</i></p> <p><i>Standard</i> <i>Performance rating of 3 for each applicable task</i></p> <ul style="list-style-type: none"> • locating, researching, experimenting or constructing a device to be connected to a microprocessor • writing a program to accept data and return data to a device, such as: <ul style="list-style-type: none"> – photo resistor – temperature and optical sensors – photo diodes and photo transistors – optocouplers – Hall effect devices – DC stepper motors 	<p>10</p> <p>40</p> <p>35</p>

COURSE ELT3130: DATA/TELEMETRY SYSTEMS**Level:** Advanced**Theme:** Communication Systems**Prerequisite:** None**Description:** Students demonstrate the fundamentals of various data/telemetry systems, and demonstrate their applications to the real world.**Parameters:** Multimeters (analog/digital), function generator, oscilloscope and related resources. Optional equipment: computers, satellite receiver, special trainer or simulators.**Supporting Courses:** ELT3100 Analogue Communication 3
ELT2100 Radio Communication**Curriculum and Assessment Standards**

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • distinguish the difference between analog and digital carriers with voice or data transmission 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • explaining the differences between the following data/telemetry concepts: <ul style="list-style-type: none"> – analog link versus digital link – digital and data communication – pulse code modulations (PCM) and pulse amplitude signal (PAM) – frequency shift keying (FSK), phase shift keying (PSK) and quadrature amplitude modulation (QAM) – carrier and character synchronization – synchronous and asynchronous modems – scrambler and descrambler techniques – circuit message network and packet switching network. <p><i>Assessment Tool</i> <i>CTSPRE: Assessment Framework:</i> <i>Presentations/Reports</i></p> <p><i>Standard</i> <i>Performance rating of 3 for each applicable task</i></p>	20

COURSE ELT3130: DATA/TELEMETRY SYSTEMS (continued)

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • explain data/telemetry communication through experimentation, circuit analysis and project work 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • using advanced data/telemetry circuits, such as: <ul style="list-style-type: none"> – digital sampling unit – parity bit checker and detector – digital to analog (D/A) or analog to digital (A/D) converters – pulse-amplitude modulation – time division multiplexing • using computer simulation, experimental boards, CAI package or trainers to analyze the following data/telemetry concepts: <ul style="list-style-type: none"> – a function generator and observe how it can be used to encode digital information onto an FSK signal – an FSK decoder and observe how it can be used to convert a FSK signal back into a digital data – a PAM communication system that uses time division multiplexing – ongoing observed performance in the construction of an advanced data/telemetry project of student choice. <p><i>Assessment Tool</i> <i>ELTLAB–2: Assessment Checklist: Laboratory Practice, Parts 1 and 3</i></p> <p><i>Standard</i> <i>Performance rating of 3 for each applicable task</i></p>	<p>55</p>
<ul style="list-style-type: none"> • construct a voice or data transmission network 	<ul style="list-style-type: none"> • constructing or installing one of the following data networks: <ul style="list-style-type: none"> – star – ring – multidrop • constructing or installing one of the following voice transmission networks: <ul style="list-style-type: none"> – simplex – half-duplex – full-duplex. <p><i>Assessment Tool</i> <i>ELTLAB–2: Assessment Checklist: Laboratory Practice, Part 2</i></p> <p><i>Standard</i> <i>Performance rating of 3 for each applicable task</i></p>	<p>20</p>

COURSE ELT3140: MOTORS**Level:** Advanced**Theme:** Robotic and Control Systems**Prerequisite:** None**Description:** Students demonstrate knowledge of electric motor operation and loading characteristics.

Parameters: AC/DC motors (single-phase AC motor and DC motors) and related resources.
Note: The student must have access to instruction from an individual with Electrical Technologist or journeyman status when students are performing practical components other than low voltage.

Supporting Courses: ELT2130 Magnetic Control Devices
 ELT3040 Generation/Transformation
 ELT2080 Control Systems 2

Curriculum and Assessment Standards

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • explain electromotive principles as applied to direct current (DC) and single-phase alternating current (AC) motors • explain the operational characteristics of common DC and AC motors 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • explaining the electromotive principles of both a DC motor and an AC single-phase motor. <p><i>Assessment Tool</i> <i>ELT3140–1: Presentation/Reports, Electric Motors</i></p> <p><i>Standard</i> <i>Performance rating of 3 for each applicable task</i></p> <ul style="list-style-type: none"> • describing the operating characteristics of: <ul style="list-style-type: none"> – DC series motor – DC shunt motor – DC compound motor – single- and/or three-phase commutator motors – single- and/or three-phase induction motor – single- and/or three-phase synchronous. <p><i>Assessment Tool</i> <i>ELT3140–1: Presentations/Reports: Electric Motors</i></p> <p><i>Standard</i> <i>Performance rating of 3 for each applicable task</i></p>	<p>15</p> <p>20</p>

