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Mathematics Program Assessment Plan

University of Alaska Southeast

Permanent Program Faculty

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Table of Contents

1 – Introductory Comments

This assessment plan will continue to be refined and/or revised as needed to best fit the needs of the UAS Mathematics Program as well as serve as a resource for Program Reviews as per the Board of Regent's and UAS Program Review Policy 10.06.01A.

The majority of mathematics departments/programs in US colleges and universities implement assessment practices and curriculum designs based on the research and recommendation of the Mathematics Association of America (MAA), the American Mathematical Society (AMS), American Statistical Association (ASA), and affiliated committees. The advice given in reports compiled by such committees stress designing assessment plans around the needs of the program in question. References and resources for this plan include relevant publications of, and activities organized by the MAA, the AMS, and the ASA.

Revisions of the Mathematics Program Assessment Plan, when made, will follow recommendations that arise from Program Reviews, or those that are provided in relevant publications of the MAA, AMS and ASA.

The current plan contains refinements pertaining to continued data collection efforts and outcomes assessment of student learning. These refinements are in response to observations from annual assessment reports through the 2010 academic year, and requests made by the Dean of Arts and Sciences and the Provost's office.

2 – Assessment Cycle

The Mathematics Program assessment cycle will comprise of *Annual Reports* as well as Board of Regents (B.O.R.) required *Program Reviews*.

Annual Reports are prepared end of each academic year based on pro-active and ongoing year-long discussions among program faculty, along with supporting material where applicable. Among other material, these reports may include:

a. Observations on current trends and areas of possible concern.

b. Recommendations and/or proposals agreed upon by the Mathematics Program faculty.

c. Justifications for recommendations and/or proposals.

d. Implementation time-line of proposed changes, if applicable.

e. Observations concerning the status and effectiveness of recent changes implemented as described in earlier annual reports.

When appropriate, specific activities and proposals concerning student assessment in lower level mathematics coursework are included in annual reports. Matters relating to the assessment of students enrolled in the Mathematics BS and Minor programs are addressed on an ongoing basis.

Program Reviews, as per Board of Regent's Policy, are performed according to the timeline established by the Dean of Arts and Sciences and the UAS Provost's Office. Annual reports and UAS IR data will serve as resources for B.O.R. required Program Reviews.

3 – Assessment of GER and Service Courses

G.E.R and Service courses offered by the UAS Mathematics Program include:

a. Developmental and remedial courses such as MATH 054, 055 and 105 (Note that MATH 105 is a G.E.R. for Associates degrees at UAS).

b. Bachelor's degree GER courses such as MATH 107, MATH 106, and STAT 107.

c. Service courses[1] for degrees in other disciplines, including MATH 108, 200, 201, STAT 273, STAT 400, and STAT 401.

The relevance of course content, the coordination of multi-section courses, student abilities and preparedness, as well as *student assessment tools and practices (as defined in course syllabi)* are discussed at the end of each semester after final examinations have been graded in preparation of upcoming semesters.

The Mathematics Program faculty may also conduct periodic evaluations of how these courses compare to similar courses offered at other institutions, and how they contribute toward some or all of the six *UAS General* S*tudent Competencies*.

3.1 – Consistency of GER and Service Courses

MATH 055 through MATH 108 as well as STAT 107 and STAT 273 are offered through all three UAS campuses, and since there are typically two or more sections of these courses offered each semester, the Mathematics Program has established some *consistency practices* to ensure course uniformity over time, and across campuses and sections of these courses.

Practice 1: *During the 2006, 2007 and 2008 academic years Program faculty prepared and agreed upon "Course Guidelines" for local and distance delivered sections of the above listed courses. These guidelines are available to all full-time faculty, and part-time faculty through their respective full-time faculty supervisor.*

Practice 2: *At the Juneau campus, for each semester each multi-section MATH 054 – MATH 107 course is assigned a course coordinator. The coordinator's duties include arranging and moderating meetings for midterm exams as well as preparing the Juneau campus final exam for the course and semester in question.*

Practice 3: *At the Juneau campus, MATH 107 sections also have a course coordinator. However, the final exam is prepared by a Juneau faculty member who is not teaching a MATH 107 section during the semester in question to ensure unbiased examinations.*

Practice 4: *The Juneau campus typically shares final exams for MATH 107 with Ketchikan and Sitka faculty who are teaching MATH 107 during the*

[1] Of these courses, MATH 200, MATH 201 and STAT 273 are Mathematics B.S. degree core requirements, and STAT 400 and STAT 401 are Mathematics B.S. degree electives.

semester in question. An effort is also made to share midterm and final exams for the remaining mathematics courses, but this is mainly at the request of Ketchikan and Sitka faculty.

Practice 5: *Coleen Ianuzzi of Ketchikan and Joseph Liddle of Sitka serve as mentors/supervisors for part-time instructors who teach out of Ketchikan or Sitka, respectively. Juneau course coordinators and the Program Coordinator serve as mentors/supervisors for Juneau part-time instructors.*

All program course guidelines and recent syllabi are posted in an "electronic" file cabinet on UASOnline. All full-time and regular part-time mathematics faculty members have access to this "file cabinet" and may refer to the contents as needed.

Consistency among other service courses is currently maintained through fairly regular consultations among faculty.

