

Syllabus

INFO 5100 Application Engineering & Development Course Syllabus

Course Information

Course Title: Application Engineering and Development - INFO 5100

Term and Year: FALL 2024

Credit Hours: 4.0

Course Format: In-class (exam review lectures are online).

Online link (for labs, office hours): <https://northeastern.zoom.us/my/o.badreldin>

Meeting times: TBD.

Corequisite(s): INFO 5101.

For advising questions please contact: coe-toronto-gradadvising@northeastern.edu (<mailto:coe-toronto-gradadvising@northeastern.edu>).

Instructor Information:

Name: Omar Badreddin

NEU Email Address: o.badreldin@northeastern.edu (<mailto:o.badreldin@northeastern.edu>)

Teaching Assistant:

Name: Rishabh Lokanathan Kaushick

NEU Email: kaushick.r@northeastern.edu

Office Hours: Monday and Wednesday 1:00 to 2:00 PM.

Office hours are in person and virtual: TBD (<https://northeastern.zoom.us/my/ramanathan.ak>)

Course Description:

Takes students in a step-by-step manner through the process of systematically combining UX techniques, business processes, and complex data models to assemble applications that are user-friendly and meet business requirements. Employs the object-oriented paradigm, visual user experience, and system design principles to put together complicated, powerful, real-world applications. The primary objective of this course is to practice social-technical software engineering methods and tools to solve real-world problems. Offers students an opportunity to learn innovative design and programming techniques to build significant business applications quickly; to practice simple and smart ways of making software construction enjoyable; and to master the art of how to systematically write software programs to solve any business problem.

Program Learning Outcomes (PLOs):

The main objective of this course is to introduce the students to the discipline of Software Engineering. In particular:

- Identify the problems that one should expect when developing large software systems.
- The methods that the software developer can use to deal with each of the problems.
- The tools that the software developer can use.
- The procedures that can be followed in developing software.

Course Learning Outcomes

Based on satisfactory completion of this course, a student should be able to:

CLO1: Formulate use-case diagrams and scenarios to support understanding of user requirements.

CLO2: Use object-oriented design notations, including UML class diagrams and state machine diagrams to

model problem solutions.

CLO3: Use basic object-oriented design patterns to structure solutions to software design problems.

CLO4: Translate design features, such as classes and relationships, to implementations.

CLO5: Design and implement software employing the principles of modularity, encapsulation, information

hiding, abstraction, and polymorphism.

CLO6: Design, implement, and use classes and methods that follow conventions and styles, and make

appropriate use of advanced features such as inheritance, exception handling, and generics.

CLO7: Evaluate existing classes and software for the purposes of extension through inheritance.

CLO8: Create API documents for classes, fields, and methods.

CLO9: Design and implement test suites for automated unit testing.

CLO10: Re-factor existing source code to improve its design or efficiency.

Course Outline:

| Topic | Name | ~ Duration (hours) | Discussion Material |
|----------|---|--------------------|--|
| A | Introduction to Modern Software Engineering | 2 | - |
| B | UML Use Case Modeling | 2 | Requirement Gathering Techniques For A Business Analyst: https://youtu.be/8EBWxW5Cn1g |
| C | UML Class Diagrams | 4 | UML Diagrams in Software Engineering: https://www.youtube.com/watch?v=efJPNX03JVk |
| D | UML State Machines | 3 | SpaceX and Software Engineering: https://youtu.be/v8f6q4ruvds |
| E | Introduction to MVC | 2 | Becoming a better Software Architect: https://www.youtube.com/watch?v=VK_tDNtiAT4 |
| F | Advanced Java Features | 4 | A Deep Look Into The INSANE Software That Runs Starlink: https://youtu.be/iKtOW92ncq0 |
| - | Midterm revision and exam | 3 | - |
| G | Documenting with Javadoc | 2 | - |
| H | Testing using Unit Test | 2 | Boeing 737 MAX: How its MCAS software works: https://youtu.be/GdkP9Y4QfRg |
| I | Design Patterns | 4 | - |
| J | User Interface Design | 3 | How Robinhood Gets Casual Traders Hooked: https://youtu.be/lxzMNomgQS8 |

| | | | |
|----------|---|---|--|
| K | Multi-threaded Programming | 2 | |
| L | Introduction to Business Process Modeling | 3 | |
| M | Introduction to Software Testing | 3 | |
| - | Final revision and exam | 2 | |

Policy on late work: late submissions of course work will not be graded or considered without a documented and approved excuse.

