

Manufacturing

Required Components for the SHSM—Manufacturing

1. A bundle of nine Grade 11 and Grade 12 credits that comprises:
 - four manufacturing major credits
 - three other required credits from the Ontario curriculum, in English, mathematics, and science
 - two cooperative education credits tied to the sector
2. Six sector-recognized certifications and/or training courses/programs (three compulsory and a choice of three electives)
3. Experiential learning and career exploration activities within the sector
4. Reach ahead experiences connected with the student's postsecondary plans
5. Development of Essential Skills and work habits required in the sector, and documentation of them using the OSP

Profile of the Manufacturing Sector

Automobiles, wood products, petroleum and coal products, iron and steel mills, primary metals and fabricated metal products, electricity, plastics and rubber products, printing, biotechnology, textiles, clothing, and leather products are all aspects of the manufacturing sector. In Ontario, the manufacturing sector still accounts for the greatest number of jobs with its production of consumer and industrial goods that are essential for the province's prosperity. Although the manufacturing sector remains a powerhouse in our economy, contributing 15 per cent of gross domestic product in 2007, the sector is undergoing fundamental change.¹

An article on the website of the Alliance of Sector Councils² explains that the manufacturing sector is under tremendous pressure as a result of multiple external stresses, including market-place globalization, an accelerated pace of technological change, and a global financial crisis. The alliance reports that manufacturers are now urgently refocusing their strategies to remain competitive and continue to be an important part of the Canadian economy.

The manufacturing industry is committed to addressing skills development, labour market, and human resource issues across the various sectors within Canadian manufacturing. This will provide new employment opportunities for students choosing to pursue a career in this sector.

INSIGHT

The requirements of this SHSM are unique and are geared to the manufacturing sector. However, the design of all SHSM programs follows a consistent model, described in **Section A: Policy**.

¹ Statistics Canada, Canada Yearbook Overview 2008, www41.statcan.ca/2008/ceb_r000_2008-eng.htm.

² The Alliance of Sector Councils, Manufacturing, www.councils.org/our-priorities/manufacturing.

The SHSM in manufacturing provides students with a strong foundation for a wide variety of careers in the manufacturing sector, from those focusing on the service, repair, and modification of vehicles and vehicle systems to those related to the organization and management of manufacturing services and mass-transit systems.

Occupations in the Manufacturing Sector

The following table provides examples of occupations in the manufacturing sector, with corresponding NOCs, sorted according to the type of postsecondary education or training the occupations would normally require.

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See **Section A1.6** for more on occupations and NOCs

Apprenticeship Training	College
<ul style="list-style-type: none"> • Die Designer 2232 • Electrician 7212 • Electrician, Plant Maintenance 7242 • Industrial Instrument Mechanic 2243 • Millwright – Industrial 7311 • Mould Maker 7231 • Precision Machinist 7231 • Precision Metal Fabricator 7263 • Roll Grinder/Turner 9511 • Tool and Cutter Grinder 9511 • Tool and Die Maker 7232 • Welder 7265 • Welder Fitter 7265 	<ul style="list-style-type: none"> • Buyer 1225 • Chemical Production Engineering Technologist 2211 • Design and Drafting Technologist 2253 • Electronics Engineering Technologist and Technician 2241 • Industrial Engineering Technologist and Technician 2233 • Instrumentation and Control Technologist and Technician 2243 • Inventory Analyst 1474 • Manufacturing Technician/Technologist 2233 • Materials Supervisor/Material Control Manager 0114 • Mechanical Engineering Technologist 2232 • Photonics Technologist and Technician 2241 • Production and Quality Control Technologist 2233 • Stationary Engineer 7351 • Technical Sales Specialist 6221
University	Workplace
<ul style="list-style-type: none"> • Chemical Engineer 2134 • Electrical Engineer 2133 • Engineer, Computer Integrated Manufacturing 2141 • Industrial and Manufacturing Engineer 2141 • Mechanical Engineer 2132 • Metallurgical Engineer 2142 • Production Engineer 2141 	<ul style="list-style-type: none"> • Foundry Worker 9412 • Inventory Clerk 1474 • Labourer, Material Handling 7452 • Machine Operator, Metal Machining 9511 • Motor Vehicle Assembler 9482 • Solderer 7265

Note: Some of the names of occupations in this table may differ slightly from the names given in the National Occupation Classification system. The names listed here reflect common usage by institutions and organizations in this sector in Ontario.

