FIRST EDUCATION

Class Pack Standards Alignment
Canada Technology Education Standards

FIRST TECH CHALLENGE

Legend

X The standard is clearly addressed by program activities.

- This standard potentially could be addressed as part the program either by actions that the coach or teacher takes when working with the students or by conditions established by the program.

Module Abbreviations			
WS	Starting with Workforce Skills	PS	Project Sprints and Competition
DG	Designing for the Game	I4	Industry 4.0 and Your Community
BR	Building and Programming a Basic Robot	SJ	Sensors Machine Learning and Java
MM	Machines to Mechanisms	I2	Improving through Iteration II
I1	Improving through Iteration I	LC	Learning and Pathways and Career Exploration

TE J4 M	Computer Technology Fundamentals Expectations	WS	DG	BR	MM	I1	PS	I4	SJ	I2	LC
Computer Hardware	A1.1 describe the function of internal buses within computer systems (e.g., data bus; memory bus; address bus; buses in CPUs, RAM, and chipsets);			-					-		
	A1.2 identify appropriate storage devices for various computing requirements (e.g., optical drives, flash drives, single and arrayed hard drives);			-					-		
	A1.3 describe how advances in computer technology (e.g., CPUs, memory, storage) have spurred advances in related technologies (e.g., cellular telephones, hand-held devices, image capture systems).							x			
Computer Systems	A2.1 describe how to assign permissions and attributes to drives, folders, and files with various operating systems (e.g., user permissions, archiving, encryption, compression);	-	-	-	-	-	-	-	-	-	-
	A2.2 describe methods for optimizing a computer system (e.g., updating firmware, updating drivers, defragmenting files, allocating virtual memory);			x		x		x	x	x	
	A2.3 describe the functions of the BIOS and other firmware in computer systems (e.g., boot process, hardware recognition, resource allocation, port settings, energy management);			x		-		-	-	-	
	A2.4 describe various standards for data flow between computer ports and peripherals (e.g., MIDI, RS-232, USB, IEEE 1394, SCSI).			x		x		x	x	x	
	A3.1 use technical terminology to accurately describe the specifications for electronic components and computer interfaces;			x	x	x	x	x	x	x	
	A3.2 describe the function and operation of various input devices, output devices, and electronic circuits used in interface and control systems (e.g., input devices: temperature sensor, light sensor, position encoder; output devices: AC motor, stepper motor; circuits: power supply, motor driver);			x	x	x	x	x	x	x	

Electronics, Robotics, and Computer Interfacing	A3.3 calculate the values and operating parameters of electronic components in a circuit, using fundamental laws and circuit-analysis techniques (e.g., Ohm's law, Kirchhoff's laws, Thévenin and Norton equivalent circuits);			-							
	A3.4 draw and interpret diagrams that use standard symbols to represent electronic components and the operation of control systems (e.g., schematic diagram, block diagram, flow chart);			x		x				x	
	A3.5 research and select components based on circuit requirements (e.g., use Internet searches, manufacturer's data sheets, supplier catalogues, and/or parts database).		x	x	x	x	x	x	x	x	
Networking Concepts	A4.1 describe the function of routed protocols (e.g., IP, IPX) and routing protocols (e.g., RIP, OSPF, EIGRP) in the transmission of data over a network;								x		
	A4.2 explain the seven layers of the OSI (open systems interconnection) model and the corresponding network devices;										
	A4.3 describe IP addressing and subnetting strategies for IP networks (e.g., borrowing bits, calculating number of subnets and hosts, determining specific subnet address range);										
	A4.4 describe static and dynamic classful public and private addressing and related strategies (e.g., Class A, Class B, Class C, NAT, PAT, DHCP).										
Data Representation and Digital Logic	A5.1 perform arithmetic operations on positive and negative binary numbers (e.g., addition, subtraction) using two's complement representation;			x		x		x	x	x	
	A5.2 use Boolean logic (e.g., Karnaugh maps) to design a solution to a logic problem that has multiple inputs and outputs (e.g., manufacturing process, starting a car);								x	x	
	A5.3 use Boolean logic and the laws of Boolean algebra to design, simplify, and build computer logic circuits using logic gates (e.g., adder circuit, decoder circuit);								x	x	
	A5.4 describe the role of flip-flop circuits in the storage and flow of data (e.g., asynchronous counter, synchronous counter, shift register, memory register);										
	A5.5 describe how computers store and work with different types of data, including numbers, characters, and arrays;			x		x		x	x	x	
	A5.6 explain how analogue quantities can be represented by digital systems (e.g., analogue to-digital converter, pulse-width modulation).			x		x		x	x	x	

