

**COURSE OUTLINE**

**1. Course:** PMAT 511, Algebra III

L01: Tuesdays and Thursdays, 12:30-13:45, MS 427, Clifton Cunningham,  
Office 528 Tel. No. 220-6888, e-mail cccunning@ucalgary.ca,  
Office Hours: Wednesdays 13:15-14:30,

Course website: Desire 2 Learn (D2L) Algebra III.

Department of Mathematics and Statistics – MS476 Telephone number – 403-220-5210

**2. Prerequisites:** PMAT 411 or PMAT 431 (recommended) or the consent of the Division (<http://www.ucalgary.ca/pubs/calendar/current/pure-mathematics.html#6119>). Credit for both PMAT 511 and PMAT 611 will not be permitted.

**3. Grading:** The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Problem Sets (5)	50% = 5 x 10%
Written Examination (3 hours)	50% (To be scheduled by the Registrar)

Problem Sets will be assigned roughly every 2 weeks.

All grading in this course will use the University of Calgary GPA system, as explained in the Academic Calendar <http://www.ucalgary.ca/pubs/calendar/current/f-2.html>. This means that all assignments and the written final exam will be awarded a letter grade or equivalent GPA and the final letter grade awarded in this course will be determined by a weighted average of GPAs.

**4. Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in Section 3.6. It is the student's responsibility to familiarize himself/herself with these regulations. See also Section E.6 of the University Calendar

**5. Recommended Reading:** *"Algebra: Chapter 0"*, American Mathematical Society, *Graduate Studies in Mathematics, Volume 104* (2009), 713 pages, ISBN-10 0-8218-4781-3, ISBN-13: 978-0-8218-4781-7. *Algebra*, Thomas W. Hungerford, Springer, *Graduate Texts in Mathematics Volume 73*, 1974 ISBN: 978-1-4612-6103-2 (Print) 978-1-4612-6101-8 (Online), available from the University of Calgary library.

**6. Examination Policy:** No aids of any sort will be allowed during the 3-hour final exam. Students should also read the Calendar, Section G, on Examinations.

**7. Writing across the curriculum statement:** In this course, the quality of the student's writing in assignments and final exam will be a factor in the evaluation. See also Section E.2 of the University Calendar. [Delete #9 if not relevant]

**8. OTHER IMPORTANT INFORMATION FOR STUDENTS:**

**(a) Academic Misconduct:** (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under Section K. Student Misconduct to inform yourself of definitions, processes and penalties

**(b) Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on assembly points.

- (c) **Academic Accommodation Policy:** Students with documentable disabilities are referred to the following links: Calendar entry on students with disabilities and Student Accessibility Services. MSC452 Phone: 220-8237
- (d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- (e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, 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 also <http://www.ucalgary.ca/secretariat/privacy>.
- (f) **Student Union Information:** VP Academic Phone: 220-3911 Email: [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca)  
 SU Faculty Rep. Phone: 220-3913 Email: [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca)  
 Student Ombudsman Phone: 220-6420 Email: [ombuds@ucalgary.ca](mailto:ombuds@ucalgary.ca)
- (g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

## 9. Syllabus:

1. Rings and localization
2. Modules over rings; submodules; factor modules; kernel and image of a linear map; direct sums.
3. Free modules; IBN rings, basis and rank.
4. Finitely generated modules over a PID; state the fundamental theorem (they are direct sums of cyclic modules); torsion submodule; torsion free modules.
5. Primary decomposition;  $p$ -modules; invariant factors; uniqueness; proof of the fundamental theorem (time permitting).
6. The matrix of a linear operator; minimal and characteristic polynomials; the Cayley-Hamilton theorem.
7. Canonical forms for matrices; the rational form; the Jordan form.

**10. Graduate vs. Undergraduate versions of this course.** This course is cross-listed with PMAT 611 with which it will share all lectures. However, the Problem Sets and the Final Examination will not be identical: the questions in the graduate version of this course (PMAT 611) will be more demanding than those in this course.