Postsecondary Programs and Training in the Manufacturing Sector

The following are examples of programs and training related to careers in the manufacturing sector and the accreditations associated with each.

Apprenticeship Training

Construction Boilermaker	Certificate of apprenticeship/ certificate of qualification
General Machinist	Certificate of apprenticeship/ certificate of qualification
Industrial Maintenance Mechanic	Certificate of apprenticeship/ certificate of qualification
Machine Tool Builder and Integrator	Certificate of apprenticeship/ certificate of qualification
Machinist	Certificate of apprenticeship/ certificate of qualification
Mechanical Millwright	Certificate of apprenticeship/ certificate of qualification
Millwright	Certificate of apprenticeship/ certificate of qualification
Mould Maker	Certificate of apprenticeship/ certificate of qualification
Precision Metal Fabricator	Certificate of apprenticeship/ certificate of qualification
Sheet Metal Worker	Certificate of apprenticeship/ certificate of qualification
Steamfitter	Certificate of apprenticeship/ certificate of qualification
Welder	Certificate of apprenticeship/ certificate of qualification

College

Industrial Engineering Technology – Management	Diploma
Industrial Management	Diploma
Integrated Manufacturing Systems	Diploma
Manufacturing Engineering Technology	Diploma
Manufacturing Management	Diploma
Mechanical CAD/CAM Technician – Automated Machining	Diploma
Mechanical Engineering Technician	Diploma

Mechanical Engineering Technology	Diploma
Mechanical Technician – Tool Making	Diploma
Process Automation	Bachelor’s degree

University

Industrial Engineering	Bachelor’s degree
Industrial Engineering – Automotive Manufacturing Systems Engineering	Bachelor’s degree
Manufacturing Engineering	Bachelor’s degree
Manufacturing Engineering and Management	Bachelor’s degree
Mechanical Engineering – Manufacturing, Controls, Automation, and Robotics	Bachelor’s degree

Training for the Workplace

Flux Cored Arc Welding (Manufacturing)	Certificate
Gas Metal Arc Welding (Manufacturing)	Certificate
Good Manufacturing Processes	Certificate
Manufacturing Techniques	Certificate
Manufacturing Techniques – Wood Products	Certificate
Mechanical Techniques – CNC/CAD/CAM Specialist	Certificate
Mechanical Techniques – Design	Certificate
Mechanical Techniques – Manufacturing	Certificate
Welder Operator Manufacturing	Certificate
Welding Techniques	Certificate

Required Components for the SHSM–Manufacturing

The SHSM–Manufacturing has the following five required components:

1. A bundle of nine Grade 11 and Grade 12 credits

These credits make up the bundle:

- four manufacturing major credits that provide sector-specific knowledge and skills
- three other required credits from the Ontario curriculum, in English, mathematics, and science, in which some expectations are met through learning activities contextualized to the manufacturing sector

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See **Section A1.2** for more on SHSM credits.



- two cooperative education credits that provide authentic learning experiences in a workplace setting, enabling students to refine, extend, apply, and practise sector-specific knowledge and skills

Credits		Apprenticeship Training		College		University		Workplace	
		Gr. 11	Gr. 12	Gr. 11	Gr. 12	Gr. 11	Gr. 12	Gr. 11	Gr. 12
Manufacturing Major		2	2	2	2	2	2	2	2
includes content delivered in the sector's context	English	1		1		1		1	1
	Mathematics		1		1		1	1	
	Science	1		1		1			
Cooperative Education		2		2		2		2	
Total number of credits		9		9		9		9	

Note: Multiple credits in the Ontario technological education curriculum allow additional instructional time for the practice and refinement of skills needed to develop student performance to the levels required for certification, entry into apprenticeship programs, or participation in school–work transition programs (see *The Ontario Curriculum, Grades 11 and 12: Technological Education, 2009*, page 17).

