

**MATH-3032 COMPLEX FUNCTIONS AND PDES  
WINTER 2024**

**Instructor:** Xin Yang LU

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**Classes:**

- MATH-3032-WA on MW 4-5.30 in BB1075,
- MATH-3032-WB on MW 5.30-7.00 in RB2042.

**Office Hours:** TTh 4.30-5.30 in RB2015, or scheduled on demand. Both in person or via Zoom options available. Always schedule by email (even for in person office hours) before coming to office hours.

DESCRIPTION

- **Textbook:** *Advanced engineering mathematics* by Dennis G. Zill and Warren S. Wright. Recommended, but not required. Chapters to be covered: 12–18, excluding 13.8.
- **Topics:** We will cover the following topics:
  - (1) Orthogonal functions and Fourier series:
    - (a) Orthogonal functions
    - (b) Fourier series
    - (c) Fourier cosine and sine series
    - (d) Complex Fourier series
    - (e) Sturm-Liouville problem
    - (f) Bessel and Legendre series
  - (2) Boundary value problems on rectangular domains:
    - (a) Separation of variables
    - (b) Classic PDEs and boundary value problems
    - (c) Heat equation
    - (d) Wave equation
    - (e) Laplace equation
    - (f) Inhomogeneous problems
    - (g) Orthogonal series expansion
  - (3) Boundary value problems in other coordinate systems:
    - (a) Polar coordinates
    - (b) Cylindrical coordinates
    - (c) Spherical coordinates
  - (4) Integral transforms:
    - (a) Error function
    - (b) Laplace transform and applications
    - (c) Fourier integral
    - (d) Fourier transform
    - (e) Fast Fourier transform
  - (5) Numerical solutions:
    - (a) Heat equation (numerical solutions)
    - (b) Wave equation (numerical solutions)
    - (c) Laplace equation (numerical solutions)
  - (6) Functions of complex variables
    - (a) Complex numbers
    - (b) Powers and roots
    - (c) Sets in the complex plane
    - (d) Cauchy-Riemann equations

- (e) Exponential and logarithmic functions
- (f) Trigonometric and hyperbolic functions
- (g) Inverse trigonometric and hyperbolic functions
- (7) Complex integration:
  - (a) Contour integral
  - (b) Cauchy-Goursat theorem
  - (c) Path independence
  - (d) Cauchy's integral formula
- **Assignments:** 3 assignments during the semester.
- **Final Exam:** There will be a formal 3 hours final exam.
- **Grading scheme:** Each assignment is worth 15%, and the final exam is worth 55% of the overall mark.
- **Practice problems:** Practice problems will be periodically posted on MyCourseLink during the semester. Such problems will have solutions, but will not be graded, nor they do count toward the final grade.
- **Policies:**
  - Important announcements will be made through MyCourseLink to registered students via MyCourseLink. You are responsible for reading the info posted on MyCourseLink.
  - I attempt to reply to e-mail in a timely fashion, but do not expect immediate responses.
- **Academic Dishonesty:** All cases of academic dishonesty will be dealt with according to the university's Code of Student Behavior and Disciplinary Procedures, copies of which are available from the university's web-site.
- **Accommodations:** Lakehead University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you think you may need accommodations, you are strongly encouraged to contact Student Accessibility Services (SAS) and register as early as possible. For more information, please visit: <http://studentaccessibility.lakeheadu.ca>