

# WHAT IS BIOSYSTEMS ENGINEERING?



## WHAT TYPES OF JOBS DO BIOSYSTEMS ENGINEERS DO?

Biosystems engineers have a tendency to pursue careers where they can help people, preserve the environment or tackle societal problems (such as reducing hunger by improving food production).

This will lead to engineering jobs with environmental organizations, consulting firms, government agencies, research companies, food and pharmaceutical industries, agricultural equipment manufacturers, oil and gas companies, among others.



[umanitoba.ca/engineering](http://umanitoba.ca/engineering)

**BIOSYSTEMS ENGINEERING EMPHASIZES** the application of engineering principles to biologically-based systems (plants, animals, humans and microorganisms). Biosystems engineers help to create new technologies for the well-being of humans and animals, and the preservation and enhancement of natural resources and the environment.

## WHAT CHOICES DO I HAVE IN BIOSYSTEMS ENGINEERING?

The program is designed to give students knowledge of the fundamentals of engineering and introduce biological concepts to solve engineering problems involving biological systems. The department offers an accredited degree program in Biosystems Engineering, and three specializations (shown below). The bachelor's degree in Biosystems Engineering also provides the background to meet eligibility requirements for admission into the Faculty of Medicine.

### Biomedical Specialization

The biomedical specialization provides engineers with knowledge of human anatomy and physiology to enhance the understanding of the role to be played by engineers in specific areas within biomedical engineering such as rehabilitation engineering, clinical engineering, medical imaging, and orthopaedics.

### Bioresource Specialization

Challenges remain in the production of food and renewable resources for a world of ever-increasing population. The bioresource specialization provides the educational background to enable engineers to devise strategies and technologies for producing food, fibre, bio-based products, and renewable energy efficiently and sustainably.

### Environmental Specialization

There are numerous environmental issues faced by society. The environmental specialization provides engineers with the knowledge to predict environmental impacts due to human developments and to solve problems associated with the environment (soil contamination, pollution of rivers and lakes, air pollution, wastewater treatment).

### Agribusiness Minor

Our graduates often find themselves rising to positions with managerial responsibilities in industry. The agribusiness minor offers engineers the knowledge to succeed in these non-engineering challenges.

Faculty of  
Engineering



UNIVERSITY  
OF MANITOBA



## WHAT IS THE ADVANTAGE OF STUDYING BIOSYSTEMS ENGINEERING OVER OTHER PROFESSIONS?

Biosystems Engineering students learn to integrate the knowledge of biological sciences into engineering applications in order to develop practical solutions to problems associated with biological systems. Biosystems professors often employ students to work on exciting research projects during the summer months, giving them an opportunity to apply their knowledge and also earn a salary. Small class sizes allow one-on-one interactions with professors and provide students with great opportunities to develop their communication skills through in-class presentations.

## WHY SHOULD I TAKE BIOSYSTEMS ENGINEERING AT THE UNIVERSITY OF MANITOBA?

The University of Manitoba boasts the largest Biosystems Engineering program in Western Canada. The program, which is accredited by the Canadian Engineering Accreditation Board, offers the opportunity to earn one of three specializations and easy access to an

Agribusiness minor. Biosystems Engineering students at the University of Manitoba have the unique opportunity to gain hands-on fabrication skills while participating in innovative design courses.

## WHAT ARE TYPICAL COURSES?

Students will study fundamental engineering topics such as solid mechanics, fluid mechanics and thermodynamics; specialized engineering topics such as engineering properties of biological materials, mechanics of materials in biosystems, transport phenomena, instrumentation and measurement for biosystems, design of structural components in machines, safety engineering, and human factors engineering; and be introduced to the basics of cell biology, physiology and microbiology. Technical electives allow students to tailor a program according to their interests.

## IS THERE A PRACTICAL OR WORK EXPERIENCE COMPONENT?

Yes! Co-operative education is a process of learning that formally integrates the student's academic study with practical work experience. The work terms provide you with industry experience, help finance your education and provide guidance for further career specialization. At the time of your first placement, you will have completed 80 credit hours of your program and be in a position to make a contribution in the workplace. Each successfully completed cooperative education course carries one credit hour. A graduate who successfully completes three work terms has the words "co-operative education" appear on their transcript.



## IN WHAT TYPES OF RESEARCH ARE BIOSYSTEMS ENGINEERING PROFESSORS INVOLVED?

So many! The following is an overview: Alternative energy and buildings, ergonomic and safety issues with agricultural machines; biological production of biofuels and bioproducts; processing, drying, and evaluating food using innovative systems; computational methods for biomedical/ biological imaging, pattern recognition, spectroscopy and hyperspectral imaging; grain storage and handling; evaluation of odour-reduction technologies; machine-material interactions with soil engaging tools and processing of agricultural fibres; irrigation, drainage; remediation of contaminated soils and groundwater; and medical textiles

## HOW DO I GET IN?

Students with good academic standing can apply following completion of the required courses in University 1, or following the first year of direct entry to the Faculty of Engineering. For more information about admissions requirements, please consult the University of Manitoba general calendar.



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