



BISHOP'S UNIVERSITY

NUMBER THEORY FALL 2022

1 Course Information

COURSE CODE/SECTION: MAT 203/01
COURSE TITLE: Number Theory
SEMESTER: Fall 2022
CREDITS: 3

LECTURES: Tuesday and Thursday, 13:30–14:55, Johnson 102
When possible, lectures will also be videotaped and the recordings will be made available through the course Moodle page. Please note that the availability of the lecture videos depends on the working of the recording equipment.
Note: In the case of a university shutdown, details of how the course will proceed will be announced in accordance with the guidelines given.

PRE-REQUISITES: MAT 200 (waived for Fall 2022)

CALENDAR DESCRIPTION: A classical discipline, number theory has become the spectacularly successful language of modern cryptography and coding theory. This course is a gentle introduction to the classical theory and modern applications. Topics may include: unique factorization and congruences, group of integers modulo n and its units, Fermat's little theorem, Fermat's last theorem, Euler's function, Wilson's theorem, Chinese remainder theorem, quadratic reciprocity, Gaussian integers.

2 Instructor Information

INSTRUCTOR: Trevor Jones
OFFICE: Johnson 126
OFFICE HOURS: Wednesday 11:30–13:30, or by appointment
Office hours will be held in-person on a drop-in basis. In the event of people waiting, a limit of 10 minutes per visit will be applied.
EMAIL: tjones@ubishops.ca
WEBSITE: <http://cs.ubishops.ca/~thj>

3 Course Description

We will attempt to cover Sections 1-11 in their entirety. If time permits, additional topics will be added. The course will attempt to acquaint you with the fundamental concepts of number theory, both the theory and the computation. While the emphasis will be computational, we will not shy away from proving results or from technical details, where appropriate.

It is expected that the students will read the material in advance of the class. A detailed schedule will be made available on the course website and on Moodle. In order to have the best chance for success in learning the material for this course, the student is expected to attend all the lectures (3 hours per week) and to study outside of class time, eg. read the book, do assignments, review notes, etc. (approximately 7 hours per week). Assignments are meant to be done individually, not in groups, and without the aid of ANY electronic devices (except for online assignments which by their nature must use the web browser) in order to ensure the most accurate results for gauging student learning prior to the final exam. As the assignments are not proctored, the student left to their own honour to abide by these requirements. However, not abiding by these requirements will endanger the learning process, which will be apparent in the final exam.

Mathematics is a discipline which requires extensive mental training. As such, some of the exercises given are just that, exercises to build mental muscle. Not every exercise will be directly applicable to a specific discipline and may incorrectly be viewed as useless. These exercises are designed to build muscles for the application of mathematics to various problems.

4 Course Materials

REQUIRED TEXT: *Elementary Number Theory*, 2nd edition, Underwood Dudley. ISBN-13: 978-0-486-46931-7. Available at the COOP.

REQUIRED MATERIALS: Authorized Memory Book, Department of Mathematics, available at the COOP.

RECOMMENDED MATERIAL: If you want to use a calculator on the final exam, it must be either a **Casio fx-260 solar** or a **Casio fx-260 solar II** calculator. No substitutions are permitted. This calculator is available at the COOP.

5 Methods of Evaluation

The majority of the course assessment will be in the form of written assignments. The test will be written during class time.

The final exam are closed book and closed notes. The use of aiding devices such as translators or dictionaries are not permitted during the writing of tests or exams. If additional clarification concerning a test/exam question is requested by a student the attending examiner may provide additional clarification.

There will be no make-up test. There will be no supplemental exam. Possession of non-approved material (eg. calculator, dictionary, notes, etc.) during the test or exam will result in a grade of 0 on the assessment.

One *Authorized Memory Book* is permitted during the writing of the test and the exam. The *Authorized Memory Book* must be submitted with the test, and it will be returned when the tests are returned.

Late assignments will not be accepted and will be assigned a grade of zero. The rational for this requirement is life-skills training as working to a fixed and immovable deadline is important.

The final exam will be written in-person during the exam period.

The final grade will be calculated using the scheme below.

