

BUILDING SCIENCE

CURRICULUM

Master of Building Science (MBSc)

DEGREE REQUIREMENTS	Credits
Major Research Paper or Project	(Milestone)
Collaborative Workshop	(Milestone)
5 Core courses	5
Three elective credits	3

Master of Applied Science (MASc)

DEGREE REQUIREMENTS	Credits
Thesis	(Milestone)
Collaborative Workshop	(Milestone)
Three credits from the Core courses list (to be agreed with Program Director):	3
Two elective credits	2

Doctor of Philosophy

DEGREE REQUIREMENTS	Credits
Experiential Learning Activity	(Milestone)
Candidacy Examination	(Milestone)
Dissertation	(Milestone)
BL9105 Advanced Building Science Seminar	1
Three Elective credits	3

CORE COURSES	Credits
BL8100 Building Science Theory	1
BL8101 Building Envelope Systems	1
BL8102 Ecological Resource Eff Desgn	1
BL8103 Energy Efficient Bldg Service	1
BL8104 Building Design Seminar/Studio	1

ELECTIVES	Credits
BL8201 Sustainability-Existing Bldgs	1
BL8202 Building Automation	1
BL8203 Health, Comfort, Indoor Envmt	1
BL8204 Bldg Perform Simulation	1
BL8205 Fire Safety Design	1
BL8206 Adv Acoustic Design	1
BL8207 Bldg Performance Assessment	1
BL8208 Detail Design Project	1
BL8209 Directed Studies: Building Sci	1
BL8210 Bldg Sci and Arch Rsrch Meth	1
BL8211 Lighting Design in Buildings	1
BL8212 Renewable Energy Systems Bldgs	1
BL8213 Passive House Design and Const	1
BL8214 Life Cycle Assessment	1

BL8215	Building Envelope Restoration	1
BL8216	Special Topics	1
BL9202	Directed Studies in Building Science	1
CV8106	Advances in Concrete Materials	1
CV8306	Durability of Structures	1
ES8903	Pollution Prevention	1
ES8910	Energy and the Environment	1
ES8923	Environmental Assessment	1
ES8924	Environmental Mgmt Systems	1
ME8114	Energy Management	1

COURSE LISTING

Collaborative Workshop

An exercise whereby students who would not normally work together come together for an intensive collaborative activity. Students work in teams under the direction of Ryerson faculty members or (with the approval of the Program Director) design professionals in the community. This gives students direct experience in collaborative work with industry and community and other working design professionals, as well as community groups, university researchers from other disciplines, and artists. This will enable students to participate in a concentrated and focused special event such as a charrette or community related activity, and to work with graduate students from the Master of Architecture and undergraduate students on a specific, intensive activity. This is a Milestone. Pass/Fail

Research Paper or Project

The student is required to conduct an applied advanced research project on a topic related to building science. The student presents and agrees to the project plan with a supervisor, and the project is carried out under the guidance of the supervisor. The student must submit the completed project to an examination committee and make an oral presentation of the report to this committee, which will assess the report. This is a Milestone. Pass/Fail

Thesis

The student is required to conduct high quality research on a topic related to building science. The topic is chosen in consultation with the student's thesis supervisor, the student presents the research plan in writing, and the research is carried out under the direction of the supervisor. The student must submit the completed research in a thesis format to an examination committee and make an oral presentation of the thesis to this committee, which will assess the thesis. Through the thesis, the student is expected to furnish evidence of competence in research and a sound understanding of the specialty area associated with the research. This is a Milestone. Pass/Fail

Experiential Learning Activity

This is a Milestone.

Candidacy Examination

This is a Milestone.

Dissertation

This is a Milestone.

