

Western University Department of Mathematics  
Course Outline Fall 2022 (revised Sep 2, 2022)

Applied Mathematics 3811a \*      Mathematics 3124a †    Math 9024a ‡  
\*: Complex Variables with Applications      †‡: Complex Analysis I

**Instructor:** Dr. Greg Reid

**Email:** reid@uwo.ca

**Course Web Site:** <http://owl.uwo.ca>

**Office:** MC 281

**Tel:** 679-2111 Ext. 88793

**Instructor Office Hour:** Wed 2:30 - 3:30 pm or by appointment

*It is your responsibility to regularly check the course web site for emails, grades, announcements, assignments, important dates etc (at least several times a week). Note however that some announcements will be made only in class. Always include AM3811 or Math3124 or Math9024 in the subject line of emails.*

**Lectures:** M–W–F (9:30 am – 10:30 am) AHB -2B02

**Key Sessional Dates:** Classes begin: September 8, 2022; Fall Reading Week: October 31 – November 6, 2022; Final Exam period: December 10 – 22, 2022

**Required Text for all students:** *Fundamentals of Complex Analysis: with Applications to Engineering and Science* by Edward Saff and Arthur Snider (3rd Edition, e-version & Paperback). BTW Terrance Tao used this book when he taught Complex Analysis at UCLA!

[https://bookstore.uwo.ca/textbook-search?campus=UWO&term=W2022A&courses%5B0%5D=001\\_UW/AMA3811A](https://bookstore.uwo.ca/textbook-search?campus=UWO&term=W2022A&courses%5B0%5D=001_UW/AMA3811A)

[https://bookstore.uwo.ca/textbook-search?campus=UWO&term=W2022A&courses%5B0%5D=001\\_UW/MAT3124A](https://bookstore.uwo.ca/textbook-search?campus=UWO&term=W2022A&courses%5B0%5D=001_UW/MAT3124A)

**Official Description AM3811:** Functions of a complex variable, analytic functions, integration in the complex plane, Taylor and Laurent series, analytic continuation, Cauchy's theorem, evaluation of integrals using residue theory, applications to Laplace transforms, conformal mapping and its applications.

**AM3811 Prerequisites:** Calculus 2303a/b or Calculus 2503a/b. **Antirequisite(s):** Mathematics 3124a/b.

**Official Description Math3124:** The Cauchy-Riemann equations, elementary functions, branches of the logarithm and argument, Cauchy's integral theorem and formula, winding number, Liouville's theorem and the fundamental theorem of algebra, the identity theorem, the maximum modulus theorem, Taylor and Laurent expansions, isolated singularities, the residue theorem and applications, the argument principle and applications.

**Math3124 Prerequisites:** Mathematics 2122a/b or equivalent **Antirequisite(s):** Applied Mathematics 3811a/b.

**1. Course Content and Coverage:** Material will be taken from the following Chapters of Saff and Snider in the given sequence:

- Complex Numbers (Chapter 1), Analytic Functions (Chapter 2) and Elementary Functions (Chapter 3)
- Intro to complex & conformal transformations (misc material in Chap 1 - 3)
- Intro to Complex Integration (Chapter 4)
- Series representations for analytic functions (Chapter 5) and Residues (Chapter 6)
- Computing Laplace and Fourier Transforms (Chapter 8)
- Conformal Transformations (Chap 7 selected material depending on time)

This is a first course in Complex Analysis. Complex analysis is an essential prerequisite for much of mathematics, engineering and other scientific disciplines. It is also a beautiful subject, where the calculations are elegant, and yields results of stunning beauty and power. Our focus is on giving enough coverage to reach some of the prime

applications, especially the application to computing inverse Laplace and Fourier Transforms. Though we move quickly, covering most of the book, the major results of the course are proved.

Attention should be paid to material from lectures, text and web site, to gain a complete view of expectations for course. Our goal is find an understandable path through the material. So some material will be omitted from the text and some material and methods when more efficient, will be given from outside the text. Over-reliance on one source is unwise. For example some material will be covered in the lectures that is not in the text, and in particular in a manner sometimes different to the text.

**Core Course level learning outcomes:** Complex analysis is roughly the extension of the familiar real Calculus to complex numbers. Thus all students are expected by the end of the course to correctly execute complex calculus computations, such as differentiating, integrating and computing series, etc, and related applications. All students are expected to understand the fundamental definitions and derivations in the course. There will be a common core of assignment, quiz and exam problems from this material. Course outcomes from the common core, include being able to correctly execute computations of complex calculus: compute derivatives, integrals, series (Laurent and Taylor), locate and classify singularities, compute conformal maps, apply theorems. They should be able to prove basic results (with a background that is at the intersection of the Math 3124 and AM 3811 prerequisites).

**AM 3811:** In addition to the core, those in AM 3811 will have further designated problems and related coverage from more advanced applications. In particular the Fourier transform and applications will be covered in greater depth.

