COLLEGE OF NATURAL AND APPLIED SCIENCES
MATHEMATICS
BACHELOR OF ARTS IN MATH/MINOR IN MATH
SECONDARY ED. SPECIALIZATION IN MATH
EIGHT FULL-TIME FACULTY MEMBERS

MATH PROGRAM CURRICULAR MAPPINGS (CMs)

DEVELOPMENTAL MATH SLOs

DEV MA- 1: Perform algebraic operations on integers, fractions, decimals and expression involving variables.
DEV MA-2: Sketch graphs of linear equations and interpret graphs representing statistical data.
DEV MA-3: Construct equations representing word problems and solve the equations mathematically.
DEV MA-4: Demonstrate familiarity with geometric figures and the different units of measurement.

MATH DEGREE PROGRAM SLOs

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 & situations.
MA PR-2: Demonstrate the knowledge of current mathematical applications, computing practices and technology use in industry, and science and education.
MA PR-3: Demonstrate ability to use modern software, abstract thinking, and mathematical practices connected to scientific and industrial problems, and demonstrate these skills that are currently used by technologies in society and education.
MA PR-4: Perform skills that enable them to evaluate, propose and convey novel solutions to scientific and business problems, etc.
MA PR-5: Demonstrate a sense of exploration that enables students to pursue lifelong learning and currency in their careers in mathematics, statistics, education, high-tech and bi-tech industries.

MATH GE SLOs

MA/GE-1: Utilize algebraic skills to interpret and process quantitative data.
MA/GE-2: Demonstrate familiarity with basic mathematical concepts & methods.
MA/GE-3: Identify and classify functions by properties and applications areas.
MA/GE-4: Develop skills to present, visualize and solve problems using mathematical modeling.

DEVELOPMENTAL MATH CM

COURSE NO.	LINK TO DEV. MATH SLOs[1]			
	DEV MA-1	DEV MA-2	DEV MA-3	DEV MA-4
MA*084A	1234	1234	1234	
MA*084B	12345	12345	12345	12345
MA*085	1234	1234	1234	1234

MATH DEGREE PROGRAM CM

COURSE NO.	LINK TO PROGRAM SLOs[1]				
	MA PR-1	MA PR-2	MA PR-3	MA PR-4	MA PR-5
MA*088[1]	12345				
MA*151	12345				
MA*161A	1-10	1-10	1-10		
MA*161B	12345	12345	12345		
MA*165	1234	1234	1234		
MA*203	12345	12345		12345	12345
MA*204	12345	12345	12345	12345	12345
MA*205	12345	12345	12345		
MA*301	1234	1234		1234	
MA*302	12345		12345	12345	12345
MA*341	1234	1234		1234	1234
MA*351	1234			1234	
MA*361[2]					
MA*375	12345	12345	12345	12345	
MA*385	12345		12345	12345	12345
MA*411	12345				12345
MA*421	123				123
MA*422	123				123
MA*431	123456	123456		123456	123456
MA*441[2]					
MA*451[2]					
MA*453	1234	1234	1234	1234	1234
MA*460[2]					
MA*461[2]					

MATH GE CM

COURSE NO.	LINK TO GE SLOs[1]			
	MA GE-1	MA GE-2	MA GE-3	MA GE-4
MA*110	1234	1234	1234	1234
MA*161a	1-10	1-10	1-10	1-10
MA*161b	12345	12345	12345	12345
MA*165	1234	1234	1234	1234
MA*203	12345	12345	12345	12345

[1]The numbers are course SLO numbers that link the course to the program SLO (See UOG/CNAS/CNAS Assessment Website for detailed descriptions of these course SLOs by visiting: http://www.uog.edu/dynamicdata/CNASAssessment.aspx?siteid=2&p=20); [2]Pending Faculty Input;