Grade Breakdown*:

| | |
|--|-----|
| Assignments (~7, best of 6) | 20% |
| Labs and Project (Attendance Mandatory) | 25% |
| Midterm | 25% |
| Final Exam (comprehensive) | 30% |

* Subject to change.

Grading: Graduate Programs Final Grading Scale

| | | | | | | |
|-----------------|-----------|-----------------|-----------|-----------------|-----------|---------------------|
| 95-100% | A | 87-89.9% | B+ | 77-79.9% | C+ | 69.9% or below F |
| | | 84-86.9% | B | 74-76.9% | C | |
| 90-94.9% | A- | 80-83.9% | B- | 70-73.9% | C- | |

Academic Integrity:

A commitment to the principles of academic integrity is essential to the mission of Northeastern University. The promotion of independent and original scholarship ensures that students derive the

most from their educational experience and their pursuit of knowledge. Academic dishonesty violates the most fundamental values of an intellectual community and undermines the achievements of the entire University.

As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, examinations of whatever kind, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Students are responsible for learning the conventions of documentation and acknowledgment of sources in their fields. Northeastern University expects students to complete all examinations, tests, papers, creative projects, and assignments of any kind according to the highest ethical standards, as set forth either explicitly or implicitly in this Code or by the direction of instructors.

Go to <http://www.northeastern.edu/osccr/academic-integrity-policy/> (<http://www.northeastern.edu/osccr/academic-integrity-policy/>) to access the full academic integrity policy.

Dishonesty and/or carelessness violates fundamental values of an intellectual and professional community and will be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) as a violation of the Academic Integrity Policy. To safeguard the integrity of assignments and programs, your course may use systems such as TurnItIn, which checks written work, and Examity, an online exam proctoring system. Work that contains academic integrity violations (AIV) will be graded on a case by case basis. Work displaying AIV may earn a failing grade, a zero, or even result in the instructor assigning the student a failing grade for the class. Students may not withdraw from a class to avoid the grade penalty for serious academic integrity violations.

For additional information or for answers to frequently asked questions, please visit:

<https://cps.northeastern.edu/academic-resources/academic-integrity>
(<https://cps.northeastern.edu/academic-resources/academic-integrity>)

You may also email CPS-AcademicIntegrity@northeastern.edu (<mailto:CPS-AcademicIntegrity@northeastern.edu>).

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Student Accommodations:

The College is committed to providing equitable access to learning opportunities to students with documented disabilities (e.g. mental health, attentional, learning, chronic health, sensory, or physical). To ensure access to this class, and program, please contact The Disability Resource Center (<http://www.northeastern.edu/drc/> (<https://nam05.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.northeastern.edu%2Fdrc%2F&data=02%7C01%7Cm.saxena%40northeastern.edu%7Cc3afa3dd56534327801808d725a1bff6%7Ca8eec281aaa34daeac9b9a398b9215e7%7C0%7C0%7C637019248946219757&sdata=7Yd3U2Xu20BSQGWDj3HE9EZcvA7G1SKtVnFqBk9%2Fo8%3D&reserved=0>)) to engage in a confidential conversation about the process for requesting reasonable accommodations in the classroom and clinical or lab settings. Accommodations are not provided retroactively so students are encouraged to register with the Disability Resource Center (DRC) as soon as they begin their program. The College of Professional Studies encourages students to access all resources available through the DRC for consistent support.

Student Well-Being:

All students have access to We Care – 617-373-7591 wecare@northeastern.edu (<mailto:wecare@northeastern.edu>) for health concerns, referrals for mental health and assistance with leaves of absence. Additionally we have FIND@ Northeastern - Available 24/7/365 1-877-233-9477 (domestic) 1-781-457-7777 (international) <https://www.northeastern.edu/uhrs/find-at-northeastern/> (<https://nam12.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.northeastern.edu%2Fuhrs%2Ffind-at-northeastern%2F&data=04%7C01%7Cm.saxena%40northeastern.edu%7Cbcb913a80003440b89dd08d9fc842e29%7Ca8eec281aaa34daeac9b9a398b9215e7%7C0%7C0%7C637818466904958125%7CUnknown%7CTWFpbGZsb3d8eyJWljojMC4wLjAwMDAiLCJQIjoiV2luMzliLCJBTil6Ik1haWwiLCJXVCi6Mn0%3D%7C3000&sdata=51IfB42UxfqGetLDWH%2F8CM%2BqzfvSxeJkVCSf8S5woUE%3D&reserved=0>).

