

SECTION ONE: THE LABOUR MARKET

ENGINEERING IN CANADA

ACTIVITY: Small group activity

TIME: 1 hour

LEARNING OUTCOME:

Participants will know how economic and other trends will affect the industries where engineers work.

DESCRIPTION:

- ❑ Organize participants into groups of 3-4.
- ❑ Instruct participants to complete the exercises on **pages 6-8** in their workbooks.
- ❑ Take up answers as a class using the answer key provided. When explaining Labour Market Information, it is important to explain the key factors that are taken into consideration in arriving at the employment prospect for each occupation. These are:
 - ❑ The rate of projected employment growth to the year 2007 for the occupation as compared to the projected employment growth for all occupations in Ontario
 - ❑ Anticipated number of job openings for the occupation due to retirements
 - ❑ Reports by employers on difficulties in finding qualified workers to fill vacant positions.
 - ❑ Information about significant economic or business trends or technological developments affecting the demand for the particular occupation or the skills needed

THE LABOUR MARKET: ENGINEERING IN CANADA: ANSWER KEY

The following summaries are based on information from Job Futures (<http://jobfutures.ca>), Ontario Job Futures (www.ontariojobfutures.net), Industry Canada and the Canadian Council of Professional Engineers.

Chemical Engineers: Work prospect to 2007 is considered to be “Average”

Why: Employment growth through 2007 is expected to grow as fast as the average for all occupations particularly in the professional services or in the chemical/chemical products manufacturing industry. The retirement rate will likely be above the average of all occupations and the number of retiring workers will contribute to job openings. The number of job seekers will likely keep pace with the number of job openings. In terms of skills, employers are seeking increasingly cross-degree scientists. An example of this multidisciplinary path would be a person with chemistry, plus a divergent post-doctoral degree such as cell biology and computer and management skills.

Main Duties:

- Conduct economic and technical feasibility studies in areas related to chemical, petroleum, pulp and paper, food or other processing industries;
- Conduct research into the development or improvement of chemical engineering processes, reactions and materials;
- Evaluate chemical process technology and equipment and determine production specifications;
- Design and test chemical processing and associated plants and equipment;
- Oversee the construction, modification, operation and maintenance of pilot plants, processing units or processing plants;
- Establish and conduct quality control programs, operating procedures and control strategies to ensure consistency and adherence to standards for raw materials, products and waste products or emissions;
- Prepare contract documents and evaluate tenders for the process aspects of industrial construction;
- Supervise technicians, technologists and other engineers;
- Work in an administrative capacity, for example, in the development of guidelines and specifications for the handling of dangerous chemicals, environmental protection or standards for foods, materials and consumer goods.

Common Job Titles:

Biochemical Engineer, Chemical Engineer, Chemical Process Engineer, Petrochemical Engineer, Polymer Engineer, Refinery Engineer.

**THE LABOUR MARKET:
ENGINEERING IN CANADA: ANSWER KEY**

Civil Engineers: Work prospect to 2007 is considered to be “Average”

Why: Employment growth, through 2007, is expected to grow as fast as the average for all occupations particularly in the area of housing/renovations, constructions related to environmental protection, infrastructure development and civil engineering services outside Canada. The retirement rate for this profession will likely be above average and the number of retiring workers will contribute to job openings. The number of job seekers will likely keep pace with the number of job openings and many new entrants will be recent engineers and a large number of qualified immigrants.

Main Duties:

- Confer with clients and other members of the engineering team and conducts research to determine project requirements;
- Plan and design major civil projects such as buildings, roads, bridges, dams, water and waste management systems and structural steel fabrications;
- Develop construction specifications and procedures;
- Evaluate and recommend appropriate building and construction materials;
- Interpret, reviews and approve survey and civil design work;
- Conduct field services for civil works;
- Ensure construction plans meet guidelines and specifications of building codes and other regulations;
- Establish and monitor construction work schedules;
- Conduct feasibility studies, economic analyses, municipal and regional traffic studies, environmental impact studies or other investigations;
- Conduct technical analyses of survey and field data for development of topographic, soil, hydrological or other information and prepare reports;
- Act as project or site supervisor for land survey or construction work;
- Prepare contract documents and reviews and evaluate tenders for construction projects;
- Supervise technicians, technologists and other engineers and review and approve designs, calculations and cost estimates.

