MA 411 Introduction to Abstract Algebra Spring 2016

Class Meeting:	TTh 4:00 – 5:20 p.m.	WB 3
Instructor:	Zoltan Szekely, Ph.D.	Associate Professor of Mathematics
Office:	SC 106	**Phone:** 735-2830
Email:	zszekely@uguam.uog.edu	
Office Hours:	MW 12:30 – 2:00 p.m.	MTWTh 3:30-4:00, T 5:30-6:30 p.m.

Catalogue Course Description: This course offers a study of modern algebra with topic from group theory, and ring theory.
Prerequisites: Grades C or better in both MA 205 and MA 302.

Rationale for Offering the Course: This course is required for mathematics majors, concluding the student's undergraduate studies in algebra. Success in this course demonstrates that the student *attained the abstract level of thinking* required to succeed in professional mathematics related activity. Abstract thinking is enhanced by *a rigorous study* of algebraic structures and their properties. Commonly used mathematical objects are linked to abstract features making a natural *transition from concrete to abstract understanding*. Students will have *capstone presentations* chosen from some additional topics in linear or abstract algebra, showing their mastery in using proper algebraic language and *preparedness for individual research*.

Intended Student Learning Outcome:
Students will acquire the skill of abstract mathematical thinking through observation, investigation and generalization of features of abstract algebraic structures. In particular, students will be able to

- *determine* and *verify* whether a given abstract structure is a group, a ring or neither of the two;
- *recognize* and *apply* the different ways of obtaining new structures from given one like taking subgroups, subrings, subfields, or forming direct sums/products;
- *solve* problems with concrete groups like cyclic groups and permutation groups by applying the intrinsic properties of these groups;
- *compare* algebraic features of mathematical systems through the use of homomorphism and isomorphism;
- *prove* general statements, about properties of groups and rings by using deductive reasoning that proceeds from the defining axioms or from previously established theorems.

Students will also *make presentation* of some algebraic topic reflecting their own individual work in understanding a challenging concept in algebra.

Conceptual Structure of the Material:
Starting from simple mathematical notions as integers and sets, we proceed to transformations and permutations in order to arrive to the concept of a group, an abstract structure with one basic operation. From the simple and concrete we step to the complex and abstract. After characterizing various groups and relations between them we turn to the investigation of their inner structures, gaining a *complete characterization of finite Abelian groups*. We continue with another abstract structure,

the ring, which has two basic operations. Again, our understanding follows a line from lower to higher complexities. Many properties of groups are generalized to rings. Commonly used mathematical objects as polynomials and matrices will be investigated as special instances of rings.

Format/Activities in the Class: You are expected to attend *each class session on time*. Learning mathematics requires that you work and *practice mathematics every day*. *Good communication* is essential. Dialogue and cooperative learning is encouraged. You will learn *clear communication* of your ideas. Your instructor is hard of hearing. If you have question, raise your hand and, please, talk loudly. Follow the *communication guidelines* distributed. We'll have *amplifying technology* installed in our classroom. Please, use it properly. In case of any problem with the technology, please, immediately notify your instructor. Please, return the microphones to your instructor after class. No technology can be taken out of the classroom. All students will have a short individual *project and presentation* during the semester chosen from challenging exercises and a list of interesting algebraic topics.

Textbook: *Contemporary Abstract Algebra* by Joseph A. Gallian, Houghton-Mifflin Company, 8th edition. We will cover the first three parts (about 18 chapters) in a timely schedule.

Tentative course calendar:

Week 0	Chapter 0: Preliminaries	Week 9	Review Test2
Week 1	Ch.1: Introduction to Groups Ch.2: Groups	Week 10	Ch.12: Introduction To Rings Ch.13: Integral Domains
Week 2	Ch.3: Finite Groups, Subgroups Ch.4: Cyclic Groups	Week 11	Ch.14: Ideal and Factor Ring Ch.15: Ring Homomorphism
Week 3	Ch.5: Permutation Groups Ch.6: Isomorphism	Week 12	Ch.16: Polynomial Rings Ch.17: Factorization of Polynomials
Week 4	Review	Week 13	Ch. 18: Division in Polynomial Rings
Week 5	Test1 Ch.7: Cosets, Lagrange's Theorem	Week 14	Review Test 3
Week 6	Ch.8: External Direct Product Ch.9: Normal Subgroup	Week 15	Review
Week 7	Ch.9: Factor Group Ch.10: Group Homomorphism	Week 16	Final Test, Monday, May 20 2:00 – 3:50 p.m.
Week 8	Ch.11: Fundamental Theorem of Finite Abelian Groups		

Assignments, Quizzes, Tests: You will have to *read the textbook* for each class in advance and review the section covered after class. You need to do *all homework assignments.* You are encouraged to learn together with fellow classmate(s) as *study partners*. Please note that all work you hand me in must reflect *your own individual efforts*. If homework is assigned to hand in, then it is due *at the beginning of class*.