Library Services:

The Northeastern University Library is at the hub of campus intellectual life. Resources include over 900,000 print volumes, 206,500 e-books, and 70,225 electronic journals. For more information, visit <http://library.northeastern.edu/> (<http://library.northeastern.edu/>).

Wyzant Tutoring Services:

Northeastern University's College of Professional Studies is covering the cost of twenty-five hours per academic year of tutoring from Wyzant to help ensure your success in challenging courses. Tutors on Wyzant have helped thousands of students in 300+ subjects ranging from College Algebra to Academic Writing, Statistical Analysis to Microbiology. To access your free Wyzant Tutoring for students in the College of Professional Studies, please complete the following steps:

- Login to Northeastern University's [Canvas \(https://nam12.safelinks.protection.outlook.com/?url=https%3A%2F%2Fcanvas.northeastern.edu%2F&data=04%7C01%7Cm.saxena%40northeastern.edu%7C2781cbeb5a6446ba2b4508d94adab470%7Ca8eec281aaa34daeac9b9a398b9215e7%7C0%7C0%7C637623125461677360%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzliLCJBTil6Ik1haWwiLCJXVCi6Mn0%3D%7C1000&sdata=cn%2FV7I9EYF0k9hUCRtpMx4qdBsmKaUJmyJGxmIEKj6c%3D&reserved=0\)](https://nam12.safelinks.protection.outlook.com/?url=https%3A%2F%2Fcanvas.northeastern.edu%2F&data=04%7C01%7Cm.saxena%40northeastern.edu%7C2781cbeb5a6446ba2b4508d94adab470%7Ca8eec281aaa34daeac9b9a398b9215e7%7C0%7C0%7C637623125461677360%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzliLCJBTil6Ik1haWwiLCJXVCi6Mn0%3D%7C1000&sdata=cn%2FV7I9EYF0k9hUCRtpMx4qdBsmKaUJmyJGxmIEKj6c%3D&reserved=0) platform and click on your active course.
- Once you are logged in your class, scroll to the bottom red link on the left side of the course navigation that says "Wyzant Tutoring".
- After clicking this link, you will be prompted to access your free tutoring using your Northeastern login credentials. Indicate your program, time zone, the course you'd like support in, and the specific topics or materials you'd like help with.
- You'll receive an activation email from Wyzant for Higher Ed. (If you don't see it, check your spam or junk folders.) From the email, click on the activation button.
- Potential tutors will begin reaching out to you. Their messages will be sent to your Northeastern email inbox and will be accessible via your Wyzant account dashboard.
- Respond back to the tutors you believe might be a good fit to schedule an online session when it's convenient for you — even late at night!

Technical Help:

For immediate technical support for Canvas, call 1-833-450-3937. You can chat and report an issue to Canvas technical support right from within Canvas through the Help icon located in the Canvas global navigation.

myNortheastern, e-mail, and basic technical support

Visit the [Information Technology Services \(ITS\) Support Portal \(https://service.northeastern.edu/tech\)](https://service.northeastern.edu/tech)

Email: [help@northeastern.edu \(mailto:help@northeastern.edu\)](mailto:help@northeastern.edu)

ITS Customer Service Desk: 617-373-4357 (help)

Diversity and Inclusion:

Northeastern University and the and the Office of Institutional Diversity and Inclusion (OIDI) is committed to equal opportunity, affirmative action, diversity and social justice while building a climate of inclusion on and beyond campus. In the classroom, member of the University community work to cultivate an inclusive environment that denounces discrimination through innovation, collaboration and an awareness of global perspectives on social justice.

Please visit <http://www.northeastern.edu/oidi/> (<http://www.northeastern.edu/oidi/>) for complete information on Diversity and Inclusion

TITLE IX:

Title IX of the Education Amendments of 1972 protects individuals from sex or gender-based discrimination, including discrimination based on gender-identity, in educational programs and activities that receive federal financial assistance.

Northeastern's [Title IX Policy](https://www.northeastern.edu/policies/pdfs/Title_IX_Policy.pdf) (https://www.northeastern.edu/policies/pdfs/Title_IX_Policy.pdf) prohibits sex and gender-based discrimination, including sexual harassment, sexual assault, sexual exploitation, relationship or domestic violence, and stalking. The Title IX Policy refers to sex and gender-based discrimination as "Prohibited Offenses." The Title IX Policy applies to the entire Northeastern community, including students, faculty and staff of all gender identities. Allegations of Prohibited Offenses can be reported to the Title IX Coordinator within **The Office for University Equity and Compliance** at: titleix@northeastern.edu (<mailto:titleix@northeastern.edu>) and/or through **the Northeastern University Police Department (NUPD)** by phone: for an Emergency 617.373.3333; for Non-Emergency 617.373.2121. Reporting to NUPD does **NOT** commit the victim/affected party to future legal action.