2. Six sector-recognized certifications and/or training courses/programs

The SHSM in manufacturing requires students to complete six sector-recognized certifications and/or training courses/programs. Of these, three are compulsory and the remaining three are electives that must be chosen from the list in the following table. Note that items in the table that are capitalized are the proper names of specific certifications or training courses/programs that are appropriate for the SHSM. Items that are lowercased are names of the areas or categories within which specific certifications or training courses/programs should be selected by the school or board. The requirements are summarized in the table below.

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See **Section A1.3** for more on SHSM certifications and training.

Three compulsory			
Cardiopulmonary Resuscitation (CPR) Level A	generic (i.e., not site-specific) instruction about the Workplace Hazardous Materials Information System (WHMIS)	Standard First Aid	
Three electives from the list below			
computer-aided design and computer-aided manufacturing (CAD/CAM)	Canadian Welding Bureau (CWB) – flat	confined space awareness	elevated work platforms
fall protection	hoisting and rigging	lift truck safety	lockout/tagging
personal protective equipment – manufacturing	propane safety	safe lifting	software
transportation of dangerous goods			

3. Experiential learning and career exploration activities

Experiential learning and career exploration opportunities relevant to the sector might include:

- one-on-one observation of a cooperative education student at a placement in the manufacturing sector (example of job twinning)
- a day-long observation of a skilled tradesperson in the manufacturing sector (example of job shadowing)
- a one- or two-week work experience with a member of an industry association or a professional in the sector (example of work experience)
- participation in a local, provincial, or national Skills Canada competition
- a tour of a range of manufacturing enterprises
- attendance at a manufacturing trade show, conference, or job fair
- attendance at demonstrations and hands-on activities presented by equipment vendors.

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See **Section A1.4** for more on experiential learning and career exploration activities.

POLICY

Note that volunteer activities in an SHSM cannot be counted towards the hours of community involvement required to earn the OSSD.

4. Reach ahead experiences

Students are provided one or more reach ahead experiences – opportunities to take the next steps along their chosen pathway – as shown in the following examples:

- Apprenticeship: visiting an approved apprenticeship delivery agent in the sector
- College: interviewing a college student enrolled in a sector-specific program
- University: observing a university class in a sector-related program
- Workplace: interviewing an employee in the sector

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See **Section A1.5** for more on reach ahead experiences.



5. Essential Skills and work habits and the OSP

Students will develop Essential Skills and work habits required in the sector and document them using the OSP, a component of the SHSM.

FIND IT!

See **Section A1.6** for more on Essential Skills and work habits.



Pathways for the SHSM–Manufacturing

A table illustrating the four pathways and required credits leading to completion of this SHSM is provided below. You will also find tables illustrating sample bundles of credits, and other useful resources, on the ministry's SHSM website.

Awareness building (Grades 7 and 8)

See **Section 5.5** for information on building awareness of SHSM programs among students in Grades 7 and 8.

Exploration (Grades 9 and 10)

See **Section 5.5** for information on providing Grade 9 and 10 students with opportunities for exploration of SHSM programs. In addition, students considering this SHSM can be encouraged to enrol in the following courses to become better informed about careers and postsecondary options in the sector:

- Exploring Technologies: This Grade 9 course is recommended for all students following SHSM pathways that have a technological education focus. The course provides students with opportunities to explore a variety of technologies, including manufacturing technology, by engaging in activities related to them.
- Career Studies (compulsory) and Discovering the Workplace: Some of the expectations in these Grade 10 courses provide opportunities for students to explore occupations and other postsecondary options in the sector and to participate in experiential learning activities.
- Manufacturing Technology (TMJ20): This course is recommended for any Grade 10 student who is considering enrolling in an SHSM–Manufacturing program.

TOOLS AND RESOURCES

Visit the ministry's SHSM website at www.edu.gov.on.ca/eng/teachers/studentsuccess/specialist.html for:

- sample bundles of credits specific to this SHSM
- a list of organizations and resources specific to this SHSM.