Working on homework during class time is unacceptable! Late homework is penalized by score reduction. You should be ready for *pop Quizzes* with questions similar to your homework assignments (hint: see even exercises in your book). There will be 3 *hour long Tests*, one for each topic, with a preliminary schedule below. Timing may be modified depending on the progress we make with the class material. There will also be projects offered with individual presentation. The *Final Test* is cumulative.

Preliminary Test dates (timing *may change* as announced in class):

- Thursday, February 25
- Tuesday, April 12
- Thursday, May 5

The *Final* is on Tuesday, May 17
4:00 – 5:50 p.m.

Evaluation and Grades: Scores on Quizzes and homework are up to *10 points* each, while scores on Tests are up to *100 points*. A *Topic Score* is given after each Test. The Topic Score includes your Test Score for that topic with 80% weight and your Quiz/homework average for that topic with 20% weight. There will be 3 Topic Scores. Your *Semester Score* is calculated as follows:

- Topic Scores: 20% each (3 x 20% = 60%)
- Final Test: 30%
- Presentation: 5%
- Attendance & Participation: 5%
- Total: 100%

Grading Scale:

- A: 100 – 90%
- B: 89 – 80%
- C: 79 – 70%
- D: 69 – 60%
- F: 59 – 0%

A Pre-Final Score (including all but the Final Score) that you will have earned with your class work during the semester, will be calculated and provided to you before you take the Final Test. Grade information can be obtained via email for a limited time after taking the Final. In order to receive it, you will have to send an email to your instructor after 2 days of the Final. This email will be replied with the following information: Final Score, Overall Semester Score and the Semester Grade you earned.

Course policies: Attend each class on time, participate and do the coursework. If you cut a class, it is *your responsibility* to make up any missed class material. Pagers, cell phones, or any distractive devices must be *turned off* in the classroom. Be courteous in class, don't chat, respect and pay attention to your instructor/classmate who works at the board. *Focus on learning* so that your understanding benefits the most from your participation in the class activities.
Academic dishonesty is a serious violation of university policy, punished by failing grade or suspension from your studies. *Never cheat* and *never be dishonest*! *I*: Your *constructive comments* and *feedback* are always appreciated!
Make-up policy: No make-up for missed Quizzes or homework. Missed scores are counted as zero. If you have to miss a Test, let your instructor know it in advance. If your excuse is approved, you may make up one Test *on the last week of classes*. You will have to give a written request for any make-up Test at least one week before you take it.

Some helpful hints:
It is recommended to read each section from the book *before* we cover it in the class. Then pay attention and take *detailed notes* in the class, so that you get a good understanding of the new material. Pay particular attention to the *examples* we discuss in class. Please, be advised that it is completely normal not to understand everything at once (or feeling "getting lost" sometimes) during a lecture. Take your time *after* class again to read the section from the book together with your class notes. After you have read the book, try to solve the homework problems. If you get stuck, *seek help* from your instructor. Office hours, phone or email are all suitable ways to contact him. *Do not give up on trying until you succeed*. We'll have time to discuss solutions for the most challenging exercises in class. *Bottom line:* It is a challenging course. You'll have help available in order to succeed. You'll also need determination.

Special needs:
If you are a student with a disability who will require an accommodation(s) to participate in this course, please contact me or the Institutional Compliance Officer privately to discuss your specific needs. You will need to provide me with documentation concerning your need for accommodation(s) from the EEO/ADA & TITLE IX Office. If you have not registered with the EEO/ADA & TITLE IX Office, you should do so immediately at 735-2244, (TTY) 735-2243 to coordinate your accommodation request.

Tobacco Policy:
The University of Guam is a tobacco-free campus and has a total ban on sales, smoking and distribution and use of tobacco and tobacco-based products on campus. UOG is committed to promoting the health, wellness and social well-being of the University Community, the people of Guam and the Western Pacific.

Drop dates: The deadline for voluntary withdrawal from the course is *March 9.* Except extenuating circumstances, no withdrawal petition will be signed by your instructor after *Test 3.*

Contact for classmates: You are encouraged to exchange *contact information* with your classmates. Choose at least one *study partner*. Contact your classmate(s) if you miss a class and make up the missed material. You are also encouraged to form *study groups.*

List here some contact information from your classmates:

Name	Phone Number	Email address	Study partner? (yes/no)

GE QR Learning Outcomes:

UOG students will be able to *apply* analytical and quantitative reasoning (QR) to *address* complex challenges and everyday problems by:

QR-1: *interpreting* information presented in a mathematical and graphical form;
QR-2: *representing* information in a mathematical and graphical form;
QR-3: effectively *calculating* using quantitative data;
QR-4: *analyzing* quantitative information in order to scrutinize it and *draw* appropriate conclusions;
QR-5: *evaluating* the assumptions used in *analyzing* quantitative data
QR-6: *communicating* quantitative information in support or refutation of an argument.

