UNIVERSITY OF CALGARY
FACULTY OF SCIENCE

Department of Mathematics & Statistics
MS 476
403 220-5210
math@ucalgary.ca

COURSE OUTLINE

1. **Course:** MATH 327, Number Theory - Fall 2021

   Lecture 01: MWF 15:00 - 15:50 in SB 148

Instructor	Email	Phone	Office	Hours
Dr Mark Bauer	bauerm@ucalgary.ca	403 210-8456	MS 558	By appointment

   In Person Delivery Details:

   This course is intended to be taken completely in-person. There will be 2 "lecture-style" meetings per week (typically Monday and Wednesday - full schedule available in D2L). The third day will be for either quizzes or group work (the latter is optional - see grading).

   Re-Entry Protocol for Labs and Classrooms:

   To limit the spread of COVID-19 on campus, the University of Calgary has implemented safety measures to ensure the campus is a safe and welcoming space for students, faculty and staff. The most current safety information for campus can be found here.

   Course Site:

   D2L: MATH 327 L01-(Fall 2021)-Number Theory

   Note: Students must use their U of C account for all course correspondence.

2. **Requisites:**

   See section 3.5.C in the Faculty of Science section of the online Calendar.

   Prerequisite(s):
   Mathematics 271 or 273. Also known as: (formerly Pure Mathematics 427)

3. **Grading:**

   The University policy on grading and related matters is described in F.1 and F.2 of the online University Calendar.

   In determining the overall grade in the course the following weights will be used:

Component(s)	Weighting %	Date
Homework (4 mandatory, additional 2 optional)	40-60 (10% each)	Sept. 28, Oct. 19, Nov. 16, Dec. 7 (optional ones due Dec. 9)
Synchronous Quizzes (4 offered, must do at least 2)	20-40 (10% each)	Oct. 1, Oct. 22, Nov. 19, Dec. 3
Group worksheets - (6 optional)	0-30 (5% each)	Sept. 17, Sept. 24, Oct. 8, Oct. 29, Nov. 5, Nov. 26
Discussion posts	0-10	Up to 2% can be earned for each textbook chapter (maximum 10%)
Choose your own adventure (independent or group - optional)	0 or 10	Proposal due Oct. 4, final submission Dec. 22

   Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	95 %	90 %	85 %	80%	75%	70 %	65 %	60%	55%	50 %	45 %

Students will be required to demonstrate competence in Ch. 1-3, 5-8 of the textbook. The mandatory components are all assessments on this material. In additional, student will need to demonstrate mastery of this material (through additional assessment), or develop additional breadth in the subject matter by studying Ch. 4, or Ch. 9 & 10. An additional project is provided as an option for students seeking some independent study in material related to the course. Outside of the base 60% of required assessment, students are encouraged to make up the remaining 40% using assessment that fits their interest and learning styles.

There will be the requirement throughout the semester to engage with the instructor to ensure you can fill the grading components for the course.

If you have any concerns about this, please discuss it directly with me as early as possible.

The University of Calgary offers a flexible grade option, Credit Granted (CG) to support student's breadth of learning and student wellness. Faculty units may have additional requirements or restrictions for the use of the CG grade at the faculty, degree or program level. To see the full list of Faculty of Science courses where CG is not eligible, please visit the following website: https://science.ucalgary.ca/current-students/undergraduate/program-advising/flexible-grading-option-cg-grade

4. **Missed Components Of Term Work:**

The university has suspended the requirement for students to provide evidence for absences. Please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations.

In the event that a student legitimately fails to submit any online assessment on time (e.g. due to illness etc...), please contact the course coordinator, or the course instructor if this course does not have a coordinator to arrange for a re-adjustment of a submission date. Absences not reported within 48 hours will not be accommodated. If an excused absence is approved, one possible arrangement is that the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course. This option is at the discretion of the coordinator and may not be a viable option based on the design of this course.

5. **Scheduled Out-of-Class Activities:**

There are no scheduled out of class activities for this course.

6. **Course Materials:**

Required Textbook(s):

Martin H. Weissman, *An Illustrated Theory of Numbers*: American Mathematical Society.

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security, and malware updates;
- A current and updated web browser;
- Webcam/Camera (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Stable internet connection.

For more information please refer to the UofC ELearning online website.