Common Job Titles: Civil Engineer, Construction Engineer, Highway Engineer, Municipal Engineer, Public Works Engineer, Structural Engineer, Transportation Engineer

THE LABOUR MARKET: ENGINEERING IN CANADA: ANSWER KEY

The “work prospect” rating is subject to change with time due to changes in economic conditions, technology, demographics and consumer behaviour trends.

Electrical/Electronic Engineers: Work prospect to 2007 is considered to be “Good”

Why: Employment growth, through 2007, is expected to grow as fast as the average for all occupations particularly in the professional services, aerospace and electric power industries, as companies are increasingly using new manufacturing technologies. The retirement rate for the same period will likely be above average and the number of retiring workers will contribute to job openings. The number of job openings will likely keep pace with the number of job seekers. New entrants will be recent graduates and immigrants.

Main Duties:

- Conduct research into the feasibility, design, operation and performance of electrical generation and distribution networks, electrical machinery and components and electronic communications, instrumentation and control systems, equipment, and components;
- Prepare material cost and timing estimates, reports and design specifications for electrical and electronic systems and equipment;
- Design electrical and electronic circuits, components, systems and equipment;
- Supervise and inspect the installation, modification, testing and operation of electrical and electronic systems and equipment;
- Develop maintenance and operating standards for electrical and electronic systems and equipment;
- Investigate electrical or electronic failures;
- Develop specialized applications and system software;
- Prepare contract documents and evaluate tenders for construction or maintenance;
- Supervise technicians, technologists, programmers, analysts and other engineers.

Common Job Titles: Avionics Engineer, Communications Engineer, Instrumentation and Control Engineer, Electrical Engineer, Electronics Test Engineer

THE LABOUR MARKET: ENGINEERING IN CANADA: ANSWER KEY

Industrial Engineers: Work prospect to 2007 is considered to be “Average”

Why: Employment growth, through 2007, is expected to grow as fast as the average of all occupations as industrial growth and the greater use of automation in factories and in offices will continue to create new opportunities for Industrial Engineers. The retirement rate will be below average and the number of retiring workers should not contribute significantly to job openings. The supply of job seekers mostly recent graduates, is not keeping pace with the number of job openings. The increased emphasis on product quality will require engineers to have expertise in quality control to meet international quality standards.

Employers look for individuals skilled in computer based drafting, spreadsheet and database software applications as well as having communication, teamwork, planning and organizing, and problem solving skills.

Main Duties:

- Plan and design plant layouts and facilities;
- Study new machinery and facilities and recommend or select efficient combinations;
- Develop flexible or integrated manufacturing systems and procedures;
- Conduct studies and implement programs to determine optimum inventory levels for production and to allow optimum utilization of resources;
- Analyze costs of production;
- Design, develop and conduct time studies and work simplification programs;
- Determines human resource and skill requirements and develops training programs;
- Develops performance standards, evaluation systems and wage and incentive programs;
- Conducts studies of the reliability and performance of plant facilities, and production or administrative systems;
- Establishes programs and conduct studies to enhance industrial health and safety or to identify and correct fire and other hazards;
- Evaluates or assesses industrial facilities;
- Supervises technicians, technologists, analysts, administrative staff and other engineers

Common Job Titles: Cost Engineer, Industrial Engineer, Manufacturing Engineer, Plant Engineer, Production Engineer, Safety Engineer

**THE LABOUR MARKET:
ENGINEERING IN CANADA: ANSWER KEY**

Mechanical Engineers: Work prospect to 2007 is considered to be “Good”

Why: Employment growth, through 2007, is expected to grow faster than the average of all occupations particularly in the manufacturing and aerospace industries and as such this field moves in tandem with the general level of economic activity of these sectors. The retirement rate will likely be above average, and the number of retiring workers should contribute to job openings. The number of job seekers will likely keep pace with the number of job openings and new entrants will be new graduates and a significant number of immigrants. Emerging technologies in information technology, biotechnology, and nanotechnology may generate new job opportunities for mechanical engineers. The growing use of electronics in machinery and process control will lead to an increased overlap between mechanical and electrical and electronics engineering. Many mechanical engineers will need skills in this area. Employers will be seeking individuals with general and specific computer skills, as well as, communication and teamwork skills.

Main Duties:

- Conduct research into the feasibility, design, operation and performance of mechanisms, components and systems;
- Prepare material, cost and timing estimates, reports and design specifications for machinery and systems;
- Design power plants, machines, components, tools, fixtures and equipment;
- Supervise and inspect the installation, modification and commissioning of mechanical systems at construction sites or in industrial facilities;
- Develop maintenance standards, schedules and programs and provide guidance to industrial maintenance crews;
- Investigate mechanical failures or unexpected maintenance problems;
- Prepare contract specifications and cost estimates and evaluate tenders for industrial construction or maintenance;
- Supervise technicians, technologists and other engineers and review and approve designs, calculations and cost estimates.