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Intended Student Learning Outcomes (SLOs):

After completing the course, successful students will be able to:

- *MA 411 SLO1 – determine* and *verify* whether a given abstract structure is a group, a ring or neither of the two;
- *MA 411 SLO2 –* and *apply* the different ways of obtaining new structures from given one like taking subgroups, subrings, subfields, or forming direct sums/products;
- *MA 411 SLO3 – solve* problems with concrete groups like cyclic groups and permutation groups by applying the intrinsic properties of these groups;
- *MA 411 SLO4 – compare* algebraic features of mathematical systems through the use of homomorphism and isomorphism;
- *MA 411 SLO5 – prove* general statements, about properties of groups and rings by using deductive reasoning that proceeds from the defining axioms or from previously established theorems.

Mathematics Program Learning Outcomes (PLOs):

Students completing the mathematics program at the UOG will:

- *MA PR PLO1 – demonstrate* critical thinking, problem solving skills and ability to *use* mathematical methods by identifying, evaluating, classifying, analyzing, synthesizing data and abstract ideas in various contexts and situations;
- *MA PR PLO2 – exhibit* a sound conceptual understanding of the nature of mathematics, and *demonstrate* advanced mathematical skills in mathematical analysis, modern algebra and other mathematical discipline(s);
- *MA PR PLO3 – argue* and *reason* using mathematics, read, *create* and *write* down logically correct mathematical proofs, *use* exact mathematical language and *communicate* mathematics efficiently orally, in writing and using information technology tools;
- *MA PR PLO4 – apply* abstract thinking, mathematical methods, models and current practices in the sciences, including state-of-the-art mathematical software, to solve problems in theoretical mathematics or in a diverse area of mathematical applications;
- *MA PR PLO5 – show* maturity in mathematical knowledge and thinking that prepares and encourages students to pursue graduate studies in mathematics or in related fields;
- *MA PR PLO6 – demonstrate* an appreciation of and enthusiasm

for inquiry, learning and creativity in mathematical sciences, a sense of exploration that enables them to pursue lifelong learning and up-to-date professional expertise in their careers through various areas of jobs, including governmental, business or industrial jobs in mathematics, related sciences, education or technology.

Institutional Learning Outcomes (ILOs):

After graduating at the UoG, successful students will *demonstrate* and *apply:*

- *UoG ILO 1* – mastery of *critical thinking* and *problem solving;*
- *UoG ILO 2* – mastery of *quantitative analysis;*
- *UoG ILO 3* – effective oral and written *communication;*
- *UoG ILO 4* – understanding and appreciation of *culturally diverse* people, ideas and values in a democratic context;
- *UoG ILO 5 – responsible* use of knowledge, natural resources, and technology;
- *UoG ILO 6* – an appreciation of the *arts* and *sciences*;
- *UoG ILO 7* – an interest in *personal development* and *lifelong learning*

Curriculum Mappings:

	MA PR PLO1	*MA PR PLO2*	*MA PR PLO3*	*MA PR PLO4*	*MA PR PLO5*	*MA PR PLO6*
MA 411 SLO1	x	x				
MA 411 SLO2	x	x				
MA 411 SLO3	x	x	x	x		
MA 411 SLO4	x	x	x	x	x	x
MA 411 SLO5	x	x	x	x	x	x

	UoG ILO1	*UoG ILO2*	*UoG ILO3*	*UoG ILO4*	*UoG ILO5*	*UoG ILO6*	*UoG ILO7*
MA PR PLO1	x	x					
MA PR PLO2	x	x					
MA PR PLO3	x	x	x				
MA PR PLO4	x	x	x			x	
MA PR PLO5					x	x	
MA PR PLO6					x	x	x

UNIVERSITY OF GUAM
COLLEGE OF NATURAL AND APPLIED SCIENCES
COURSE SYLLABUS[1]

1. BASIC INFORMATION:

(1) Semester/year: Spring 2016
(2) Course: MA*422: Introduction to Analysis II
(3) Class Meeting: MW, 1600-1720
(4) Instructor: Dr. Henry J. Taijeron
(5) Office: WA-9
(6) Phone: 735 2825 (leave message)
(7) Email: htaijeron@gmail.com
Office Hours: ***Office hours: subject to change with advance notice****

MW: 1515-1600, 1720-1805
TTH: 1720-1805
Fri: 1450-1620

All other times by appointment upon request

2. CATALOG COURSE DESCRIPTION:

This is the second course in a two-semesters sequence designed to provide and introduction to the rigorous study of the foundations of calculus. Topics covered include differentiation, integration, sequences and series of functions. Prerequisite: A Grade of C or better in MA*421.