7. **Examination Policy:**

The quizzes are designed to be completed during class time on the specified dates. Each quiz is designed to be completed in under 35 minutes, with an extra 15 minutes of time to deal with technical issues/submissions. Time will be adjusted for SAS students according to their accommodation letter. Other students requiring accommodations for exceptional circumstances will need to arrange these with the instructor no less than 7 days before the exam.

No aids are allowed on tests or examinations.

Students should also read the Calendar, Section G, on Examinations.

8. **Approved Mandatory And Optional Course Supplemental Fees:**

There are no mandatory or optional course supplemental fees for this course.

9. **Writing Across The Curriculum Statement:**

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section E.2 of the University Calendar.

10. **Human Studies Statement:**

Students will not participate as subjects or researchers in human studies.

See also Section E.5 of the University Calendar.

11. **Reappraisal Of Grades:**

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See Section I.3 of the University Calendar.

   a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall submit the Reappraisal of Graded Term work form to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed rationale that outlines where and for what reason an error is suspected. See sections I.1 and I.2 of the University Calendar

   b. **Final Exam:** The student shall submit the request to Enrolment Services. See Section I.3 of the University Calendar.

12. **Other Important Information For Students:**

   a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, Mental Health Services Website) and the Campus Mental Health Strategy website (Mental Health).

   b. **SU Wellness Services:** For more information, see www.ucalgary.ca/wellnesscentre or call 403-210-9355.

   c. **Sexual Violence:** The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email (svsa@ucalgary.ca) or phone at 403-220-2208. The complete University of Calgary policy on sexual violence can be viewed at (https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Sexual-and-Gender-Based-Violence-Policy.pdf)

   d. **Misconduct:** Academic integrity is the foundation of the development and acquisition of knowledge and is based on values of honesty, trust, responsibility, and respect. We expect members of our community to act with integrity. Research integrity, ethics, and principles of conduct are key to academic integrity. Members of our campus community are required to abide by our institutional Code of Conduct and promote academic integrity in upholding the University of Calgary's reputation of excellence. Some examples of academic misconduct include but are not limited to: posting course material to online platforms or file sharing without the course instructor's consent; submitting or presenting work as if it were the student's own work; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; borrowing experimental values from others without the instructor's approval; falsification/fabrication of experimental values in a report. Please read the following to inform yourself more on academic integrity:

   Student Handbook on Academic Integrity
   Student Academic Misconduct Policy and Procedure
   Research Integrity Policy

Additional information is available on the Student Success Centre Academic Integrity page

e. **Academic Accommodation Policy:**

It is the student's responsibility to request academic accommodations according to the University policies and procedures listed below. The student accommodation policy can be found at: https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Student-Accommodation-Policy.pdf

Students needing an accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities: https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Accommodation-for-Students-with-Disabilities-Procedure.pdf.

Students needing an accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, by filling out the Request for Academic Accommodation Form and sending it to Mark Bauer by email bauerm@ucalgary.ca preferably 10 business days before the due date of an assessment or scheduled absence.

f. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see Legal Services website.

g. **Student Union Information:** VP Academic, Phone: 403-220-3911 Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: 403-220-3913 Email: sciencerep@su.ucalgary.ca. Student Ombudsman, Email: ombuds@ucalgary.ca.

h. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction (USRI) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.

i. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or non-academic misconduct, in addition to any other remedies available at law.

Course Outcomes:

○ Articulate the rich history and current applicability of number theory.

○ Apply number theoretic algorithms to solve problems involving the integers.pply number theoretic algorithms to solve problems involving the integers.

○ Explain properties and significance of prime numbers and unique factorizationxplain properties and significance of prime numbers and unique factorization.

○ Determine the structure of modular unit groups and apply number theoretic algo- rithms to compute their invariants.

○ Define the notion of a quadratic residue and their associated symbols (Legendre, Jacobi). Be able to perform efficient computation of these symbols using number theoretic algorithms and identifying the applicability of this symbols to solving certain problems. Demonstrate how the law of quadratic residuoisity is the key input in these calculations

○ Describe how continued fractions give a systematic way of describing real numbers while emphasizing rationality, or the deviation from it. Use continued fractions to be able to solve problems in Diophantine Analysis.

○ Use mathematical reasoning to establish the validity of mathematical statements

Electronically Approved - Sep 08 2021 16:33

Department Approval

Electronically Approved - Sep 08 2021 17:05

Associate Dean's Approval