Faculty members are considered "responsible employees" at Northeastern University, meaning they are required to report all reports of and information about alleged Prohibited Offenses to the Office for University Equity and Compliance.

If you or someone you know has experienced a Prohibited Offense, **confidential** support and guidance can be found through (<https://www.northeastern.edu/ouec/resources/main-campus-resources/> (<https://nam12.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.northeastern.edu%2Fouec%2Fresources%2Fmain-campus-resources%2F&data=02%7C01%7Cm.saxena%40northeastern.edu%7C515666bcdb9e462d77fa08d829c937d4%7Ca8eec281aaa34daeac9b9a398b9215e7%7C0%7C0%7C637305291482180830&sdata=G1F5ORmpWAPWpG8q6OkXErj3O0KRwdkd2MMqFBfI5Dw%3D&reserved=0>), **University Health and Counseling Services (UHCS)** staff (<http://www.northeastern.edu/uhrs/> (<https://nam12.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.northeastern.edu%2Fuhrs%2F&data=02%7C01%7Cm.saxena%40northeastern.edu%7C515666bcdb9e462d77fa08d829c937d4%7Ca8eec281aaa34daeac9b9a398b9215e7%7C0%7C0%7C637305291482190825&sdata=HUf79tuEjbP6rLcSGni9MLT1f2rEq4LO8LxJWL7MfKg%3D&reserved=0>).

and the **Center for Spiritual Dialogue and Service (CSDS) clergy**

members (<http://www.northeastern.edu/spirituallife/>

(<https://nam12.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.northeastern.edu%2Fspirituallife%2F&data=02%7C01%7Cm.saxena%40northeastern.edu%7C515666bcbd9e462d77fa08d829c937d4%7Ca8eec281aaa34daeac9b9a398b9215e7%7C0%7C0%7C637305291482200819&sdata=5PgwUdMW6xzyz6kOalezCm8htAaSYhmk1DRJjwMSTKw%3D&reserved=0>).

Employees within the VRC, UHCS, and CSDS are not required to report allegations of Prohibited Offenses to the Office for University Equity and Compliance.

In case of an emergency, please call 911 OR NUPD'S Emergencyline: 617-373-3333.

Please visit www.northeastern.edu/titleix (<https://nam12.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.northeastern.edu%2Ftitleix&data=02%7C01%7Cm.saxena%40northeastern.edu%7C515666bcbd9e462d77fa08d829c937d4%7Ca8eec281aaa34daeac9b9a398b9215e7%7C0%7C0%7C637305291482200819&sdata=C2IPayB0XouFZSQZs2MRNvsBXIQNG2h1A3T2Cem0IOM%3D&reserved=0>)

for a complete list of [reporting options](https://nam12.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.northeastern.edu%2Fouec%2Freporting-options%2F&data=02%7C01%7Cm.saxena%40northeastern.edu%7C515666bcbd9e462d77fa08d829c937d4%7Ca8eec281aaa34daeac9b9a398b9215e7%7C0%7C0%7C637305291482210813&sdata=bBhLYjmTZpQbjrcQOiEMPYVU5N3qGMS9%2FA4i1xglINY%3D&reserved=0) (<https://nam12.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.northeastern.edu%2Fouec%2Freporting-options%2F&data=02%7C01%7Cm.saxena%40northeastern.edu%7C515666bcbd9e462d77fa08d829c937d4%7Ca8eec281aaa34daeac9b9a398b9215e7%7C0%7C0%7C637305291482210813&sdata=bBhLYjmTZpQbjrcQOiEMPYVU5N3qGMS9%2FA4i1xglINY%3D&reserved=0>)

and resources, both on-and off-campus.

[reporting options](https://nam12.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.northeastern.edu%2Fouec%2Freporting-options%2F&data=02%7C01%7Cm.saxena%40northeastern.edu%7C515666bcbd9e462d77fa08d829c937d4%7Ca8eec281aaa34daeac9b9a398b9215e7%7C0%7C0%7C637305291482210813&sdata=bBhLYjmTZpQbjrcQOiEMPYVU5N3qGMS9%2FA4i1xglINY%3D&reserved=0)

and resources, both on-and off-campus.

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