3. COURSE CONTENT:

Differentiation
Integration
Sequences and series of functions
An introduction to measure theory and the Lebesgue integral as time permits

4. RATIONALE FOR OFFERING COURSE:

Freshman and sophomore level courses in calculus are primarily aimed at developing a working knowledge of the subject with emphasis placed on skills needed in applications. The purpose of this course is to introduce students to the mathematical methods of analysis which provide the theoretical basis of calculus. In the process, students are encouraged to make their own evaluation of the correctness of mathematical assertions.

The basic contents of the course is needed by any student who is planning to continue in mathematics. The ideas here provide a foundation for all work in continuous mathematics. More generally, students are presented with an important paradigm as they

are exposed to the sustained development of a significant mathematical area defined by axioms using theorems and proofs.

5. SKILLS AND BACKGROUND REQUIRED OR EXPECTED:

The student should have completed MA*421.

6. CONCEPTUAL STRUCTURE OF THE COURSE:

"Introduction to Analysis is designed to bridge the gap between the intuitive calculus normally offered at the undergraduate level and the sophisticated analysis courses the student reaches in the senior or first-year graduate level. This course is structured for the development of a rigorous foundation for the basic topics in analysis. It begins with preliminaries on set theory and a brief discussion on real numbers and its completion. We then introduce the topic on sequences, where a thorough understanding of this topic is a must in understanding the remainder of MA421 and MA422."[1]

As in MA421, a major component of MA422 will be exposing students to more proofs. MA422 will be a continuation of this exposure to proofs. The goal in MA422 as in MA421is for students to learn to read, write and understand mathematical proofs where emphasis will be placed on: presentation, clarity, writing, correctness, organization, and understanding of proofs.

[1]Edward Gaughan,"Introduction to Analysis", 5th Ed.

7. FORMAT AND ACTIVITIES IN THE COURSE:

Class lectures will be based on an informal integrated lecture/discussion/dialogue format, where Instructor will begin this type of lecture format for each chapter, and then students by Group Assignments will be expected to present the remaining topics in the chapter. Clarity and details (but concise) of presentation of topics will be expected from students.

8. TEXTBOOK AND READINGS:

Recommended:

(1) Edward Gaughan, "Introduction to Analysis", 5th Ed.,

(2) Steven R. Lay, Analysis with an Introduction to Proof, 5th Ed., PEARSON.

9. ADDITIONAL MATERIALS OR EQUIPMENT:

Instructor will use recommended textbook (1) above as an outline for the course. Both recommended textbooks cover the same topics, but instructor will use recommended textbook 1's "Table of Contents" when covering the materials for the class. Any additional material needed in class will be passed out to students and/or emailed to students.

10. ASSIGNMENTS AND EXAMS:

The primary assessment tools for the evaluation of learning outcomes and for grades are assignments, exams and clarity and details of class presentations. Assignments and group presentations will be emailed to students indicating their due dates. Exams will be announced approximately a week or two before the exam is administered.

Assignments are categorized as:

(1) Workshop Assignments which are assignments worked during class sessions and are usually due at the end of the period;

(2) Practice Problem Assignments are homework assignments to be done outside of class time and are usually due within a week or two after they are assigned.

11. EVALUATION AND GRADES:

(1) Grading: The final numerical grade for the class will be determined as follows:

Homework and quizzes: ----------40%
Group Assignments----------10%
Semester Exams and Final Exam: --------- 50%
Total:----------100%

(2) Numerical Grade[1] → Letter Grade:

90 – 100 → A;
80 – 89 → B;
70 – 79 → C;
60 – 69 → D;
$\underline{\leq}$ 59 → F.

(3) **ACADEMIC DISHONESTY:** Plagiarism and cheating are serious offenses and may be punished by failure on the exam, paper or project, failure in the course and/or expulsion from the University and a letter placed in your permanent file. For more information refer to the academic dishonesty policy in the University handbook. Instructor will inform you what "stuff" you are allowed to use such as calculators, textbooks, notes, etc., but most especially "WHAT YOU ARE NOT ALLOWED TO USE for each exam!" Definitely, no student is allowed to use computers, cell phones, etc.

Regarding "Cheating":

- The first time you are caught cheating on my exam, you will get a zero for the exam. A zero in one of my exams will do "wonders" to your overall numerical average (the mean).

- The second time you are caught cheating on my exam, YOU WILL FAIL THE COURSE. No buts, No excuses, …, No anything… YOU WILL FAIL!!!

