McGill University

Department of Electrical and Computer Engineering
ECSE 223 Model-Based Programming
Winter 2022

Instructor Marwan Kanaan marwan.kanaan@mcgill.ca

Lectures Tuesdays and Thursdays 8:35am – 9:55am

Office Hours By appointment.

Tutorials Mondays 11:35am – 1:25pm and Wednesdays 12:35pm – 2:25pm

Learning Outcomes The objective of this course is to introduce Model-Driven Engineering for modern development of software systems. After completing this course, students will be able to:

1. Identify the concepts of a domain and their relationships with the help of a key structural modeling notation (i.e., UML class diagrams) (PA, IN)
2. Express executable behavior with behavioral modeling notations (i.e., UML sequence diagrams and UML state machines) (PA, ET)
3. Apply the concepts of behavior-driven development with executable scenarios as specification by mapping them to domain-specific acceptance tests (ET, DE)
4. Evaluate the quality of models expressed with these UML modeling notations, explain the semantics of these UML modeling notations (PA, IN)
5. Use code auto generated from UML models in an application (ET)
6. Express natural language constraints to make UML class diagrams more precise (PA, ET)
7. Choose appropriate design patterns (DE)

Textbook Timothy C. Lethbridge and Robert Laganière, *Object - Oriented Software Engineering: Practical Software Development using UML and Java* (2nd edition), McGraw Hill, 2005

Grading Scheme

Midterms	30%
Project	43%
Final exam	25%
Workshops	2%

Midterms Two online open-book midterms to be completed individually, will test the students' knowledge of the course material. The midterms will take place during lecture times on:

Midterm 1 Tuesday February 22
Midterm 2 Tuesday March 29

Each midterm will cover the material up to and including the preceding lecture. Students who miss a midterm with no valid reason will receive a grade of zero.

Final exam A three-hour online open-book final exam will test everything the students learned in this course.

Workshops To prepare students for the teamwork required for the project, workshops are held throughout the course. These workshops are graded based on participation and completion of assignments and/or surveys. If a student does not participate in a workshop or does not fill out an assignment/survey by the deadline, then the student receives a grade of zero on this assessment.

Project The project will allow students to experience working on a medium-scale software engineering project in teams of 6. All deliverables are due at 11:59pm on the day of the deadline. The graded deliverables are the following:

Deliverable	Weight	Due date
Deliverable 1	10%	February 11
Deliverable 2	10%	March 11
Deliverable 3	10%	March 25
Deliverable 4	10%	April 8
Group presentation	3%	April 5–12

Course Policies:

- Communication: You can communicate with the course staff in two ways:
  - Discussion boards: if you have any questions about course material, projects, tutorials, or lectures, please post your questions on the discussion boards of myCourses so that everyone can benefit. You can even post anonymously if you wish.
  - Email: if you have an issue which you would like to discuss with me privately, please email me and put ECSE 223 in the subject line of your email. Given that this is a large class, please keep your emails short and to the point.
- Late Submission: A penalty of 5% of the total mark will be applied for every day late, unless prior arrangements are made, or a valid excuse is provided. This penalty only applies to the project deliverables. There is no late penalty for the midterms. A late submission for a midterm will not be accepted.
- Requesting additional feedback: if you would like additional feedback or want to contest the grading of an assessment, please email me within one week after the release of the grade for that assessment to discuss it. Otherwise, the grade is final. If the assessment is a project deliverable, please copy all group members in your email using their McGill email addresses.

McGill Policy Statements

- In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded. This does not apply to courses in which acquiring proficiency in a language is one of the objectives.
- McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/students/srr/honest/ for more information).
- © Instructor-generated course materials (e.g., handouts, notes, summaries, exam questions, etc.) are protected by law and may not be copied or distributed in any form or in any medium without explicit permission of the instructor. Note that infringements of copyright can be subject to follow up by the University under the Code of Student Conduct and Disciplinary Procedures.
- As the instructor of this course, I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me and the Office for Students with Disabilities, 514-398-6009.

In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.

