

# Sustainable Energy

This section presents the requirements for programs in:

- **M.A. Sustainable Energy**
- **M.A.Sc. Sustainable Energy**
- **M.Eng. Sustainable Energy**

## Program Requirements

### M.A. Sustainable Energy (5.0 credits)

#### M.A. Sustainable Energy (5.0 credits)

|  |            |
|--|------------|
| <b>1. 2.0 credits in:</b>  | <b>2.0</b> |
| SERG 5002 [0.5] Sustainable Energy Engineering for Policy Students   |            |
| SERG 5003 [0.5] Energy Evaluation and Assessment Tools   |            |
| SERG 5004 [1.0] Applied Interdisciplinary Project  |            |
| <b>2. 0.0 credit in:</b>   | <b>0.0</b> |
| SERG 5800 [0.0] Sustainable Energy Seminar   |            |
| <b>3. 0.5 credit in:</b>   | <b>0.5</b> |
| PADM 5121 [0.5] Policy Analysis: The Practical Art of Change   |            |
| <b>4. 0.5 credit in:</b>   | <b>0.5</b> |
| PADM 5510 [0.5] Energy Economics   |            |
| <b>5. 0.5 credit in:</b>   | <b>0.5</b> |
| PADM 5515 [0.5] Sustainable Energy Policy<br>or PADM 5615 [0.5] Politics and Policy of Energy in Canada    |            |
| <b>6. 1.0 credit selected from the Sustainable Energy Policy courses listed below</b>                      | <b>1.0</b> |
| <b>7. 0.5 credit from graduate level courses offered by the School of Public Policy and Administration</b> | <b>0.5</b> |
| <b>Total Credits</b>   | <b>5.0</b> |

#### Notes:

1. Courses must be appropriate to the student's qualifications and selected with the approval of the student's program supervisor.
2. Only a selection of courses listed is given in a particular academic year.

#### Courses - Sustainable Energy Policy

|                 |  |
|-----------------|--|
| PADM 5511 [0.5] | Energy Management  |
| PADM 5512 [0.5] | International Politics of Sustainable Energy                     |
| PADM 5572 [0.5] | Policy Seminar (Sustainable Energy)                              |
| PADM 5611 [0.5] | Science and Technology Policies                                  |
| PADM 5612 [0.5] | Industrial Policy, Innovation and Sustainable Production         |
| PADM 5613 [0.5] | Science, Risk and Evaluation                                     |
| PADM 5614 [0.5] | Natural Resource Management                                      |
| PADM 5616 [0.5] | Environmental Policy   |
| PADM 5617 [0.5] | Implementing Sustainable Development in Industrialized Countries |
| PADM 5618 [0.5] | Environmental and Ecological Economics                           |
| PADM 5619 [0.5] | Urban Sustainability   |

PADM 5620 [0.5] The Science, Politics and Economics of Global Climate Change

PADM 5908 [1.0] Research Essay

SERG 5906 [0.5] Directed Studies in Sustainable Energy

Other courses as approved by the MA supervisor

### Co-op Option for M.A. Sustainable Energy

A co-op option is available to full-time students in the M.A. program. Students admitted to this option must satisfactorily complete at least two work terms in order to graduate with a co-op designation on their transcripts and diplomas. These work terms are four months in duration and locate students in government departments or other organizations in order to work at a junior officer level. They provide students with opportunities to integrate the theoretical and practical aspects of public administration. During a work term, students will register in PADM 5319. While on a work term, students are limited to an additional 0.5 credit course. It should be noted that most co-op positions in the federal public service are restricted to Canadian citizens.

### M.A.Sc. Sustainable Energy (5.0 credits)

#### M.A.Sc. Sustainable Energy (5.0 credits)

|  |            |
|--|------------|
| <b>1. 1.0 credit in:</b>   | <b>1.0</b> |
| SERG 5001 [0.5] Sustainable Energy Policy for Engineers  |            |
| SERG 5003 [0.5] Energy Evaluation and Assessment Tools   |            |
| <b>2. 0.0 credit in:</b>   | <b>0.0</b> |
| SERG 5800 [0.0] Sustainable Energy Seminar   |            |
| <b>3. 1.5 credits from the Mechanical Energy Conversion courses (below), or from the Efficient Electrical Energy Systems courses (below), or from the Sustainable Energy Policy courses.</b> | <b>1.5</b> |
| <b>4. 2.5 credits in M.A.Sc. thesis:</b>   | <b>2.5</b> |
| MECH 5909/ M.A.Sc. Thesis  |            |
| SYSC 5909/   |            |
| ELEC 5909 [2.5]  |            |
| <b>Total Credits</b>   | <b>5.0</b> |