- Some examples of cheating:

  - Copying.
  - Talking to your "neighbor" during quiz or exam, passing notes during quiz or exam, doing anything suspicious that "appears" to imply copying, etc.

- Using a laptop, cell phone, or any device that you can use to access the internet on any of my quiz, in-class exams or the final exam is CHEATING. I tell you what device cannot be used in an exam. If I say you can't, THEN YOU CANNOT USE IT!!!
- You are not allowed to use your calculator unless I say that you can. If caught using a calculator in an exam when I said you can't, IT'S CHEATING.
- Bottom line: Just don't do anything suspicious that could be interpreted as "cheating."

Students must attend every lecture and take careful notes. Questions on the exams will be based on the homework assignments, reading assignments, and topics presented in class.

12. COURSE POLICIES:

(1) MA422- A Capstone Course for Math Majors

This course was selected by the math faculty as the capstone course for math majors. As quoted below:

"A Capstone course is a course offered as part of an academic major aiming to bring together major aspects of the academic discipline(s) related to the said major.[1]

A capstone course is one in which a student enrolls in to complete a Bachelor's degree at many American and Canadian universities.[2] **"** [3]

1. **Jump up^** Marcus Ford; Marcus Peter Ford (2006). *Beyond the Modern University: Toward a C*. IAP. p. 44. ISBN 978-1-59311-405-3.
2. **Jump up^** Washington
3. http://en.wikipedia.org/wiki/Capstone_course

For this class, the instructor will administer an assessment test to achieve the goal stated in the definition of a capstone course stated above. This assessment test will not be used in determining the final grade of students enrolled in the class. However, the instructor may use it as extra credit work in determining the grades of students. Details will be discussed in class.

(2) Attendance

YOU ARE EXPECTED TO ATTEND CLASSES AND ON TIME, EVERY LECTURE. Missing class will put you behind in the material and cause for you a break in the flow of the course. Don't even bother to come into class if you are $\geq$ 10 minutes late. Don't leave class early.

(3) Assignments (workshop problems and practice problems)

The three most important ways to learn mathematics are to DO PROBLEMS, DO PROBLEMS, AND DO PROBLEMS. Reading the text and listening to lectures, even with complete understanding, cannot substitute for solving problems on your own. Work all workshop and practice problems!

(4) Make-up policy
There will be **NO MAKE-UP** homework assignments, **NO MAKE-UP** in-class exams, and **NO MAKE-UP** final exam. **I DON'T BELIEVE IN MAKE-UP ANYTHING!**

(5) Students responsibility
You are expected to be on time for each class (barring unforeseen circumstances). Please keep tardiness and absences to a minimum. If you are absent, it is your responsibility to pick up anything handed out or passed back during your absence, and in a timely manner. Please see me before or after class--or during office hours--to obtain these items, though--not during the day's lesson.

(6) It is your responsibility to keep hold of any supplemental material distributed in class. It is also your responsibility to hold on to homework, quizzes and tests passed back to you. Do not assume I always have additional copies of previous handouts, quizzes or tests (or accompanying answer keys) available.

(7) It is your responsibility to keep an accurate record of your graded work.

(8) Once we begin class I expect you to be here for the full class period. Leaving after the first 10 minutes or arriving right at the end of class is not only of no benefit, it's unduly disruptive. If you are ill, PLEASE stay home and take care of the more important business of getting yourself well. If you are exhausted, PLEASE go home and get in the needed rest, for sleeping in class isn't going to help you learn the day's lesson. PLEASE give me, your fellow classmates, and the learning environment itself the same consideration and respect you yourself would wish and expect.

(9) It is your responsibility to keep, read and know the contents of this syllabus.

(10) **Finally, it is your responsibility to email your instructor at htaijeron@gmail.com. You will need to do this so that instructor can forward you e-copies of notes, assignments, additional materials, etc.**

13. SPECIAL NEEDS:
"If you are a student with a disability who will require a accommodation(s) to participate in this course, please contact me or the Institutional Compliance Officer privately to discuss your specific needs. You will need to provide me with documentation concerning your need for accommodation(s) from the EEO/ADA and TITLE IX Office. If you have not registered with the EEO/ADA and Title IX Office, you should do so immediately at 735-2244, (TTY) 735-2243 to coordinate your accommodation request."

14. CALENDAR OR SCHEDULE:
Exams will be announced a week before it is administered. Workshops will be conducted at any time during the class meetings and assigned problems will be due at the end of the period. Due dates for homework assignments will be announced by instructor. Students will be informed during class time or emailed to students of lesson plans on a weekly basis.

15. DROP DATES:

University policy sets the drop dates. You can withdraw from classes "voluntarily" until mid October (i.e., without notifying instructor) and as late as the end of the semester with instructor's signature on a withdrawal form. See the semester schedule of courses.

