

Univ. of Winnipeg Dept. of Physics  
Winter 2017

## PHYS-2106 Mathematical Physics II

Lecture Times: MWF 10:30-11:20AM

Room: 2C15

Instructor: Dr. Andrew Frey

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Office: 2L26

Office Phone: 786-9215

WWW: <http://ion.uwinnipeg.ca/~afrey/FW1617/mphys2/>

Office Hours: M 2:30-3:30PM or by appointment

### Course Description

This course provides an introduction to important mathematical topics used in physics.

### Textbooks

There are three required texts, but several others may be helpful.

- **Required:** *Mathematical Methods for Physics and Engineering* (3rd ed) by Riley, Hobson, and Bence
- **Required:** *Advanced Mathematics For Engineers and Scientists* (Schaums Outline) by Spiegel
- **Required:** *Mathematical Handbook of Formulas and Tables* (Schaums Outline) by Spiegel and Liu
- **Supplementary:** *Advanced Engineering Mathematics* by Kreyszig
- **Supplementary:** *Mathematical Methods in the Physical Sciences* by Boas
- **Supplementary:** *Essential Mathematical Methods for Physicists* by Arfken and Weber

In addition, some extra reading (from other texts, journal articles, etc) may be assigned.

### Topics

We will discuss

- Linear Algebra: — Index Notation — Vectors — Matrices — Traces & Determinants — Types — Eigenvalues/Eigenvectors — Change of Basis
- Dirac, Heaviside, and Gamma Functions
- Fourier Series and Fourier Transforms
- Ordinary Differential Equations: — Systems of 1st Order ODEs — 2nd Order ODEs — Series Solutions — Eigenfunctions — Special Functions
- Partial Differential Equations: — Separation of Variables — Wave Equations

Not all topics above will be covered equally. Also, some topics may be added, skipped due to time constraints, or taught in different orders.

### Assignment Policies

**Homework:** Assignments will be posted on the course web page (see above) in PDF format approximately once per week. They will **NOT** be handed out in class, so you must tell me if you cannot access the assignments! The assignment will then be due at 10:59PM on the listed due date in the labeled dropbox outside room 2L26; make sure to mark your paper with your name and “Math. Phys.” Alternately, homework can be emailed to the instructor as black-and-white scanned (*not photographed*) PDF or a PDF prepared with L<sup>A</sup>T<sub>E</sub>X software. Homework solutions will be posted on the course web page as soon as possible after the homework is due. Collaboration on the problems is allowed, but each student must write up the solutions independently. Late assignments will **not** be accepted without prior permission from the instructor. Some assignments will require the use of Maple software, which is available on the computers in room 2L14.

**Exams:** No electronic equipment is allowed during either in-class tests or the final exam, except at the discretion of the instructor. Students should be prepared to present identification at tests and exams.

**Religious Holidays:** You may choose not to attend class or write tests/examinations on holy days of your religion, but you must notify me at least two weeks in advance. If so, I will provide the opportunity to make up work without penalty.

**Organization:** Your homework and exam solutions should be written (or typed) neatly with steps explained *as if you were writing a research paper*. Not all algebra need be shown if the steps are explained in words; however, showing your work may improve your credit if you make a mistake. Homework that is not neatly organized and written will not be graded and will be given **zero credit** (one warning will be allowed). In addition, multiple pages must be stapled together.

**Regrading:** If you feel that there is a mistake in grading, I will regrade each problem in question completely. It is possible that newly discovered mistakes will reduce your credit. Please also see the section on appeals.

## Evaluation

**Grades:** Course grades will be comprised of the following components:

- Homework Assignments: 40%
- Two In-Class Tests: 30% (15% each)
- Final Exam: 30%

Guidelines for the assignment of numerical percentage grades to letter grades are as follows:

- A+ = 95-100%
- A = 87-94%
- A- = 80-86%
- B+ = 74-79%
- B = 67-73%
- C+ = 61-66%
- C = 53-60%
- D = 50-52%
- F = 0-49%

Note that these are guidelines. Final grades shall be approved by the Department Review Committee and may be subject to change.

**Appeals and Misconduct:** See the **Regulations and Policies** section of the **Academic Calendar** (<https://uwinnipeg.ca/academics/calendar/docs/regulationsandpolicies.pdf>) regarding appeals and academic misconduct. Note that use of solutions from other courses, previous years, or from the textbook publisher will be considered cheating. Students facing a charge of academic or non-academic misconduct may choose to contact the University of Winnipeg Students' Association (UWSA) where a student advocate will be available to answer any questions about the process, help with building a case, and ensuring students have access to support. For more information or to schedule an appointment, visit our website at <http://www.theuwsa.ca/academic-advocacy> or call 204-786-9780.

**Exam & Other Important Dates:** Dates to note include

- First Lecture: Jan 4, 2017
- First In-Class Test: Feb 3, 2017 (tentative)
- Winter Reading Week: Feb 19-25, 2017
- Voluntary Withdrawal Date: Mar 1, 2017 (without academic penalty)
- Second In-Class Test: Mar 3, 2017 (tentative)
- Final Course Lecture: April 3, 2017
- Final Exam: April 19, 2017, 9:00AM, 2C15 (subject to university scheduling)

## Miscellaneous

**Emails:** I may at times need to communicate with the class as a whole via email, which will be through your official university email address. Please check that account.

**Accessibility Services:** Students with documented disabilities, temporary or chronic medical conditions, requiring academic accommodations for tests/exams (e.g., private space) or during lectures/laboratories (e.g., note-takers) are encouraged to contact Accessibility Services (AS) at 204-786-9771 or [accessibilityservices@uwinnipeg.ca](mailto:accessibilityservices@uwinnipeg.ca) to discuss appropriate options. All information about a student's disability or medical condition remains confidential. <http://www.uwinnipeg.ca/accessibility>.

**Data Collection:** Students who plan to conduct research interviews, focus groups, surveys, or any other method of collecting data from any person, even a family member, must obtain the approval of the appropriate ethics committee before commencing data collection. Exceptions are research activities in class as a learning exercise. See <http://www.uwinnipeg.ca/research/human-ethics.html> for submission requirements and deadlines.

**Respectful Working and Learning Environment Policy:** All students, faculty, and staff have the right to participate, learn and work in an environment that is free of harassment and discrimination. The UW Respectful Working and Learning Environment Policy may be found online at <http://www.uwinnipeg.ca/respect>.