FIRST EDUCATION

Class Pack Standards Alignment
Canada Technology Education Standards

FIRST TECH CHALLENGE

TEJ4 M	Computer Technology Skills	WS	DG	BR	MM	I1	PS	I4	SJ	I2	LC
Hardware Solutions	B1.1 select appropriate components and build computer systems that meet specific requirements (e.g., gaming system, engineering workstation, media centre, control system, home office system);										
	B1.2 select and use appropriate procedures, tools, and diagnostic equipment when assembling computing devices (e.g., procedures: use of anti-static wrist strap and/or mat; tools: crimper; diagnostic equipment: multimeter, cable tester, oscilloscope);										
	B1.3 construct and test connection media for interfacing a computer with an external device (e.g., serial cable, parallel cable).			x							
Computer Systems	B2.1 use a variety of sources to collect information for solving computer problems (e.g., Internet searches, technical reference materials);			x		x		x	x	x	
	B2.2 create a log and/or engineering journal to document work done on computer systems (e.g., troubleshooting, software updates, hardware installations, maintenance);	x	x	x	x	x	x	x	x	x	x
	B2.3 use a logical approach to diagnose and troubleshoot computer hardware and software problems			x		x		x	x	x	
Electronics Robotics and Computer Interfacing	B3.1 use a design process (see pp. 22–23) and appropriate software (e.g., circuit simulation software, CAD [computer-aided design] software) to design circuits;	x			x	x			x	x	
	B3.2 construct circuits made from both discrete components and integrated circuits to perform specific functions (e.g., regulated power supply, electronic dice, audio amplifier, microcontrollerbased alarm circuit)										
	B3.3 safely construct electronic circuits for interfacing or robotic applications using appropriate materials, tools, and techniques, including soldering (e.g., materials: breadboard, printed circuit board, etchant, solder; tools: soldering iron, etch bath, third hand with magnifier);										
	B3.4 test and troubleshoot electronic circuits, using appropriate methods (e.g., isolating and substituting components) and test equipment (e.g., multimeter, oscilloscope, logic probe), and modify the circuits to meet design requirements if necessary			x	x	x	x	x	x	x	
	B4.1 design and build a network (e.g., connection media, interconnection devices, peripherals, server, workstations) that meets user requirements;										

Network Setup and Management	B4.2 optimize and maintain a computer network (e.g., check performance, accessibility, and security);			x		x	x		x	x	
	B4.3 implement various network services for users (e.g., HTTP, FTP, remote desktop, SMTP, DHCP);										
	B4.4 configure workstations, servers, and/or networked devices (e.g., create users, assign privileges to folders, set up services, format and partition hard drives);										
	B4.5 apply logical troubleshooting techniques, using data from simulation and/or diagnostic tools (e.g., simulation software, packet sniffers, cable tester			x		x	x	x	x	x	
Computer Programming	B5.1 compare low-level and high-level programming languages;								x	x	
	B5.2 apply programming concepts including subroutines, parameter passing, decision and repetition structures, arrays, and character representation;								x	x	
	B5.3 use a design process (see pp. 22–23) to create a program that interacts with a real-world device (e.g., traffic light, alarm system, robot, joystick);		x	x	x	x	x	x	x	x	x
	B5.4 write a low-level program that runs on a real or simulated controller device (e.g., programmable logic controller [PLC], microcontroller, assembler simulator).			x	x	x	x	x	x	x	x
TEJ4M	**Technology The Environment and Society**	WS	DG	BR	MM	I1	PS	I4	SJ	I2	LC
Technology and the Environment	C1.1 assess the effects of computer and electronics technology on the environment (e.g., hazardous materials contained in computer components, use of energy and other resources, fuel consumption and air pollution reduced by computerized traffic control systems);							-			
	C1.2 outline and apply strategies to recycle or reuse computers and computer components (e.g., develop a local recycle/reuse program, create an in-school public awareness campaign).							-			
Technology and Society	C2.1 assess the benefits of computer and electronic technology for society (e.g., improved access to technology for economically disadvantaged people and nations; greater efficiency and lower costs for information services; development of a “global village”; software that can help monitor or predict changes in wetland area, deforestation, and climate);							-			
	C2.2 assess the drawbacks of computer and electronics technology for society (e.g., Internet gambling addictions, more sedentary lifestyle, spam,							-			

	telemarketing, loss of privacy, infringement of intellectual property rights through unlicensed copying and electronic distribution).										
TEJ4M	**Professional Practice and Career Opportunities**	WS	DG	BR	MM	I1	PS	I4	SJ	I2	LC
Health and Safety	D1.1 explain the importance of following industry health and safety standards and practices (e.g., standards and regulations specified in the Workplace Hazardous Materials Information System [WHMIS] and the Electrical Safety Code; practices such as electrical grounding and precautionary measures when working with live circuits and devices that store electrical energy; ergonomically	x	x	x	x	x	x	x	x	x	x
	xD1.2 evaluate and use appropriate techniques to avoid health and safety problems (e.g., repetitive strain injuries, eye strain, electrical shock, burns from soldering tools) when assembling, using, and maintaining computer systems.	x	x	x	x	x	x	x	x	x	x
Ethics and Security	D2.1 describe the components of an acceptable use policy for computers, cellular technology, PDAs, and/or other electronic devices (e.g., appropriate use, protection of intellectual property rights, prohibition of plagiarism);							x			
	D2.2 outline a purchasing policy for computers, taking ethical issues into account (e.g., the environment, human rights, child labour);							x			
	D2.3 describe methods to safeguard confidential data and other sensitive electronic information (e.g., password protection, encryption, biometrics, behavior metrics, steganography).							x			
Career Opportunities	D3.1 assess various career opportunities related to computer technology and electronics(e.g., computer engineering technician or technologist, electrical engineer, programmer, systems analyst), and identify opportunities for further training and certification (e.g., college or university programs, trade certifications);										x
	D3.2 explain the need for lifelong learning in the computer technology industry (e.g., rapid changes in technology, employability, progress into positions of greater responsibility);										x
	D3.3 demonstrate an understanding of and apply the Essential Skills that are important for success in the computer technology industry, as identified in the Ontario Skills Passport (OSP) (e.g., reading text, writing, document use, computer use, oral communication, numeracy, thinking skills);										x

	D3.4 demonstrate an understanding of and apply the work habits that are important for success in the computer technology industry, as identified in the Ontario Skills Passport (e.g., working safely, teamwork, reliability, organization, working independently, initiative, self-advocacy);										x
	D3.5 maintain an up-to-date portfolio that includes pieces of work and other materials that provide evidence of their skills and achievements in computer technology (e.g., Passport to Safety certificate, OSP Work Plan, OSP Transition Plan, circuit diagrams, photographs of projects, video of working robot), and explain why having a current portfolio is important for career development and advancement.										x