16. CONTACT INFORMATION FOR CLASSMATES:

Exchange contact info with at least one classmate. Contact your classmate(s) if you miss class or if you want to form a study group. Students must inform instructor their email address so that instructor can contact student whenever necessary.

17. *Tobacco-free/Smoke-free/Vaping-free campus:*

UOG is a tobacco-free/smoke-free, vaping/e-cigarette free campus. Thank you for not using tobacco products or e-cigarettes on campus, for helping to fight cancer, and for helping make UOG a healthy learning and living environment.

18. GE QR Learning Outcomes:

UOG students will be able to apply analytical and quantitative reasoning

(QR) to address complex challenges and everyday problems by:

QR-1: Interpreting information presented in a mathematical and graphical form;

QR-2: Representing information in a mathematical and graphical form;

QR-3: Effectively calculating using quantitative data;

QR-4: Analyzing quantitative information in order to scrutinize it and draw appropriate conclusions;

QR-5: Evaluating the assumptions used in analyzing quantitative data

QR-6: Communicating quantitative information in support or refutation of an argument.

19. CHECKLIST FOR GRADING OF PROOFS:

Checklist for Grading of Proofs		
Category	Description	Student Score
Format (1 pt)	In "Claim" Section of Proof: ✓ Is it clear what is to be proven? ✓ Are all hypotheses and assumptions stated? ✓ Does the proof have a clear beginning?	
Grammar (1 pts)	The math "Grammar" in Proof: ✓ Does the proof contain complete sentences? ✓ Correct spelling, grammar, and punctuation? ✓ Clarity of Proof (Do the sentences flow and contain proper transitions?)	
Clarity (2 pts)	"Clarity" of Proof" ✓ Are all of the variables defined and described adequately? ✓ Is notation used correctly? ✓ Are symbols used properly when substituting for words? ✓ Are the arguments and logic easy to understand?	
Correctness (5 pts)	"Correctness" of Proof: ✓ Is the mathematics correct? ✓ Does the argument solve the problem or prove the claim? ✓ Are theorems and prior results used correctly and referenced? ✓ Are all words used correctly and precisely?	
Organization (1 pt)	"Organization" in proof: ✓ Is it written as simply and directly as possible? ✓ Are there any unnecessary sentences that could be removed? ✓ Is the explanation well organized? ✓ Are long arguments separated into lemmas?	

Source: http://www.math.uh.edu/~tomforde/Math3333/Syllabus3333web.pdf

20. STUDENT LEARNING OBJECTIVES AND MA422 CURRICULAR MAPPING:

MA422 – Student Learning Outcomes

Ever wondered why we require certain courses for general education, or for a given major, or as a prerequisite for another course? Read on below to see what the MA203 student learning outcomes are

(what you should expect to learn in this course), how they tie into the Math Program Learning Outcomes, and how they tie into the bigger picture – the University's Institutional Learning Outcomes.

MA422 Course Student Learning Outcomes (SLOs)

Course SLOs:	Program Learning Outcomes (PLOs)	University Learning Outcomes (ILOs)	Method of Assessment
SLO1: Demonstrate familiarity with continuity, derivatives, integrals (Riemann), and infinite series (if time permits) of functions.	MA PR-1 MA PR-2 MA PR-3 MA PR-4 MA PR-5	ILO-1 ILO-2 ILO-3	Questions on homework, workshops, quizzes and tests.
SLO2: Refine skills in communicating mathematics effectively by participating in classroom discussions and presenting work orally in class.	MA PR-1 MA PR-2 MA PR-3 MA PR-4 MA PR-5 MA PR-6	ILO-1 ILO-2 ILO-3 ILO-6 ILO-7	Questions on homework, workshops, quizzes and tests.
SLO3: Refine skill in reading, writing, and ascertaining the validity of proofs.	MA PR-1 MA PR-2 MA PR-3 MA PR-4 MA PR-5 MA PR-6	ILO-1 ILO-2 ILO-3 ILO-6 ILO-7	Questions on homework, workshops, quizzes and tests.

(Note: Student Learning Outcomes for MA422 are undergoing revisions.)

Math Program Learning Outcomes:

MA PR-1: *demonstrate critical thinking*, *problem solving skills* and ability to use mathematical methods by *identifying, evaluating, classifying, analyzing, synthesizing* data and abstract ideas in various contexts and situations.

MA PR-2: *exhibit a sound conceptual understanding* of the nature of mathematics, and *demonstrate advanced mathematical skills* in mathematical analysis, modern algebra and other mathematical discipline(s).

MA PR-3: *argue and reason* using mathematics, *read, create* and *write down* logically correct mathematical proofs, *use exact mathematical language* and *communicate mathematics efficiently* orally, in writing and using information technology tools.