### M.Eng. Sustainable Energy (5.0 credits)

#### Requirements:

|   |            |
|---|------------|
| <b>1. 2.0 credits in:</b>   | <b>2.0</b> |
| SERG 5001 [0.5] Sustainable Energy Policy for Engineers   |            |
| SERG 5003 [0.5] Energy Evaluation and Assessment Tools  |            |
| SERG 5004 [1.0] Applied Interdisciplinary Project   |            |
| <b>2. 0.0 credit in:</b>  | <b>0.0</b> |
| SERG 5800 [0.0] Sustainable Energy Seminar  |            |
| <b>3. 1.5 credits in:</b>   | <b>1.5</b> |
| <b>Mechanical Engineering focus:</b>  |            |
| 1.5 credits in Mechanical Energy Conversion courses (listed below), or Sustainable Energy Policy courses      |            |
| or  |            |
| <b>Electrical Engineering focus:</b>  |            |
| 1.5 credit in Efficient Electrical Energy Systems courses (listed below) or Sustainable Energy Policy courses |            |

|   |     |
|---|-----|
| <b>4. 1.5 credits in:</b>                 | 1.5 |
| <b>Mechanical Engineering focus:</b>      |     |
| Graduate-level MECH courses               |     |
| or  |     |
| <b>Electrical Engineering focus:</b>      |     |
| Graduate level ELEC, SYSC or EACJ courses |     |
| <hr/>                                     |     |
| Total Credits                             | 5.0 |

#### Courses - Mechanical Energy Conversion

|                 |  |  |
|-----------------|--|--|
| MECH 5009 [0.5] | Environmental Fluid Mechanics Relating to Energy Utilization |  |
| MECH 5201 [0.5] | Methods of Energy Conversion                                 |  |
| MECH 5203 [0.5] | Nuclear Engineering  |  |
| MECH 5204 [0.5] | Fundamentals of Combustion                                   |  |
| MECH 5205 [0.5] | Building Performance Simulation                              |  |
| MECH 5402 [0.5] | Gas Turbines   |  |
| ENVE 5101 [0.5] | Air Pollution Control  |  |
| ENVE 5102 [0.5] | Traffic-Related Air Pollution                                |  |
| ENVE 5103 [0.5] | Air Quality Modeling   |  |
| ENVE 5104 [0.5] | Indoor Environmental Quality                                 |  |
| SERG 5906 [0.5] | Directed Studies in Sustainable Energy                       |  |

**With the approval of the Department, the following courses may be included in the above list:**

|                 |  |  |
|-----------------|--|--|
| MECH 5800 [0.5] | Special Topics in Mechanical and Aerospace Engineering |  |
| MECH 5801 [0.5] | Special Topics in Mechanical and Aerospace Engineering |  |
| MECH 5802 [0.5] | Special Topics in Mechanical and Aerospace Engineering |  |
| MECH 5803 [0.5] | Special Topics in Mechanical and Aerospace Engineering |  |
| MECH 5804 [0.5] | Special Topics in Mechanical and Aerospace Engineering |  |
| MECH 5805 [0.5] | Special Topics in Mechanical and Aerospace Engineering |  |
| MECH 5806 [0.5] | Special Topics in Mechanical and Aerospace Engineering |  |
| MECH 5807 [0.5] | Special Topics in Mechanical and Aerospace Engineering |  |
| MECH 5808 [0.5] | Special Topics in Mechanical and Aerospace Engineering |  |
| MECH 5809 [0.5] | Special Topics in Mechanical and Aerospace Engineering |  |

#### Courses - Efficient Electrical Energy Systems

|                 |   |     |
|-----------------|---|-----|
| ELEC 5200 [0.5] | Advanced Topics in Integrated Circuits and Devices            | 0.5 |
| ELEC 5302 [0.5] | Renewable and Distributed Energy Resource Technologies        | 0.5 |
| ELEC 5405 [0.5] | Advanced Linear and Nonlinear Circuit Theory and Applications | 0.5 |
| ELEC 5509 [0.5] | Integrated Circuit Technology                                 | 0.5 |
| ELEC 5707 [0.5] | Microsensors and MEMS   | 0.5 |
| ELEC 5808 [0.5] | Signal Processing Electronics                                 | 0.5 |
| ELEC 5900 [0.5] | Engineering Project I   | 0.5 |
| SYSC 5001 [0.5] | Simulation and Modeling                                       | 0.5 |
| SYSC 5004 [0.5] | Optimization for Engineering Applications                     | 0.5 |
| SYSC 5006 [0.5] | Design of Real-Time and Distributed Systems                   | 0.5 |

|                 |  |     |
|-----------------|--|-----|
| SYSC 5103 [0.5] | Software Agents  | 0.5 |
| SYSC 5104 [0.5] | Methodologies For Discrete-Event Modeling And Simulation | 0.5 |
| SYSC 5105 [0.5] | Software Quality Engineering and Management              | 0.5 |
| SYSC 5207 [0.5] | Distributed Systems Engineering                          | 0.5 |
| SYSC 5401 [0.5] | Adaptive and Learning Systems                            | 0.5 |
| SERG 5906 [0.5] | Directed Studies in Sustainable Energy                   | 0.5 |

#### Regulations

See the General Regulations section of this Calendar.