BL8100 Building Science Theory

This course allows students to develop an advanced understanding of building science theory as it applies to sustainable design issues, and provides the foundation of technical knowledge for other courses. It includes understanding climate and solar geometry, the environment, advanced heat, air and moisture transfer, durability, and principles of modeling, Course content is relevant to the OBEC Building Science Specialist designation. 1 Credit

BL8101 Building Envelope Systems

In this course students will investigate a broad range of building envelope systems as applied to variety of building typologies in order to develop proficiency with respect to envelope performance and its relevance to durable, sustainable design. This course also addresses the impact of envelope components/assemblies on heat, air and moisture transfer through the envelope, detailing issues and constructability. The course will also provide core knowledge for the OBEC Building Science Specialist designation.

Prerequisite: BL8100. Corequisite: BL8100. 1 Credit

BL8102 Ecological and Resource Efficient Design

In this course students will have an opportunity to explore concepts such as biomimicry, closed loop systems, ecological design processes and prefabrication. Students will develop an in depth understanding of how to design to minimize the environmental impacts of material and component choices, specifications, and processes. The focus will be on resource efficiency, construction processes, and materials selection. Students will be asked to critically evaluate green building assessment systems and develop an understanding of LCA methods. 1 Credit

BL8103 Energy Efficient Bldg Services

This course provides students with opportunities to explore advanced building services systems appropriate for energy efficient buildings and to investigate renewable energy systems in buildings. The course will focus on a number of selected techniques, such as combined heat and power (CHP), solar energy systems, ground source heat pumps, etc. Students will develop knowledge and skills that enable them to carry out relevant work in research, design, evaluation, commissioning and development. Prerequisite: BL8100, BL8101. Corequisite: BL8100, BL8101. 1 Credit

BL8104 Building Design Seminar/Studio

This seminar/studio course will focus on a design exercise/project aiming to develop and apply advanced knowledge of low energy design, exploring passive design, building form, construction technologies, and systems integration. Areas of study may include, net zero energy, natural lighting design, and integration of renewable energy. The use of appropriate methods of appraisal of passive systems and their integration will be considered. Prerequisite: BL8101, BL8103. Corequisite: BL8101, BL8103. 1 Credit

BL8201 Sustainability, Heritage and Existing Buildings

This course considers the relationship between heritage and environment conservation. Students will develop the theoretical knowledge and the building science principles necessary for extending the life and improving the performance of heritage and other existing buildings. Students will develop an understanding of the theory and role of standards, testing and survey protocols, and will apply this in practice. There will also be a consideration of the economic basis of decision making. Course content is relevant to the OBEC Building Science Specialist designation. 1 Credit

BL8202 Building Automation

This course deals with the control of typical building service systems and equipment. It covers the methods and techniques used to control and operate building devices in order to optimize the indoor environment quality and to minimize the energy consumption and the operation costs. After completing the course, students are expected to be able to understand how typical building systems should be controlled, to design building automation systems for simple buildings, and to understand the principle of building automation and opportunities it offers. 1 Credit

BL8203 Health, Human Comfort and Indoor Environment

Students will have an opportunity to develop an understanding of human comfort and the health impacts of spaces, forms, materials and ventilation systems. This will include the effect of materials selection, maintenance and ventilation, how design issues affect productivity; and how users perceive and experience spaces. 1 Credit

BL8204 Building Performance Simulation/Modeling

Simulation can be used as a teaching and research tool in the area of air movement, indoor air, wind impact, fire safety, energy efficiency, lighting, etc. Principle of modeling and computational simulation will be explored. This course will make students become familiar with the potential for building simulation programs particularly to improve energy performance and understand the techniques of simulation, why and when such programs can be best used. Students will develop critical skills necessary to assess the appropriate choice of procedure and precision at different stages of the design process. This course may be offered in association with the Department of Mechanical Engineering. 1 Credit

BL8205 Fire Safety Design

Fire safety engineering is the application of scientific and engineering principles based on an understanding of the phenomena and effects of fire and of the behaviour of people to fire, to protect people, property and the environment from the destructive effects of fire. This course addresses multi-disciplinary aspects involving chemistry (e.g. the behaviour of materials), physics (e.g. heat transfer, movement of smoke), civil engineering (e.g. deformation of structures), electrical and mechanical engineering, and psychology (e.g. behaviours of people). Students will explore how to provide an acceptable level of safety when an accidental fire occurs and consider the implications on innovative and experimental sustainable design solutions. 1 Credit