MA PR-4: *apply abstract thinking, mathematical methods, models* and *current practices* in the sciences, including state-of-the-art mathematical software, to solve problems in theoretical mathematics or in a diverse area of mathematical applications.

MA PR-5: *show maturity in mathematical knowledge and thinking* that prepares and encourages students to pursue graduate studies in mathematics or in related fields.

MA PR-6: *demonstrate an appreciation of* and *enthusiasm for* inquiry, learning and creativity in mathematical sciences, a sense of exploration that enables them to *pursue lifelong learning* and *up-to-date professional expertise* in their careers through various areas of jobs, including governmental, business or industrial jobs in mathematics, related sciences, education or technology.

Institutional Expected Student Learning Outcomes:
UOG Expected Student Learning Outcomes December 2008

Some of the expected fundamental knowledge, skills, and values that the University of Guam student will have demonstrated upon completion of any degree are:

ILO1: Mastery of critical thinking & problem solving
ILO2: Mastery of quantitative analysis
ILO3: Effective oral and written communication
ILO4: Understanding & appreciation of culturally diverse people, ideas & values in a democratic context
ILO5: Responsible use of knowledge, natural resources, and technology
ILO6: An appreciation of the arts & sciences
ILO7: An interest in personal development & lifelong learning

21. [1]BASED ON DR. BARBARA GROSS DAVIS, UC BERKELEY MODEL "CREATING A SYLLABUS". From the hard copy book *Tools for Teaching* by Barbara Gross Davis; Jossey- Bass Publishers: San Francisco, 1993. Linking to this book chapter from other websites is permissible. However, the contents of this chapter may not be copied, printed, or distributed in hard copy form without permission. For a more detailed explanation on each numbered section of the syllabus, please visit: http://teaching.berkeley.edu/bgd/syllabus.html.

MATH 431 Further Linear Algebra (Topics in Advanced Mathematics)
Spring 2016
MW 11:00-12:20 at HSS 104

Instructor: Hideo Nagahashi (office: WB #5)
E-mail: nagahashi_h@yahoo.com
Phone: 735-2788 (unless emergency use e-mail)
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Office Hours:
MW 8:30-11:00 at WB #5
T 8:30-9:30 at WB #5, and by an appointment

Text: Linear Algebra: A Modern Introduction, **4th Edition** by David Poole

Catalog Course Description: This course offers selected topics in advanced mathematics such as topology, mathematical induction, non-Euclidean geometries. Different subject matter may be repeated for credit. Prerequisite: Grades of C or above in MA205.

Rational for Offering Course: This course satisfies the major elective requirements for Math. The course is also useful for the Math, Engineering, and Physical Science disciplines.

Tentative Schedule:

1st-6th week	Jan 20-Feb 24
7th-12th week	Feb 29-Apr 6
13th-18th week	Apr 11-May 11

Test 1	Feb 24 (Wed)
Test 2	Apr 6 (Wed)
Test 3	**May 18 (Wed) 10:00-11:50**

Grades: The total number of points available is 400. Grades will be no lower than those set forth in the following table. Student's work is usually graded on a partial credit basis. Student's written solutions must include all work needed in order to solve problems. Points will be deducted (or given none) for omitting any work even if the answer is correct.

Quiz	100pts
Test 1	100pts
Test 2	100pts
Test 3	100pts

A	90-100 %
B	80-90 %
C	70-80 %
D	60-70 %
F	0-60 %

Homework: Homework is assigned from the required Textbook. Homework is an essential component of the course. To be successful, do all assigned problems even if it is not collected and graded.

Quiz: **QUIZ EVERY CLASS** (in-class or take-home). No make-up for Quizzes. If you miss a Quiz, your point for that Quiz is zero. Instead **THREE** lowest Quiz score will be dropped, and your total Quiz points will be adjusted (out of 100 points possible) at the end of the semester. The main purpose of the Quiz is to let you prepare for "bigger" Tests and the cumulative Final Exam. Do not worry too much about your low score on a single Quiz. However, failure to take **FOUR** Quizzes will result in grade **F** as a course grade regardless of your total points. (Excused absence will be counted as missing *half* if immediately reported.)

Test: There will be three in-class Tests. No make-up for Tests. All notes and the textbook are prohibited from use. It is crucial to do well on Tests. Missing any **SINGLE** Test will result in grade **F**. Very special circumstances will be handled very specially by consultation with the instructor. Except for true emergencies, these special cases are arranged in advance with the instructor.

Attendance: Students are expected to attend every scheduled class. It is the student's responsibility to keep informed of any announcements, syllabus adjustments or policy changes made during scheduled classes. ***I will give warning if a student often comes late for the class. Once you get the warning, you cannot take quiz when you are late next time and it will be counted as missing that quiz.***

Calculators: A graphing calculator (e.g. TI-83) is required for this course. Students are expected to have a working calculator for Quiz/Test/Final **with exception**. No calculator swapping is permitted during testing periods.