#### Academic Standing

A grade of B- or better must be obtained in each course counted towards the master's degree.

#### Full-time Continuation

Students will be required to withdraw from the program if their weighted grade point average falls below 7.0 (B-) after two terms of full-time study (or equivalent), or if they receive a grade of less than B- in any two courses they have registered in.

#### Part-time Continuation

Students will be required to withdraw from the program if their weighted grade point average falls below 7.0 (B-) after completing 2.0 credits, or if they receive a grade of less than B- in any two courses they have registered in.

#### Regulations

See the General Regulations section of this Calendar.

#### Academic Standing

A grade of B- or better must be obtained in each course counted towards the master's degree.

#### Full-time Continuation

Students will be required to withdraw from the program if their weighted grade point average falls below 7.0 (B-) after two terms of full-time study (or equivalent), or if they receive a grade of less than B- in any two courses they have registered in.

#### Part-time Continuation

Students will be required to withdraw from the program if their weighted grade point average falls below 7.0 (B-) after completing 2.0 credits, or if they receive a grade of less than B- in any two courses they have registered in.

#### Regulations

See the General Regulations section of this Calendar.

#### Academic Standing

A grade of B- or better must be obtained in each course counted towards the master's degree.

#### Full-time Continuation

Students will be required to withdraw from the program if their weighted grade point average falls below 7.0 (B-) after two terms of full-time study (or equivalent), or if they receive a grade of less than B- in any two courses they have registered in.

### **Part-time Continuation**

Students will be required to withdraw from the program if their weighted grade point average falls below 7.0 (B-) after completing 2.0 credits, or if they receive a grade of less than B- in any two courses they have registered in.

### **Admission**

Applicants must have a bachelor's degree (or equivalent), with an average of B+ or higher. The level of academic performance and potential demonstrated within the degree is more important than the discipline; students may enter the program from a wide variety of academic backgrounds in the social sciences, humanities, sciences and engineering. Mid-career applicants who do not have a bachelor's degree, but who have demonstrated professional excellence over a number of years of work in the public sector will also be considered.

All applicants must have completed 1.0 credit in university-level micro- and macroeconomic theory (ECON 1000 [1.0] or the equivalent)

0.5 credit in PSCI at the 2000-level or higher, dealing with institutions and processes by which governments legitimize and exercise power, ideally in a Canadian setting (PSCI 2003 or equivalent).

A working knowledge of algebra is also expected.

In some cases, applicants may be admitted to the program despite not having completed one of these prerequisite courses in economics or political science, on the condition that the course be completed with a grade of B- or higher in the first year of the program. It is strongly recommended that students complete the prerequisites before starting the program, to ensure that their progress through the core courses is unimpeded.

Students whose first language is not English or who have not completed a previous degree at an English speaking university must demonstrate an adequate command of English by attaining, at least, a TOEFL score of 237 CBT (computer-based test) or 580 (written); or 86 IBT overall with a minimum score in each component of: writing: 22; speaking: 22; reading: 20; and listening: 20, or a CAEL score of 70, or an IELTS score of 7.0.

### **Admission**

Applicants must have a bachelor's degree (or equivalent) in a discipline relevant to engineering disciplinary foundations.

Normally, an average of B+ or higher is required for admission.

### **Admission**

Applicants must have a bachelor's degree (or equivalent) in a discipline relevant to engineering disciplinary foundations.

Normally, an average of B+ or higher is required for admission.

## **Sustainable Energy (SERG) Courses**

### **SERG 5001 [0.5 credit]**

#### **Sustainable Energy Policy for Engineers**

This course introduces engineering students to the policy world by examining political and policy institutions, and covering basic principles of policy analysis, as they relate to the energy realm.

### **SERG 5002 [0.5 credit]**

#### **Sustainable Energy Engineering for Policy Students**

This course introduces policy students to fundamental principles of engineering, particularly as they relate to energy production, transformation and consumption.

### **SERG 5003 [0.5 credit]**

#### **Energy Evaluation and Assessment Tools**

Introduction to principles and tools for financial and performance analysis of energy projects, systems and technologies, and their application. Topics may include: probability theory, regression analysis, cost-benefit analysis, life cycle analysis, carbon accounting and emissions modeling, and other techniques particular to the energy field.

### **SERG 5004 [1.0 credit]**

#### **Applied Interdisciplinary Project**

Application of assessment tools, energy evaluation methods, engineering, economics and policy studies to actual sustainable energy projects.

Includes: Experiential Learning Activity

Precludes additional credit for SERG 5000 (no longer offered).

Prerequisite(s): SERG 5003 and one of SERG 5001 or SERG 5002.

### **SERG 5800 [0.0 credit]**

#### **Sustainable Energy Seminar**

A series of seminars presented by researchers and practitioners in the area of sustainable energy. To complete this course, a student must attend at least ten seminars during their program.

### **SERG 5906 [0.5 credit]**

#### **Directed Studies in Sustainable Energy**

A directed course on selected subjects related to sustainable energy as approved by a course supervisor.