Specialization (Grades 11 and 12)

Students acquire the sector-specific knowledge and technical skills required to earn their OSSD with an SHSM–Manufacturing by completing its five required components. Students and their parents/guardians are encouraged to consult with guidance counsellors and teachers to select the courses that will enable students to pursue their goals.

Manufacturing sector representatives have identified knowledge of entrepreneurship and basic business practices as important for students as they prepare for careers in this sector. Therefore, it is recommended that in Grade 11 or 12 students do one of the following:

- complete an entrepreneurship course offered in the Ontario business studies curriculum
- pursue an extracurricular activity focused on entrepreneurship (e.g., Junior Achievement’s Company Program)

Students pursuing an apprenticeship pathway should consider OYAP, which enables them to start an apprenticeship while earning their OSSD.

Students pursuing a university pathway are advised to complete their required cooperative education credits in Grade 11, in order to allow room in their timetables in Grade 12 for credits needed to meet university entrance requirements.

When helping students plan their SHSMs, particularly with respect to the selection of courses to fulfil the requirement for credits in the major, teachers should bear in mind that technological education courses can be offered as single-credit or multiple-credit courses.

Program pathways: SHSM–Manufacturing

- Shaded boxes – required credits in the bundle for the SHSM–Manufacturing
- (C) – compulsory credit for the OSSD

Grade 9: <i>Exploration</i>	Grade 10: <i>Exploration</i>	Apprenticeship Training Pathway: <i>Specialization</i>		College Pathway: <i>Specialization</i>		University Pathway: <i>Specialization</i>		Workplace Pathway: <i>Specialization</i>	
		Grade 11	Grade 12	Grade 11	Grade 12	Grade 11	Grade 12	Grade 11	Grade 12
An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit
(C) English	(C) English	(C) English	(C) English	(C) English	(C) English	(C) English	(C) English	(C) English	(C) English
(C) Mathematics	(C) Mathematics	(C) Mathematics	Mathematics	(C) Mathematics	Mathematics	(C) Mathematics	Mathematics	(C) Mathematics	Mathematics
(C) Science	(C) Science	Science in either Gr. 11 or Gr. 12		Science in either Gr. 11 or Gr. 12		Science in either Gr. 11 or Gr. 12		Science in either Gr. 11 or Gr. 12	
(C) Geography of Canada	(C) Canadian History	Manufacturing Major	Manufacturing Major	Manufacturing Major	Manufacturing Major	Manufacturing Major	Manufacturing Major	Manufacturing Major	Manufacturing Major
(C) Core French	(C) Career Studies/ Civics	Manufacturing Major	Manufacturing Major	Manufacturing Major	Manufacturing Major	Manufacturing Major	Manufacturing Major	Manufacturing Major	Manufacturing Major
(C) Healthy Active Living Education	(C) The Arts	May be used as a (C) Cooperative education (2 credits), related to the sector, in either Gr. 11 or Gr. 12	May be used as a (C) Cooperative education (2 credits), related to the sector, in either Gr. 11 or Gr. 12	May be used as a (C) Cooperative education (2 credits), related to the sector, in either Gr. 11 or Gr. 12	May be used as a (C) Cooperative education (2 credits), related to the sector, in either Gr. 11 or Gr. 12	May be used as a (C) Cooperative education (2 credits), related to the sector, in either Gr. 11 or Gr. 12	May be used as a (C) Cooperative education (2 credits), related to the sector, in either Gr. 11 or Gr. 12	May be used as a (C) Cooperative education (2 credits), related to the sector, in either Gr. 11 or Gr. 12	May be used as a (C) Cooperative education (2 credits), related to the sector, in either Gr. 11 or Gr. 12
Exploring Technologies	Manufacturing Technology	Business Studies or an optional or a compulsory credit	Cooperative Education or an optional or a compulsory credit	Business Studies or an optional or a compulsory credit	Cooperative Education or an optional or a compulsory credit	Science	Mathematics	Business Studies or an optional or a compulsory credit	Cooperative Education or an optional or a compulsory credit