**Math 3124a:** In addition to the core, those in Math 3124 will have further designated problems that are related to more advanced theoretical aspects of complex variables including related proofs.

**Math 9024a:** In addition to the core, the graduate students in Math 9024a will be expected to do the more advanced problems from both Math 3124 and AM 3811. Correspondingly for Assignment, Exam and Quizzes they will be asked to omit some of the common core problems. In addition, they will be asked to do a longer (15 minute) individual presentation on a topic decided in mutual consultation with the instructor.

**Computers and calculators:** No use of calculators on quizzes, midterm or final. Some use of the computer package Maple will be made via myvlab for assigned problems and some quizzes (see <http://myvlab.uwo.ca> ).

## 2. Evaluation:

**25% – 3 quizzes and 3 graded assignments:**

**Quiz 1:** is on Wed Sep 21 in class; **Quiz 2:** Frid Sep 30 in class, **Quiz 3:** Frid Oct 7 in class

**Assignment 1:** due Frid Oct 14, **Assignment 2:** due Frid Nov 4, **Assignment 3:** due Sun Nov 20

**10% — Team Presentations**

**25% – Midterm:** Friday October 21, 7 - 9 pm (location to be announced), Makeup midterm Sat Oct 29, 7 to 9 pm

**40% – Final Exam – 3 hours**

Teams of 3 presentations will involve students choosing lecture material to present lecture material during class time (6min per student) on a topic from the course chosen jointly by the team and I. Lectures will be videod. Teams of 3 are preferred, but teams of 2 or 4 are possible. As an alternate, a student may choose a project (min 9 pages).

Graded assignments and quizzes will all be equally weighted. There will be no make-ups on missed quizzes or assignments, and these receive 0 scores. However, you will be able to drop your lowest score (ie. one quiz score or one assignment score). If accomodation is obtained for missing an assignment the accomodation will usually be an allowance of extra time to complete the assignment. A makeup is only offered for the final exam and midterm and only with the appropriate documentation and approvals. For consideration of a prorated grade, notification of valid reasons, together with appropriate documentation, for missed quizzes or assignments should be given at the time of the event.

### **3. Contingency plan for an in-person class pivoting to 100% online learning**

In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, affected course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will **not** change. Any remaining assessments will also be conducted online as determined by the course instructor.

### **4. Additional comments on Course Materials**

Students are responsible for checking the course OWL site (<http://owl.uwo.ca>) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class. As well, students should regularly consult the Gradescope site associated with the course.

All course material will be posted to OWL: <http://owl.uwo.ca>. and on Gradescope.

If students need assistance with the course OWL site, they can seek support on the OWL 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. Other notes on Methods of Evaluation**

As per policy, take-home examinations may be scheduled only with permission of the Dean of the Faculty offering the course to ensure that the examination plans will not unduly interfere with the students' ability to write their other exams.

### **6. Student Absences**

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

#### **Assessments worth less than 10% of the overall course grade:**

For work worth less than 10% of the total course grade, the instructor is empowered to grant academic considerations without referring the student to their academic counsellors. If an instructor chooses to do so, the mechanism for dealing with missed work (e.g., an extension, make-up opportunity, or reweighting) must be specified on the course outline to ensure fair treatment for all students. Note that in all cases where documentation (medical or otherwise) is required, it can *only* be collected by the student's Dean's Office Academic Counselling unit.

#### **Assessments worth 10% or more of the overall course grade:**

By policy, academic considerations for work totalling 10% or more of the final course grade can be granted only by the student's Faculty of Registration (typically by their academic counsellors). In such cases, students should be directed as follows.

For work totalling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_medical.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf).

The Student Medical Certificate is available at

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/medicalform.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf).

### **Absences from Final Examinations**

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See the Academic Calendar for details (under [Special Examinations](#)).

**Note:** missed work can *only* be excused through one of the mechanisms above. Being asked not to attend an in-person course requirement due to potential COVID-19 symptoms is **not** sufficient on its own.

## **6. Accommodation and Accessibility**

### **Religious Accommodation**

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>.

### **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](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf).

## **7. Academic Policies**

The website for Registrarial Services is <http://www.registrar.uwo.ca>.

In accordance with policy,

[https://www.uwo.ca/univsec/pdf/policies\\_procedures/section1/mapp113.pdf](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 e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

**Electronic Devices on Quiz, Tests and Exams:** None are permitted.

**Scholastic offences** are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

**[If Remote Proctoring Software may be used in this course, including in the event of health lock-down]**

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>.

**Note:** use of online proctoring for in-person courses requires approval from the Dean's Office.

## 8. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, 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 and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (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](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](mailto: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. You may also wish to contact Accessible Education at

[http://academicsupport.uwo.ca/accessible\\_education/index.html](http://academicsupport.uwo.ca/accessible_education/index.html)

if you have any questions regarding accommodations.

Learning-skills counsellors at the Student Development Centre (<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/>.