MATH DEGREE PROGRAM-LEVEL ASSESSMENTS

ASSESSMENT ACTIVITY	ASSESSMENT RESULTS AND RECOMMENDATIONS FOR PROGRAM IMPROVEMENTS
1. Program Capstone Evaluation Assessment using MA411. Program learning objective selected: ***Demonstrate critical thinking, problem solving skills and ability to use mathematical methods by identifying, evaluating and classifying, analyzing, synthesizing, data and abstract ideas in various contexts and situations.*** ***In particular, Problem solving techniques and presentation skills were assessed in MA411.***	Dr. Szekely submitted in fall 2008 report titled "Capstone Assessment through Abstract Algebra" to CNAS Assessment Committee. Findings: The findings indicate good general presentation skills of students, but point out weaknesses in *relating abstract content with presentable material*. Typically, a high percentage of students has *trouble to answer questions* of abstract nature related to the topic of their presentation. As a remedy, students should be encouraged to "talk mathematics" by using exact language in mathematical problem solving *from their freshman years throughout their studies*. Also, presentation as a meaningful assignment should be employed in most, if not all, mathematics courses in order to enhance students' ability to use exact mathematical language in a critically attentive environment. *Preliminary results* of this assessment were presented at the CNAS assessment meeting at November 30th, 2007.
2. Program Capstone Evaluation Assessment Study using MA411. Program learning objective selected: Same objective as in 1.	Dr. Trance submitted in fall 2008 report titled "A Report on the Assessment by Student Presentation in MA411 (Introduction to Abstract Algebra)" to CNAS Assessment Committee. Findings: This method of assessing the attainment of a program objective primarily aims to see how much mathematical maturity the students have gained in going through the different majors courses prior to their final semester in the program as indicated by their firm grasp of the concepts and clear perception of how theorems may be linked together in a logical sequence in order to form a solid proof of another theorem. Among the four presenters only one showed enough mathematical maturity to give an insightful and fluid flow of arguments indicating a good understanding of what she was sharing with her classmates. One student had very little add-on to what was presented in the book and the others, too, projected quite a limited understanding of the material assigned to them. As far as presentation skill is concerned, two of the student presenters made good use of visual aids which contributed a lot in making the abstract concepts appear relevant to the physical world. The value of these findings should be seen in the light of other assessment results.
3. Summary of Program Capstone Evaluation Assessment Studies done in 1 and 2 above.	Drs. Szekely and Trance submitted in fall 2008 report titled "Capstone Assessment through Abstract Algebra" to CNAS Assessment Committee. Findings: As mentioned, a high percentage of students had *trouble to answer questions* of abstract nature related to the topic of their presentation. Based on this finding we make a recommendation: students should be encouraged to "talk mathematics" by using exact language in mathematical problem solving *from their freshman years throughout their studies*. As a good practice, we may encourage students to come to the board frequently and *present their solutions* to homework, quiz or test assignments in front of their classmates in a way that is convincing to both the instructor and their peers. They should also *take and answer questions* from their fellow students so that, in the long range, they develop good command of the knowledge they convey. In general, presentation as a meaningful assignment should be employed in most, if not all, mathematics courses in order to enhance students' ability to use exact mathematical language in a critically attentive environment.
4. Program Capstone Evaluation Assessment Study using MA422. Program learning objective selected: Same objective as in 1.	Dr. Trance submitted in spring 2007 report titled "A REPORT ON: THE PROGRAM ASSESSMENT TEST GIVEN TO: SENIOR STUDENTS IN MA422" to CNAS Assessment Committee. Recommendations: 1. Based on the way the first problem in the Program Assessment Test (PAT) was solved, it is recommended that the formulation of the problems be improved so as to direct the students to use purely mathematical methods in their solutions. 2. It is also recommended to determine the best time for administering the PAT. The schedule should be such that the students will have enough time to review lessons learned in previous courses and still have the interest to get a high rating in the test. 3. A proper incentive to motivate the students to do their best in the PAT should be determined. 4. The result of the PAT should be interpreted in relation to the results of other forms of assessment implemented by the department. 5. A single result is insufficient to serve as basis for introducing changes in the B.S. Mathematics program. Additional data and other relevant factors should be considered for this purpose.
5. Program Capstone Evaluation Assessment study using MA422. Program learning objective selected: Same objective as in 1.	Dr. Nagahashi submitted in fall 2008 report titled "Spring 2008 Program Assessment Test for Math Majors in MATH 422" to CNAS Assessment Committee. Findings; There were three in-class exams and a final exam given in MATH 421 during Fall 2007 semester (six out of seven students took MATH 421). Also three exams were given in class of MATH 422 during Spring 2008. Although students showed certain levels of understandings for these exams, no students could get Problem 5, which focuses on the main issues of MATH 421/422. On the other hand most of the students got the correct answer for Problem 3, which they had a review session right before the exam, and also which is a more computational type of problem. This contrast shows their weakness for the long-term memory, and also the weakness of the skills in reading, writing, and ascertaining the validity of proofs. Hence these aspects should be more stressed in MATH 421/422, or even in MATH 302 and MATH 411.