Common Job Titles: Mechanical Engineer, Fluid Mechanics Engineer, Heating and Refrigeration Engineer, Automotive Engineer

THE LABOUR MARKET: ENGINEERING IN CANADA: ANSWER KEY

Computer Engineers (Hardware/Software): Work prospect to 2007 is considered to be “Average”

Why: While employment for this occupation has grown about as fast as the average for all occupations for the past decade, the recent downturn in communications and computer systems will reduce job opportunities over the short term. In the longer term, through 2007, continued demand for information technology will create new opportunities in information systems engineering, software and database development. The retirement rate will be significantly below average and the number of retiring workers should not be a major source of job openings. The number of job seekers will likely not keep pace with the number of job openings, and many new entrants will be new graduates. Employers continue to prioritize individuals with technical skills in wireless telecommunications, popular programming languages, network administration, and relational database management systems to complement e-business. In addition, many employers also emphasize the need for written and verbal communication skills, and teamwork and problem solving skills. Computer Engineers can be classified into two distinct categories, Computer Hardware Engineers and Software Engineers.

Main Duties:

Computer hardware engineers perform some or all of the following duties:

- Plan, design and co-ordinate the development of computers and related equipment;
- Research, develop and integrate computer and telecommunications system network architecture;
- Supervise and inspect the installation, modification and testing of computers and related equipment;
- Supervise drafters, technicians, technologists and other engineers.

Software engineers perform some or all of the following duties:

- Analyze the requirements for the application of computer technology in real-time environments for process or machine control, instrumentation, robotics, telecommunications, environmental monitoring, remote sensing, medical and related engineering, scientific and industrial applications;
- Design and develop or co-ordinate the development, testing and implementation of computer languages and computer software packages;
- Supervise the work of programmers, technologists and technicians and other engineering and scientific personnel.

Common Job Titles: Computer Engineer, Computer Software Engineer, Computer Hardware Engineer, Integrated Circuit Design Engineer, Network Systems Engineer, Software Design Engineer, and Systems Design Engineer

**THE LABOUR MARKET:
ENGINEERING IN CANADA: ANSWER KEY**

The following summaries are based on information from: Industry Canada, Human Resources & Skills Development, Industry Canada, Ontario Job Futures, The Canadian Construction Association, and The Aerospace Industry Association

Manufacturing: growing

Why: Manufacturing industries have the largest share of employment in the goods-producing sector in Ontario producing a variety of consumer and industrial products that are key to Ontario's wealth. The sector accounts for one fourth of all economic activity in the province and about 70% of the sector's products are exported to other provinces or countries. It is projected that between 2002 and 2007 manufacturing will contribute 19% of all new jobs created in Ontario

Construction: growing

Why: Following a rather flat year in 2003, the Canadian construction industry is expected to record very impressive growth in 2004 and continue this trend to 2005. The construction sector can be further subdivided into four major categories; residential construction, non-residential construction (office buildings, recreational facilities etc), engineering construction (road building, industrial plants, mines etc) and repair work. Engineering construction will have the highest growth in 2004 following moderate growth after that. The overall contribution of new jobs of this sector between 2002 and 2007 will be 4%

Aerospace: growing

Why: The aerospace industry in Canada has come through a tough business environment since late 2001 when terrorism and general economic slowdown undermined business activity, especially related to business travel and the sale of new aircraft. The outlook for business in 2004 and in the long term is expected to show improvement. Market risks are high for civil aircraft manufacturers, not only because of the volatility of their markets, but also because of the risk involved in defining the right product. In determining which aircraft to 'launch', manufacturers must forecast future trends in air travel and airline competition that will lead to changes in equipment requirements, identifying and targeting 'gaps' in the aircraft seating capacity/range continuum which are not adequately served by existing product offerings. It is estimated that engineering accounts for 20% of all employment in this sector. Major players in the aerospace market in Canada include Bombardier, Spar Aerospace, MacDonald Dettwiler and Associates, Allied Signal Aerospace, Bell Helicopter, and Lockheed Martin

**THE LABOUR MARKET:
ENGINEERING IN CANADA: ANSWER KEY**

Telecommunications: growing

Why: Convergence of computer and communications technologies, coupled with deregulation, has driven dramatic restructuring of this industry and led to a number of high profile mergers and acquisitions in both telecommunications equipment and services. Wireless communications and the Internet have completely changed the economics of telephone service. The industry will experience growth in the next few years as the customer demand for seamless mobility and Internet related products and services continues to grow. Opportunities for growth exist in the digital line subscriber technologies, fibre optic transmission systems, satellite technologies and the Information Highway. Key players in this industry include, Nortel, Bell Canada, and Telesat Canada.