- Assignments, 20 %
A minimum of one week will be available for each assignment, with the expected time necessary to complete each assignment being no more that 3 hours. Each assignment will be equally weighted. For example, if there are 17 assignments, then each assignment would be worth 20/17th of one percent toward the final grade.
- Test, October 25, 2022 20 %
- Final Exam, scheduled by Records Office 60 %
The final exam is cumulative, so you are responsible for all the material covered in the course. The exam will be three hours in duration. **(You must pass the final exam to pass the course.)** If you do not pass the final exam, and your calculated grade is 50% or greater, you will be assigned a grade of 49%. If you pass the final exam and your calculated grade is less that 50%, you will be assigned a grade of 50%.
- The calculation of the final grade will take place as follows:
 1. Let A be the grade out of 100 for the assignments, let T be the grade out of 100 for the test, and let E be the grade out of 100 for the final exam.
 2. Let C be the calculated grade according to the scheme above. Thus $C = 0.20 \times A + 0.20 \times T + 0.60 \times E$.
 3. Let F be given according to the following formula: If $E < 50$ then $F = \min(49, C)$, else $F = \max(50, C)$.
 4. Finally, the submitted grade, S will be: $S = \text{ceiling}(F) = \lceil F \rceil$.

6 Additional statements

Accessibility and Accommodation Service

The Student Accessibility & Accommodation Services helps ensure that all students with disabilities have equal access to programs at Bishop's University. They arrange for reasonable accommodations in accordance with Quebec Charter of Human Rights and Freedoms, the new Act Respecting Equal Access to Employment in Public Bodies and the United Nations Convention on the Rights of Persons with Disabilities. For more information: <http://www.ubishops.ca/future-current-students/student-campus-life/student-services/student-accessibility-accommodation-services/>

Mental Health

The University values the mental health and wellbeing of its students. Professional counsellors are available to help students deal with personal concerns related to adapting to University life, family problems, relationships, difficulties with drugs and alcohol, depression, anxiety and other matters, all of which are handled in complete confidentiality. To book an appointment with one of these counsellors, contact Ms. Francine Hamel by email (Francine.hamel@ubishops.ca) or by phone at (819) 822-9600 ext. 2695.

E-mail communication

As per University regulation, the “ubishops.ca” address is deemed to be the official e-mail between the University and its students.

Student's responsibilities

“...Students have a responsibility to attend lectures and laboratories and to perform punctually all academic assignments in accordance with the standards prescribed by the departments concerned and announced by the instructors at the beginning of the year. Failure to fulfil these requirements may lead to debarment from examinations.... Students are required to return promptly after holidays and are requested not to make travel plans which will interfere with registration or examination schedules.” (Bishop's University, 2015-2016 Academic Calendar, pg. 24)

Language of instruction

In accordance with the University's policy on Language of instruction, students have the option to submit individual written work in English or French, except where a knowledge or competency in a language is an object of the course. Students who wish to submit their work in French must notify their instructor by the Add/Drop deadline.

Academic misconduct

Bishop's University values academic integrity and has a zero tolerance towards academic misconduct. All students must understand the meaning and consequences of cheating and plagiarism under the University Regulations (see Academic Calendar / Academic Integrity).

Plagiarism

Plagiarism is a kind of academic dishonesty in which an individual uses the work of another without appropriate acknowledgement. Plagiarism includes but is not limited to the following practices:

- Using another's work without acknowledgement
- Copying material without quotation marks
- Paraphrasing too closely the exact words of the originating author
- Submitting as one's own work written in whole or in part by another individual
- Submitting in whole or in part work for which the student has received credit in another course, unless the permission of the instructor has been obtained
- Submitting any statement of fact known to be false or providing a fabricated reference to a source

Access to help centers

The University offers students free help in learning Mathematics through the Help Centre staffed with upper year students and / or professional tutors, under the supervision of Faculty members.

Location and hours of operation will be announced in class when that information becomes available.

Classroom Professionalism

The University expects students to adhere to certain standards of classroom etiquette. Classroom etiquette refers to the way students should act when in class. Below are a few points:

- Be Respectful
- Be on time and stay the entire class
- Address the professor appropriately
- Turn off your mobile device
- Only pack-up when class ends
- Participate fully
 - Prepare and read ahead of time
 - Ask questions
 - Raise your hand
 - Stay on task
 - Ask before using technology (Laptops /tablets, recording devices, etc.)
- The proper mode of address is “Dr. Jones” or “Professor Jones”.
- When emailing, remember to include the course code in the subject line and to provide proper salutation (see above). If this format not followed, please do not expect a reply. Emails received outside the normal work day (9am-5pm, Monday to Friday, holidays and breaks excepted) may experience a delay in receiving a response. Normal response time is within 24 hours.
- When asking questions, please do the following first: check the syllabus to see if the answer is there, check the solutions to assignments/tests online to see if your questions is answered there, and bring your rough work/attempts at solutions when meeting to discuss your questions.