

Mathematics 4154A/9054 Course Outline

1. Course Information

Course Information

Mathematics 4154A-001 Functional Analysis, September-December 2025 and Mathematics 9054-001 Functional Analysis, September-December 2025. In-person lectures XXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXX.

List of Prerequisites (Math 4154A)

Mathematics 2120A/B, Mathematics 3122A/B. Pre-or Corequisite(s): Mathematics 3124A/B.

Unless you have either the prerequisites for this course or written special permission from the Department of Mathematics to enroll in it, you may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on your academic record. This decision may not be appealed.

2. Instructor Information

Instructor	Email	Office	Phone	Office Hours
Gord Sinnamon	sinnamon@uwo.ca	MC 103e	x86535	See below

Students should use their Western (@uwo.ca) email addresses when contacting their instructors.

Drop-in office hours will be held in-person in MC 103e, days and times to be arranged in class. To meet outside these times, email the instructor for an appointment. In the email, suggest a **definite day and time** for the meeting and preferred format: in person, Zoom, telephone or other (specify).

3. Course Syllabus, Schedule, Delivery Mode

Description

Hilbert spaces: L^2 spaces, orthogonal complements, dual spaces, Riesz representation theorem, the Fredholm alternative, spectral resolution of compact normal operators. Banach spaces: Hahn-Banach theorem, bounded linear operators, adjoints, closed graph and Banach Steinhaus theorems.

Course Learning Outcomes

1. Prove that a given functional is or is not a norm.
2. Define the orthogonal complement of a subset of a Hilbert space.

3. Prove that the set of bounded, linear operators between two Banach spaces is itself a Banach space.
4. State the Hahn-Banach theorem for normed spaces.
5. Prove the spectrum of a bounded, linear operator on Hilbert space is a closed, bounded subset of \mathbb{C} .
6. Define the notion of a compact operator between two normed spaces.

Lecture Dates and Delivery Mode

XX
XX
XXXXXXXXXXXXXXXXXXXXXXXXXXXX.

Key Sessional Dates (Math 4154A)

Classes begin: September 4, 2025

Last day to add a Fall 12-week course: September 12, 2025

National Day for Truth and Reconciliation (observed at Western). No class: September 30, 2025

Thanksgiving. No class: October 13, 2025

Fall Reading Week: November 3 – 9, 2025

Last day to withdraw from a Fall 12-week course without academic penalty. December 1, 2025

Last day of classes in the Fall term: December 9, 2025

Study Day: December 10, 2025

Exam period: December 11 – 22, 2025

4. Course Materials

Textbook

Linear Functional Analysis, Second Edition, by Rynne and Youngson, Springer-Verlag, London, 2008.
This is a free download from Western Library.

Other

Occasional additional course material will be provided online via OWL

Costs of Textbooks and Other Learning Materials/Activities

None

All course material will be posted to OWL: <https://westernu.brightspace.com>

Students are responsible for checking the course OWL site (<https://westernu.brightspace.com>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the [OWL Brightspace Help](#) page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

5. Methods of Evaluation

Grading Scheme and Assessment Dates

The overall course grade will be calculated as listed below:

Written Assignments (4)	16%	XXXXXXXXXXXXXXXXXXXXX
In-Class Tests (2)	40%	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
Final Exam	44%	To be scheduled by the registrar. (Three hours.)

To request a one-week extension of the due date for an assignment, contact the instructor before the original deadline. This is not an academic consideration. First or second extension request: no penalty. Third or fourth extension request: assessment grade multiplied by 3/4.

For the approximate range of topics covered on each in-class test, see the Weekly Schedule, above. Detailed information for each in-class test will be announced at least five days before the test. The final examination will cover the entire course.

Assignments, Tests and Exams in Math 9054A will be more demanding than the corresponding assessments in Math 4154A.

Use of Generative AI Tools

Prohibited

General information about missed coursework (Math 4154A)

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs*, posted on the Academic Calendar: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf,

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult [Accessible Education](#).

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage: https://registrar.uwo.ca/academics/academic_considerations/. All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request **without supporting documentation** in this course. However, the following assessments are excluded from this, and therefore always require formal supporting documentation:

- Examinations scheduled during official examination periods (Defined by policy)

When a student *mistakenly* submits their one allowed Academic Consideration request **without supporting documentation** for the assessments listed above or those in the **Coursework with Assessment Flexibility** section below, the request cannot be recalled and reapplied. This privilege is forfeited.