High Technology/Computing: growing

Why: The Canadian software sector experienced a serious slowdown in 2001 and 2002. The worldwide economic slowdown resulted in decreased investment particularly in the United States, which represents 50% of the world's software market and most Canadian software exports. This software sector is expected to grow in the next few years particularly in the areas of security, storage management, web performance management, mobile and wireless software. Forty-five (45%) of all IT occupations work in the Professional Scientific & Technology services,

Environment: growing

Why: Growing concerns about resource scarcity, damage to the ecosystem and human health risks are driving the demand for environmental technologies. These concerns have given rise to new regulatory requirements and international environmental agreements, but they have also led to direct pressure on firms to develop a sense of environmental responsibility and implement environmental management systems and integrated process technologies. The focus is shifting from pollution management towards pollution prevention as standards, and voluntary incentives become new drivers of the environmental industry. Emerging technologies include, fuel cell technologies in the transportation sector, environmental building products and "smart building" techniques, sound soil conservation practices in the agriculture sector and many other successful environmental technologies developed around Canada's traditional resource-based sectors of mining and oil and gas.

**THE LABOUR MARKET:
ENGINEERING IN CANADA: ANSWER KEY**

Agriculture: Modest growth

Why: Agriculture is no longer the primary industry in the economy, as it was when Canada first became a country, but it is still very important economically. The climatic differences as well as the diversity of soils in Canada have given rise to many different kinds of farming operations. There are five major agriculture production sectors in Canada - grains and oilseeds, red meats, dairy, horticulture and poultry and eggs. International competition, other uses for land are eradicating farms; however, there are opportunities in the development of new products and in agricultural research.

Mining: Modest growth

Why: Canada remains among the five leading mineral producing countries in the world, with large areas not yet fully explored. Very capital-intensive industry and returns to the investment are highly sensitive to the Canadian dollar. Mining will make a vary modest contribution to the job creation between 2002 and 2007 (about 0.1%), however, opportunities do exist for engineers involved in designing or engineering advanced methods of ore extraction or refining and those in the skilled trades.

THE LABOUR MARKET: ENGINEERING IN CANADA

The Canadian Council of Professional Engineers (CCPE) projects a massive number of retirements in the next 10 years as baby boomers leave the workforce, creating a shortage of many engineers, technologists and technicians in Canada by the year 2005. Many of you have come here knowing that Canada needs your skills and expertise; yet you have not found work in your field. Finding your place in the Canadian labour market means knowing the answers to three main questions:

- What kinds of engineers does Canada need?**
- What industries in Canada need those engineers?**
- What skills do employers in those industries need?**

The following exercises are intended to help you answer these questions.

THE LABOUR MARKET: ENGINEERING IN CANADA

Based on what you have learned about the labour market in this workshop so far, and what you know already, try to predict whether demand will grow or decline for the following types of engineers. State your reasons for that prediction.

Chemical Engineers

Growing or Declining? _____

Why? _____

Civil Engineers

Growing or Declining? _____

Why? _____

Electrical/Electronic Engineers

Growing or Declining? _____

Why? _____

Industrial Engineers

Growing or Declining? _____

Why? _____

Mechanical Engineers

Growing or Declining? _____

Why? _____

Computer Engineers

Growing or Declining? _____

Why? _____

THE LABOUR MARKET: ENGINEERING IN CANADA

Now try to predict whether the following *industries* are likely to experience growth or decline in the next several years. State your reasons (*the first one has been completed for you*).

Manufacturing: Growing or Declining?

Why? Industry is export-driven; free trade and globalization have opened up new markets; automotive industry experience rapid growth.

Construction: Growing or Declining?

Why? _____

Aerospace: Growing or Declining?

Why? _____

Telecommunications: Growing or Declining?

Why? _____

High Technology/Computing: Growing or Declining?

Why? _____

Environment: Growing or Declining?

Why? _____

Agriculture: Growing or Declining?

Why? _____

Mining: Growing or Declining?

Why? _____