PC/Mac/Tablet/Cell etc. are not allowed to use for Quiz/Test.

Curriculum Mapping:

Course SLOs	Program PLOs	UOG ILOs	Method of Assessment
SLO 1	MA PR 1,2	ILO 1,2	Homework, Quizzes, and Tests
SLO 2	MA PR 1,2,3,4,5	ILO 1,2	Homework, Quizzes, and Tests
SLO 3	MA PR 1,2,3,4,5	ILO 1,2,5,6	Homework, Quizzes, and Tests
SLO 4	MA PR 1,2,3,4,5	ILO 1,2,5,6	Homework, Quizzes, and Tests
SLO 5	MA PR 1,2,3,4,5	ILO 1,2,5,6	Homework, Quizzes, and Tests

(Course SLOs)
SLO 1: Use basic algorithms employed in linear algebra (e.g. Gauss-Jordan elimination).
SLO 2: Demonstrate knowledge of the theory and application of vectors, matrices, vector spaces and linear transformations.
SLO 3: Apply linear algebra for problem solving by demonstrating the ability to adapt the conceptual tools.
SLO 4: Understand the significance of eigenvalues and eigenvectors, then compute them.
SLO 5: Demonstrate further knowledge of linear algebra such as orthogonality, inner product space, and Jordan canonical form.

(Math PLOs)
MA PR 1: Demonstrate critical thinking, problem solving skills and ability to use mathematical methods by identifying, evaluating, classifying, analyzing, synthesizing data and abstract ideas in various contexts and situations.
MA PR 2: Exhibit a sound conceptual understanding of the nature of mathematics, and demonstrate advanced mathematical skills in mathematical analysis, modern algebra and other mathematical discipline(s).
MA PR 3: Argue and reason using mathematics, read, create and write down logically correct mathematical proofs, use exact mathematical language and communicate mathematics efficiently orally, in writing and using information technology tools.
MA PR 4: Apply abstract thinking, mathematical methods, models and current practices in the sciences, including state-of-the-art mathematical software, to solve problems in theoretical mathematics or in a diverse area of mathematical applications.

MA PR 5: Show maturity in mathematical knowledge and thinking that prepares and encourages students to pursue graduate studies in mathematics or in related fields.
MA PR 6: Demonstrate an appreciation of and enthusiasm for inquiry, learning and creativity in mathematical sciences, a sense of exploration that enables them to pursue lifelong learning and up-to-date professional expertise in their careers through various areas of jobs, including governmental, business or industrial jobs in mathematics, related sciences, education or technology.

(UOG ILOs)
ILO 1: Mastery of critical thinking & problem solving
ILO 2: Mastery of quantitative analysis
ILO 3: Effective oral and written communication
ILO 4: Understanding & appreciation of culturally diverse people, ideas & values in a democratic context
ILO 5: Responsible use of knowledge, natural resources, and technology
ILO 6: An appreciation of the arts & sciences
ILO 7: An interest in personal development & lifelong learning

Special Accommodations: If you are a student with a disability who will require an accommodation(s) to participate in this course, please contact me or the Institutional Compliance Officer privately to discuss your specific needs. You will need to provide me with documentation concerning your need for accommodation(s) from the EEO/ADA & TITLE IX Office. If you have not registered with the EEO/ADA & TITLE IX Office, you should do so immediately at 735-2244, (TTY) 735-2243 to coordinate your accommodation request.

Academic dishonesty: All assignments and tests must be your own work. The term "plagiarism" includes, but is not limited, to, the use, by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgment. It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials. Plagiarizing in your essay or cheating on tests will be punished with a mark of 0. If a plagiarized essay is not replaced with original work I will assign you a grade of F for the course. There will be no make up for tests. If you are not sure what plagiarism is and how to avoid it in using sources for your work, see www.indiana.edu/~wts/pamphlets/plagiarism.shtml — but be careful when paraphrasing not to change the meaning of scientific information. Answers you write on the tests must come only from in your head or the information supplied in the test papers; anything else is cheating. The term "cheating" includes, but is not limited to: (1) use of any unauthorized assistance in taking quizzes, tests, or examinations, e.g., looking at other students' answers, using crib notes (including electronic), getting information from another person via any kind of communication; (2) dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; or (3) the acquisition, without permission, of tests or other academic material belonging to a member of the University faculty or staff. If you need to use an electronic translator, you must discuss this with me in advance.

Tobacco-free/Smoke-free campus: UOG is a tobacco-free campus. Thank you for not using tobacco products on campus, and for helping make UOG a healthy learning and living environment.