COURSE ELT3140: MOTORS (continued)

General Outcomes	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> • set up selected DC and AC motors, and demonstrate their loading characteristics • demonstrate established laboratory procedures and safe work practices • create a profile of a trade or occupation within the field of electric motors • demonstrate basic competencies. 	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> • collecting data to graph the operating characteristics of the following motors: <ul style="list-style-type: none"> – DC compound motor – single- and three-phase commutator motors – single- and three-phase induction motor – single-phase synchronous. <p><i>Assessment Tool</i> <i>ELTLAB–2: Assessment Checklist: Laboratory Practice, Part 1</i></p> <p><i>Standard</i> <i>Performance rating of 3 for each applicable task</i></p> <ul style="list-style-type: none"> • observed performance in following: <ul style="list-style-type: none"> – established laboratory procedures – proper wiring practices – correct loading and operating procedures. <p><i>Assessment Tool</i> <i>ELTPSP: Assessment Checklist: Laboratory Procedures and Safety Practices</i></p> <p><i>Standard</i> <i>Performance rating of 3 for each applicable task</i></p> <ul style="list-style-type: none"> • completing a career profile chart related to servicing/repairing electric motors. <p><i>Assessment Tool</i> <i>ELTCPC: Assessment Guide: Career Profiles</i></p> <p><i>Standard</i> <i>Completing all sections of the profile chart</i></p> <ul style="list-style-type: none"> • observations of individual effort and interpersonal interaction during the learning process. <p><i>Assessment Tool</i> <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p>55</p> <p>5</p> <p>5</p> <p>Integrated throughout</p>

SECTION I: LEARNING RESOURCE GUIDE

This section of the GSI explains how to obtain up-to-date information regarding learning resources that have been identified to support the delivery of courses in this strand. It provides directions for searching, by electronic means, the most current information on:

- authorized student basic, support and authorized teaching resources—resources approved by Alberta Learning for use in this strand
- provincial software agreements—licensing agreements that allow school jurisdictions to purchase educational software at significantly reduced prices
- additional sources of information—other titles and information sources that may provide potentially useful ideas for courses in this strand.

The resource listings compiled for this strand are time sensitive and subject to change. Teachers are encouraged to browse the web sites identified in this guide on a regular basis for the most up-to-date information on new learning resources, more recent versions/editions and other sources of support.

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NOTICE

SECTION I: LEARNING RESOURCE GUIDE

Alberta Learning authorizes a variety of resources that support learning and teaching in this strand. The 1999 and 2000 amendments to Section I provide directions for obtaining, by electronic means, up-to-date information about authorized resources and other sources of information.

Teachers are encouraged to browse the web sites identified in this guide on a regular basis for the most up-to-date information on:

- authorized resources; i.e., student basic, support, and authorized teaching
- provincial software licensing agreements
- additional sources of support.

The lists of authorized resources that were previously included in Section I have been removed from the 1999 and 2000 amendments to this document. Up-to-date listings of authorized resources can be accessed through:

- the Learning Resources Distributing Centre *Buyers Guide*, available electronically at <<http://www.lrdc.edc.gov.ab.ca>>
- the Authorized Resources Database, available electronically at <<http://www.learning.gov.ab.ca>> under Students and Learning, Learning and Teaching Resources.

Subsequent amendments to the *Guide to Standards and Implementation* for other CTS strands will include similar changes to Section I.

LEARNING RESOURCE GUIDE

This section of the guide provides directions for obtaining, from electronic sources, up-to-date information about learning resources that support the delivery of CTS courses in this strand. Teachers may use the information to search for current listings of:

- authorized resources that support learning and teaching
 - basic learning resources
 - support learning resources
 - authorized teaching resources
- provincial software licensing agreements
- additional sources of information
 - other titles and sources that contain potentially useful information and ideas
 - web sites that may provide access to global networks of information.

Learning resources for this strand will continue to be updated in order to maintain and expand access to current information suitable for use in a variety of CTS learning environments.

CTS AND THE RESOURCE-BASED CLASSROOM

CTS supports the development of resource-based classrooms where a variety of appropriate, up-to-date print and nonprint resources are available. This approach enables students to:

- interact with a wide range of information sources
- access and use information sources appropriately
- take an active role in managing their own learning.

CTS identifies learning resources in print, software, video and CDROM formats, as well as other sources of information available in the community and through the Internet.

Collaboration between the teacher–librarian and CTS teacher in planning resource-based research activities will ensure that students develop research skills as they increase their understanding of subject content. Planned and purposeful research activities will help students learn to

gather, process and share information, and will require access to a range of current print and nonprint resources available in the school library, other libraries, the community and/or from other sources.