DEVELOPMENTAL MATH ASSESSMENTS

ASSESSMENT ACTIVITY	ASSESSMENT RESULTS AND RECOMMENDATIONS FOR PROGRAM IMPROVEMENTS
1. Learning Objective Selected: *MA085 for the Developmental Mathematics Program Assessment: Become proficient with basic algebra and some geometry (The main learning objective of Developmental Math Course (MA*085), is to provide the opportunity for students to review and strengthen their basic algebra skills, which are essential to success in intermediate algebra and university-level Math courses.* 2. Direct Measure of Assessment (Tool Used): The direct measure is an exit assessment that a student takes before student exits MA-085. (The test does not affect the student's final semester grade.). **Note:** Other assessments were done in the developmental math program. See CNAS Assessment @ CNAS Website for details.	Assessment results showed weak retention of the material covered and inadequate preparation of the students for the MA161/165 courses. Changes: Introduced level I and II exit tests in MA085 to give students opportunity to review material.

MATH GE ASSESSMENTS

ASSESSMENT ACTIVITY	ASSESSMENT RESULTS AND RECOMMENDATIONS FOR PROGRAM IMPROVEMENTS
1. Learning Objective Selected: *MA110 Assessment for GE:* • *The enhancement of basic skills and conceptual understanding in elementary algebra (this is a General Education item).* • *The application of these skills to the mathematics of personal finance.* • *The further application of these skills to the mathematics of the business world (linear programming). See report submitted by the Math Subcommittee (Dr. Grishin) for details.* 2. Direct Measure of Assessment (Tool Used) Selected for Assessment: A short test on topics covered in the Module that includes exponential function and its inverse, the logarithm, as well as other concepts covered in the selected course, MA110, is available that will be used, for now, as the sole method of assessment. An analysis of the results of the assessment is scheduled for Math faculty meetings in spring 2007. Data gleaned from individual MA110 assessments will be analyzed by designated faculty members. *See report submitted by the Math Subcommittee (Dr. Grishin) for details.* **Note:** Other MA110 assessments were done with math faculty. See CNAS Assessment @ CNAS Website for details.	Assessment results sent to University-Wide GE Committee as requested by Chair of Committee.

MATH CAPSTONE COURSE EVALUATION ASSESSMENT STUDIES

ASSESSMENT ACTIVITY	ASSESSMENT RESULTS AND RECOMMENDATIONS
Degree program SLO selected (See Math Degree Program-Level Assessments, page 1 of Poster)	**1. Summary of Assessment Results (See below)** **2. Recommendations for Improvements (See Math Degree Program-Level Assessments, page 1 of Poster)**