BL8206 Advanced Acoustic Design

This course will provide students with opportunities to explore in depth how to provide appropriate acoustical environments within different building types, and the implications on materials use and other aspects of performance. 1 Credit

BL8207 Building Performance Assessment

This course focuses on the complex issue of assessing existing buildings for their overall performance, particularly energy use, environmental impact and occupant satisfaction and to identify potential for improvement. This is key to ensuring that sustainable buildings perform to their potential. Post-occupancy building evaluations will be used and outputs compared to performance benchmarks on which buildings can be rated and compared. Students will have the opportunity to carry out an in depth study of a range of aspects of the performance of a building through measurement, surveys, investigations, etc. 1 Credit

BL8208 Detail Design Project

This course will focus on a detail design problem and will be run as a project based course. The design will relate to some element of sustainable construction detailing focusing construction systems proposed for sustainable building projects. The course will allow students to investigate in detail a particular element or type of construction and develop appropriate design proposals. 1 Credit

BL8209 Directed Studies in Building Science

With the approval of the program director and supervisor, students enrolled in the graduate program in Building Science may take a Directed Study course to gain knowledge in an area relevant to their research for which no graduate level course is offered. A faculty member must supervise the study, and appropriate assignments (exam, report, etc) will be agreed upon before registration. 1 Credit

BL8210 Building Science and Architectural Research Methods

This course is intended to prepare students to develop and undertake research projects related to architectural science. It will allow students to understand that research is systematic inquiry directed toward the creation of knowledge. Course will allow students to become familiar with and apply several research strategies and methods in architectural science. 1 Credit

BL8211 Lighting Design in Buildings

This course will provide students with opportunities to explore in depth the design process for the lighting system design. The lighting metrics use for design will be introduced. Simple computational methods will be presented. In addition detailed Radiosity evaluation using AGI32 software will be highlighted. Day lighting methods will be one of the main design applications that would be studied in this course. 1 Credit

BL8212 Renewable Energy systems in Buildings

This course will provide students with opportunities to explore in depth the design process for renewable energy system integration into buildings. The characteristics of various available technologies and systems will be reviewed and simple computational methods will be presented. 1 Credit

BL8213 Passive House Design and Construction

Students will gain a detailed understanding of low energy housing design and the passive house system. Students will learn about the Passive House principles, the PHPP software and how to use these tools to design energy efficient housing. 1 Credit

BL8214 Life Cycle Assessment

This course will be an investigation of the principles of the Life Cycle Assessment (LCA). The student will learn about the benefits of LCA to sustainable design, and how it can be used to aid in decision making in building design. The course will focus on understanding how LCA can quantify the environmental impacts of alternative strategies and will also consider the way LCA software tools such as Athena can be used as design and research tools. 1 Credit

BL8215 Building Envelope Restoration

This course considers investigation, design and contracting the building envelope restoration process. Students will develop knowledge of various investigation techniques used in building envelope diagnostics and learn how to recognize indicators of poor performance, deficiencies and failures. The course also covers the design of remedial repair strategies, including preparation of remedial repair documents, material selection and compatibility, the tendering process and contract administration. Prerequisite: BL8100 and BL8101 or with the approval of the Building Science Graduate Program Director. 1 Credit

BL8216 Special Topics

This course is offered to deliver content that is not offered by current core and/or elective courses in the Graduate Program in Building Science. The subject matter changes from year to year. The course description will be announced prior to the scheduling of the course. 1 Credit

BL9105 Advanced Building Science Seminar

1 Credit

BL9202 Directed Studies in Building Science (PhD)

With the approval of the program director and supervisor, students enrolled in the doctoral program in Building Science may take a Directed Study course to gain knowledge in an area relevant to their research for which no graduate level course is offered. A faculty member must supervise the study, and appropriate assignments (exam, report, etc) will be agreed upon before registration. 1 Credit

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