Teachers are encouraged to reference *Focus on Research: A Guide to Developing Students' Research Skills*, referenced in the Alberta Learning Monographs section of this guide, when planning research activities.

LEARNING RESOURCE POLICY

Alberta Learning authorizes resources considered appropriate for provincial programs of study and that have met criteria for acceptability. The authorized resources for CTS include:

- student basic—resources that address the majority of the learner outcomes in one or more CTS courses
- student support—resources that assist in addressing some of the learner outcomes of a CTS course
- authorized teaching—resources that support the implementation of one or more CTS courses and assist teachers in the instructional process.

The Learning Technologies Branch also has developed distance education materials for a number of CTS courses. These course materials, also authorized by the province of Alberta, include a range of print and electronic products that can be used to support teaching and learning in CTS.

School boards may identify and approve instructional materials for use in their schools under section 44 (2) of the *School Act*. Many school boards have delegated the power to approve resources to school staff or other board employees under section 45 (1) of the *School Act*.

For further information on resource policy and definitions, refer to the *Student Learning Resources Policy* and *Teaching Resources Policy* or contact:

Learning Resources Unit
Learning and Teaching Resources Branch
Alberta Learning
5th Floor, Devonian Building, East Tower
11160 Jasper Avenue
Edmonton, AB, Canada T5K 0L2
Telephone: 780-422-4872 (to be connected toll
free inside Alberta dial 310-0000)
Fax: 780-422-0576
Internet: <<http://www.learning.gov.ab.ca>>

HOW TO OBTAIN UP-TO-DATE INFORMATION

Authorized Resources

A searchable online index of all student basic, support and authorized teaching resources for courses in this CTS strand is provided through the Authorized Resources Database on the provincial web site. Each entry in the database provides bibliographic information about the resource, an annotation where appropriate, a correlation to specific 1-credit courses in this strand, and information about how to obtain the resource.

The Authorized Resources Database can be accessed at <<http://www.learning.gov.ab.ca>>:

- click on “Students and Learning”
- select “Learning and Teaching Resources”
- then select the “Authorized Resources Database.”

When using the database to search for resources within a particular CTS strand:

- enter the strand name as the “Curricular Area”
- select the desired “Format” and “Authorization Status” from the options provided
- click on “Submit.”

The database begins each list of student basic, support and authorized teaching resources with those resources that have been authorized most recently.

Upon first entering the database, the user is provided with a title and brief description of each resource, accompanied with copyright information, authorization status, number of pages and intended use by curriculum area and grades. Then by clicking on the “More” icon, a more detailed description of each resource can be obtained, along with additional information regarding publisher/distributor, physical appearance, cost, correlation to individual CTS courses, how to obtain the resource and where the resource can be previewed.

Up-to-date information regarding the availability of distance education materials for CTS courses (i.e., print products, electronic products, products in development) can also be obtained through the web site:

- click on “Students and Learning”
- select “Learning and Teaching Resources”
- then select the “Learning Technologies Branch.”

Teachers are encouraged to browse the Authorized Resources Database and Learning Technologies Branch homepage on a regular basis for the most up-to-date information on authorized learning resources and distance education course materials that are available.

Provincial Software Agreements

Due to frequent upgrades occurring in productivity software (e.g., software packages developed for word processing, spreadsheet, database, multimedia, drawing and design applications), this kind of software is no longer authorized by the department. However, a number of provincial licensing agreements for software products are in place that allow school jurisdictions to purchase productivity software at significantly reduced prices.

An up-to-date listing of provincial software agreements can be obtained through the “Technology” section of the web site. Teachers are encouraged to browse this listing on a regular basis for information regarding additional provincial software licensing agreements that may be established from time to time.

HOW TO ORDER AUTHORIZED RESOURCES

Most of the student basic, support and authorized teaching resources can be obtained from the Learning Resources Distributing Centre (LRDC). The LRDC *Buyer’s Guide*, available in electronic or print formats, provides a complete listing of resources available for purchase and additional ordering information. The LRDC can be contacted at:

12360 – 142 Street
Edmonton, AB, Canada T5L 4X9
Telephone: 780-427-5775 (to be connected toll free
inside Alberta dial 310-0000)
Fax: 780-422-9750
Internet: <<http://www.lrdc.edc.gov.ab.ca>>.

It is recommended that all resources be previewed prior to purchase. In some instances, teachers may find it desirable to purchase one copy for their reference and additional copies as required.

ADDITIONAL SOURCES OF INFORMATION

There are many additional sources of information—other titles, and information available from government, professional associations, industry organizations and community agencies—that may provide potentially useful ideas for courses in this strand. Of further note are a number of web sites relevant to courses in this strand, which when used effectively, can provide both teachers and learners with a global network of useable information.