Evaluation Scheme for Missed Assessments

In the absence of Academic Consideration (AC), every assignment or test missed will receive a mark of zero. Even with AC, assignment submissions more than one week beyond the original due date will not be accepted or graded.

There will be no makeups for missed assignments.

Number of Assignments Missed (with AC)	0	1	2	3	4
Weight[%] of each Assignment Submitted	5	20/3	10	10	-
Weight[%] Transferred to Final Exam	0	0	0	10	20

There will be no makeups for missed quizzes.

Number of Tests Missed (with AC)	0	1	2
Weight[%] of each Test Written	20	40	-
Weight[%] Transferred to Final Exam	0	0	40

When a student misses the Final Exam and their Academic Consideration has been granted, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under [Special Examinations](#)), especially for those who miss multiple final exams within one examination period.

6. Additional Statements

6.1 Religious Accommodation

When conflicts arise with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible, but not later than two weeks prior to the writing of the examination (or one week prior to the writing of the test).

Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays - <https://www.edi.uwo.ca>

6.2 Academic Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf.

6.3 General Academic Policies

The website for Registrar Services is <https://www.registrar.uwo.ca/>.

Use of @uwo.ca email: In accordance with policy, https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf, the centrally administered e-mail account provided to students will be considered the individual's official university email address. It is the responsibility of the account holder to ensure that emails received from the University at their official university address are attended to in a timely manner.

Requests for Relief (formally known as “appeals”)

Policy on Request for Relief from Academic Decision:

https://uwo.ca/univsec/pdf/academic_policies/appeals/requests_for_relief_from_academic_decisions.pdf

Procedures on Request for Relief from Academic Decision (Undergraduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/undergrad_requests_for_relief_procedure.pdf

Procedures on Request for Relief from Academic Decision (Graduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/graduate_requests_for_relief_procedure.pdf

6.4 Scholastic Offences

Policy on Scholastic Offences:

https://uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_offences.pdf

Procedures on Scholastic Offences (Undergraduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/undergrad_scholastic_offence_procedure.pdf

Procedures on Scholastic Offences (Graduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/graduate_scholastic_offence_procedure.pdf

Use of Electronic Devices During Assessments

In courses offered by the Faculty of Science, the possession of unauthorized electronic devices during any in-person assessment (such as tests, midterms, and final examinations) is strictly prohibited. This includes, but is not limited to: mobile phones, smart watches, smart glasses, and wireless earbuds or headphones.

Unless explicitly stated otherwise in advance by the instructor, the presence of any such device at your desk, on your person, or within reach during an assessment will be treated as a *scholastic offence*, even if the device is not in use.

Only devices expressly permitted by the instructor (e.g., non-programmable calculators) may be brought into the assessment room. It is your responsibility to review and comply with these expectations.

Use of Generative AI Tools

Unless otherwise stated, the use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is **not permitted** in the completion of any course assessments, including but not limited to: assignments, lab reports, presentations, tests, and final examinations.

Using such tools for content generation, code writing, problem solving, translation, or summarization—when not explicitly allowed—will be treated as a **scholastic offence**.

If the use of generative AI is permitted for a particular assessment, the conditions of use will be specified by the instructor in advance. If no such permission is granted, students must assume that use is prohibited. It is your responsibility to seek clarification before using any AI tools in academic work.

Remote Proctoring Software may be used in this course in the event of a health lockdown.

Tests and examinations in this course will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**.

Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service,

including technical requirements, is available on Western's Remote Proctoring website at: <https://remoteproctoring.uwo.ca>.

6.5 Support Services

Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, requests for relief, exam conflicts, and many other academic-related matters: <https://www.uwo.ca/sci/counselling/>.

Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health/>) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence (GBSV) and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced GBSV (either recently or in the past), you will find information about support services for survivors, including emergency contacts at:

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. If you have any questions regarding accommodations, you may also wish to contact Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

Learning-skills counsellors at Learning Development and Success (<https://learning.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital/>.

Additional student-run support services are offered by the USC, <https://westernusc.ca/services/>.