Summary of Assessment Results

1. MA411 Assessment Study Results Using Capstone Rubric

Math Capstone Rubric for Presentations

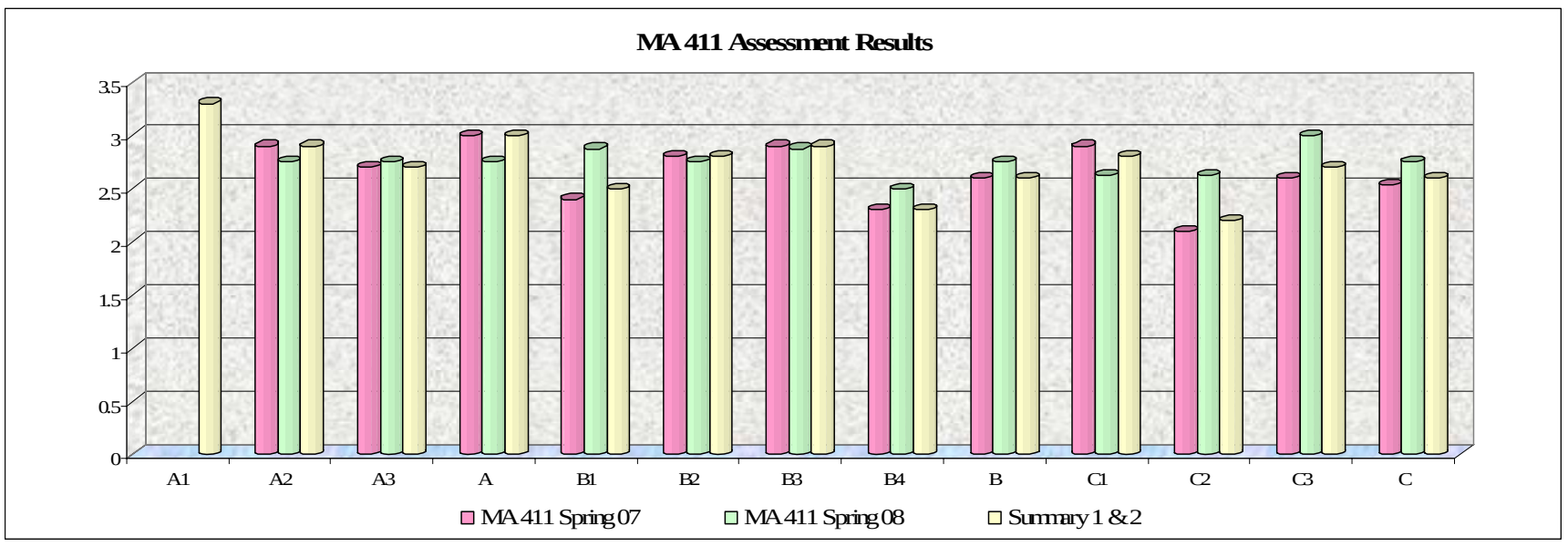
NAME OF EVALUATOR:		**Advanced:** Concise, correct w/all info needed for understanding.	**Proficient:** Correct statements, all important info included.	**Basic:** Correct statements, but some important aspect is missing.	**Unacceptable:** Incorrect statements, unintelligible sentences.
Group	Items of Measurement				
A. General Presentation Skills	A1. The topic of the presentation was stated clearly				
	A2. The presentation was neat, at the level of the Audience				
	A3. The presenter maintained good rapport throughout the presentation				
B. Presentation Skills Specific to Math	B1. The presenter used exact mathematical language				
	B2. Definitions were reviewed and/or explained as Needed				
	B3. The statements were formulated correctly				
	B4. The proof was presented in a way that gave insight				
C. Overall Performance	C1. Previous results, lemmas etc. were mentioned and explained (if any), the result(s) were placed into context				
	C2. The question(s) were answered clearly and correctly (if any)				
	C3. The presentation was convincing and reflected a good understanding the topic				

Other comments:

Assessment Results Using Capstone Presentation Rubric

Capstone Course Study, Semester	No. of Students	A. General Presentation Skills				B. Presentation Skills Specific to Math					C. Overall Performance			
		Mean for Item A1	Mean for Item A2	Mean for Item A3	Overall Mean for A	Mean for Item B1	Mean for Item B2	Mean for Item B3	Mean for Item B4	Overall Mean for B	Mean for Item C1	Mean for Item C2	Mean for Item C3	Overall Mean for C
1. MA411, Sp 2007	10	3.3	2.9	2.7	3	2.4	2.8	2.9	2.3	2.6	2.9	2.1	2.6	2.53
2. MA411, Spring 08	4		2.75	2.75	2.75	2.875	2.75	2.875	2.5	2.75	2.625	2.625	3	2.75
3. Summary 1 & 2	14	3.3	2.9	2.7	3.0	2.5	2.8	2.9	2.3	2.6	2.8	2.2	2.7	2.6

Scoring Rubrics: 1 is unacceptable ... 4 is advanced level



2. MA422 Assessment Study Results Using Capstone Rubric

Assessment Rubric for MA422 (Spring 2008)

Number of Students participating in Assessment Study (Spring 2008)	Demonstration of Understanding Concepts in	Concept Selected for Program Assessment Test (PAT)	Problem # (10 points per problem)	Average Score
7	Linear Algebra (MA341)	Eigenvalues, eigenvectors and applications	1	2.86
	Foundations of Higher Math and Abstract Algebra (MA302 and MA411)	Equivalence/Congruence classes and the first Isomorphism Theorem	2	2.29
	Multivariable Calculus (MA205)	Double Integrals and/or Triple Integrals	3a	8.33
			3b	8.0
	Analysis (MA421/MA422)	Limits of Sequences and Functions	4a	3.5
			4b	3.2
	Analysis (MA421/MA422)	Sup/Inf, Continuity, differentiability, and integrability	5a	0.8
			5b	0.5