The responsibility to evaluate these additional sources of information prior to selection rests with the user, in accordance with any existing local policy.

CTS Council

An online listing of additional sources of information relevant to courses in this strand is available on the CTS Council web site at <<http://ctscouncil.com>>. The CTS Council welcomes your suggestions for maintaining and expanding the sources of information that are shared through this site.

Telus 2Learn Alliance

A searchable online listing of web sites containing information and materials relevant to courses in this strand is available through the Telus 2Learn Alliance at <<http://www.2Learn.ca>>. This site can be accessed through the CTS homepage by going to “Related Sites.”

OTHER SOURCES OF SUPPORT

ACCESS: The Education Station

ACCESS: The Education Station offers a variety of resources and services to teachers. For a nominal dubbing and tape fee, ACCESS: The Education Station will copy audiotapes and videotapes for teachers.

ACCESS: The Education Station publishes listings of audiocassettes and videocassettes as well as a comprehensive programming schedule. For further information, visit their web site at <<http://www.accessstv.ab.ca>>.

National Film Board of Canada

The National Film Board of Canada (NFB) has numerous audiovisual resources that may be suitable for use in CTS courses. While these resources can be ordered directly from the NFB, many of their materials are also available in public libraries.

For a list of NFB audiovisual resources indexed by title and subject, or to place an order for audiovisual resources, visit their web site at <<http://www.nfb.ca>>.

Media and Resource Centres

There are a number of urban media and regional resource centres across the province that provide on a loan basis instructional materials that may support CTS courses. Teachers are encouraged to contact their local media or resource centre for further information regarding services that are available.

Urban Media Centres

Calgary Board of Education
Calgary, AB, Canada
Web site: <www.cbe.ab.ca>

Calgary Separate School Board
Calgary, AB, Canada
Web site: <www.crcssd1.calgary.ab.ca>

Edmonton Catholic School District
Edmonton, AB, Canada
Web site: <www.ecs.edmonton.ab.ca>

Edmonton Public School Board
Edmonton, AB, Canada
Web site: <www.epsb.edmonton.ab.ca>

Elk Island Public School Division
Sherwood Park, AB, Canada
Web site: <www.ei.educ.ab.ca>

Medicine Hat School District
Medicine Hat, AB, Canada
Web site: <www.sd76.ab.ca>

Northern Lights School Division
Spirit River, AB, Canada
Web site: <www.nlsd.ab.ca>
Red Deer Public School District
Red Deer, AB, Canada
Web site: <www.rdpsd.ab.ca>

Regional Resource Centres

Zone 1
Zone One Regional Resource Centre
Peace River, AB, Canada
Web site: (not yet available)

Zone 2/3
Central Alberta Media Services
Sherwood Park, AB, Canada
Web site: <www.cams.ab.ca>

Zone 4
Parkland Regional Library
Lacombe, AB, Canada
Web site: <www.prl.lacombe.ab.ca>

Zone 5
South Central Alberta Resource Centre
Strathmore, AB, Canada
Web site: (available in September 1999)

Zone 6
Southern Alberta Learning Resource Centre
Lethbridge, AB, Canada
Web site: (available in July 1999)

Alberta Learning Monographs

The following monographs are available for purchase from the Learning Resources Distributing Centre. Refer to the "Support Documents" section or the "Legal, Service and Information Publications" section in the LRDC *Buyers Guide* for ordering information and costs.

- *The Emerging Student: Relationships Among the Cognitive, Social and Physical Domains of Development*, 1991 (LRDC Product No. 161555)

This document examines the child, or student, as a productive learner, integrating all the domains of development: cognitive, social and physical. It emphasizes the need for providing balanced curriculum and instruction.

- *Students' Interactions Developmental Framework: The Social Sphere*, 1988 (LRDC Product No. 161399)

This document examines children's perceptual, structural and motor development and how such physical development affects certain learning processes.

- *Focus on Research: A Guide to Developing Students' Research Skills*, 1990 (LRDC Product No. 161802)

This document outlines a resource-based research model that helps students manage information effectively and efficiently, and gain skills that are transferable to school and work situations. This model provides a developmental approach to teaching students how to do research.

- *Teaching Thinking: Enhancing Learning*, 1990 (LRDC Product No. 161521)

Principles and guidelines for cultivating thinking, ECS to Grade 12, have been developed in this resource. It offers a definition of thinking, describes nine basic principles on which the suggested practices are based, and discusses possible procedures for implementation in schools and classrooms.

[The 1997 text was deleted September 2000.]

Note

***Effective September 2000,
pages I.9 to I.38 have been deleted
and not replaced.***