McGill
Faculty of Engineering

Course Outline

ECSE 223

Course Title:	**Model-Based Programming**
Credits:	**3**
Contact Hours:	**(3-2-4)**
Course Prerequisite(s):	**ECSE 202**
Course Corequisite(s):	**N/A**
Course Description:	**Integration of modelling with programming; abstraction in software engineering; structural modelling; state-based modelling; modelling of object-oriented systems, code generation; natural language constraints in modelling notations; architectural and design patterns; integrated development environments; programming tools (debugging, continuous build/integration, version control and code repositories, diff, defect and issue tracking, refactoring); code review processes.**

Canadian Engineering Accreditation Board (CEAB) Curriculum Content

CEAB curriculum category content	Number of AU's	Description
Math	**0**	Mathematics include appropriate elements of linear algebra, differential and integral calculus, differential equations, probability, statistics, numerical analysis, and discrete mathematics.
Natural science	**0**	Natural science includes elements of physics and chemistry, as well as life sciences and earth sciences. The subjects are intended to impart an understanding of natural phenomena and relationships through the use of analytical and/or experimental techniques.
Complementary studies	**0**	Complementary studies include the following areas of study to complement the technical content of the curriculum: engineering economics and project management; the impact of technology on society; subject matter that deals with the arts, humanities and social sciences; management; oral and written communications; health and safety; professionalism, ethics, equity and law; and sustainable development and environmental stewardship.
Engineering science	**26**	Engineering science involves the application of mathematics and natural science to practical problems. They may involve the development of mathematical or numerical techniques, modeling, simulation, and experimental procedures. Such subjects include, among others, applied aspects of strength of materials, fluid mechanics, thermodynamics, electrical and electronic circuits, soil mechanics, automatic control, aerodynamics, transport phenomena, elements of materials science, geoscience, computer science, and environmental science.
Engineering design	**26**	Engineering design integrates mathematics, natural sciences, engineering sciences, and complementary studies in order to develop elements, systems, and processes to meet specific needs. It is a creative, iterative, and open-ended process, subject to constraints which may be governed by standards or legislation to varying degrees depending upon the discipline. These constraints may also relate to economic, health, safety, environmental, societal or other interdisciplinary factors.

Accreditation units (AU's) are defined on an hourly basis for an activity which is granted academic credit and for which the associated number of hours corresponds to the actual contact time: one hour of lecture (corresponding to 50 minutes of activity) = 1 AU; one hour of laboratory or scheduled tutorial = 0.5 AU. Classes of other than the nominal 50-minute duration are treated proportionally. In assessing the time assigned to determine the AU's of various components of the curriculum, the actual instruction time exclusive of final examinations is used.

Graduate Attributes

This course contributes to the acquisition of graduate attributes as follows:

Graduate attribute	KB	PA	IN	DE	ET	IT	CS	PR	IE	EE	EP	LL
Level descriptor		I	I	I	I							

I = Introduced; D = Developed; A = Applied

KB *- Knowledge Base for Engineering: Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.*

PA *- Problem Analysis: An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.*

IN *- Investigation: An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data, and synthesis of information in order to reach valid conclusions.*

DE *- Design: An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, economic, environmental, cultural and societal considerations.*

ET *- Use of Engineering Tools: An ability to create, select, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.*

IT *- Individual and Team Work: An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.*

CS *- Communication Skills: An ability to communicate complex engineering concepts within the profession and with society at large. Such abilities include reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.*

PR *- Professionalism: An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.*

IE *- Impact of Engineering on Society and the Environment: An ability to analyse social and environmental aspects of engineering activities. Such abilities include an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society; the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.*

EE *- Ethics and Equity: An ability to apply professional ethics, accountability, and equity.*

EP *- Economics and Project Management: An ability to appropriately incorporate economics and business practices including project, risk and change management into the practice of engineering, and to understand their limitations.*

LL *- Life-Long Learning: An ability to identify and to address their own educational needs in a changing world, sufficiently to maintain their competence and contribute to the advancement of knowledge.*

Policies

Academic Integrity

McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures.
(see www.mcgill.ca/students/srr/honest/ for more information).
(approved by Senate on 29 January 2003)

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.
(approved by Senate on 21 January 2009)

Grading Policy

In the Faculty of Engineering, letter grades are assigned according to the grading scheme adopted by the professor in charge of a particular course. This may not correspond to practices in other Faculty and Schools in the University.

In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.