3.2 – Learning Outcomes

Learning outcome for mathematics and statistics courses are as described in course syllabi and detailed within course guidelines, as applicable. It must be emphasized that the UAS Mathematics Faculty do not believe in spelling out every single type of problem a student is likely to encounter in a course to identify learning outcomes for mathematics or statistics courses. This stems from the program's general philosophy;

> *The mathematics faculty believes in giving students* ***depth rather than just breadth****.* ***Problem solving is a big focus*** *of our lower division classes. We believe that students should be able to* ***apply the knowledge they have to new situations****.*

Listing specific and itemized learning outcomes would possibly encourage memorization and does not encourage students to develop critical thinking skills.

3.3 – Assessment of Courses

Answers to two questions will serve in assessing G.E.R. and service courses.

Question 1: *Is the program fulfilling its obligation to the institution and students by offering appropriate courses?*

The purpose of answering this question is to:

1. Verify the availability of faculty for future course offerings.
2. Determine the number of sections needed for courses.
3. Understand UAS student and partner discipline needs.

Answers for this question will be sought from:

a. Annual student enrollment data.

b. Solicited or unsolicited comments from UAS client programs and departments.

Question 2: *Are the current GER and service courses fulfilling their intended purposes?*

Answers to this question will determine whether:

1. The courses in question provide what they were designed to provide, and
2. Whether the courses in question meet nationally established standards.

Answers to this question will be sought from:

a. Solicited or unsolicited comments from UAS client programs.

c. Periodic review of the literature and the UAS Mathematics Program curriculum by mathematics faculty.

d. Other universities and resources from the MAA will be referred to periodically to keep track of national trends so as to ensure the transferability of UAS mathematics GER and other service courses.

4 – Assessment of the B.S. and Minor Programs

Assessment of the Mathematics B.S. degree and Mathematics Minor programs follows guidelines set forth in the *CUPM Curriculum Guide, 2004*, and subsequent reports, published by the *MAA Committee on the Undergraduate Program in Mathematics*. The UAS Mathematics Program faculty has identified five areas of importance by which the program may be assessed. Outcomes of program assessments might include proposals for possible improvements and/or adjustments.

A breakdown of the five target areas of assessment and tools follows.

4.1 – Program Viability

The effective recruitment of new majors and minors and timely graduation of enrolled mathematics majors and minors suggests an attractive and healthy program. The appeal and health of the Mathematics B.S. and Minor Programs is monitored by:

a. Identifying and capitalizing on common sources of new majors and minors.

b. Periodically surveying current majors and minors to identify ways to retain current majors and minors and improve recruitment.

c. Tracking current majors to ensure efficient six-year plans for course schedules.

Qualitative data for assessing program viability are currently obtained from *entry* and *exit interviews* of mathematics majors. The program coordinator also maintains a tracking spreadsheet for each major, starting with the student entry interview.

4.2 - Program Validity

Mathematics and statistics courses offered at UAS must, at least, be comparable with similar courses offered at other institutions. To monitor the quality and transferability of UAS mathematics and statistics courses, the Mathematics Program faculty periodically confer to:

a. Assess the appropriateness and feasibility of course offerings.

b. Assess the usefulness and applicability of course content.

c. Identify current trends in the use of technology, and appropriateness for UAS mathematics and statistics courses.

d. Identify new and innovative approaches to presenting current courses, and appropriateness for UAS mathematics and statistics courses.

Resources and qualitative data for assessing program validity include *reviews of the literature*, *consultation with faculty* from other disciplines within UAS, and *surveys of recent graduates* of the Mathematics B.S. degree program.

4.3 – Student Assessment Goals and Outcomes

Aside from the *UAS General Student Competencies*, the *goals* and *exit outcomes* identified by the Mathematics Program faculty as being relevant to measuring the potential success of UAS mathematics B.S. graduates in the workforce or in academics are given below.

Consistency in content and student assessment is maintained through the availability of standard (past) course syllabi in the program's "electronic file cabinet." Each course syllabus identifies appropriate learning outcomes as agreed upon by program faculty.

Major changes in course content as defined in syllabi are discussed before being implemented. Any changes implemented are outlined, with justifications, in Annual Reports.

Goal 1: Competency in Core Subject Content

> *Outcome 1A (Introductory Level)*: Graduates will demonstrate skills in basic quantitative and analytic problem solving, and competency in basic undergraduate mathematics coursework.
>
> *Outcome 1B (Developmental Level)*: Graduates will demonstrate an understanding of foundational theoretical concepts required to pursue further studies in mathematics.
>
> *Outcome 1C (Mastery Level)*: Graduates will demonstrate an ability to extend and generalize foundational concepts, critically analyze and solve abstract problems in mathematics, and acquire a deeper understanding and appreciation of the subject.

Goal 2: Skills in Analysis, Application, and use of Technology

> *Outcome 2A (Introductory Level)*: Graduates will have a broad awareness of the value of, and the ability to use technology as an aid to understanding and solving mathematical problems.
>
> *Outcome 2B (Developmental Level)*: Graduates will have a broad awareness of the interdisciplinary connections and applications of mathematics.
>
> *Outcome 2C (Mastery Level)*: Graduates will possess a strong foundation in utilizing skills and knowledge gained from mathematics and interdisciplinary courses to critically analyze and solve a wide variety of problems using theoretical or technological tools.

Goal 3: Professional Awareness, Ability to Conduct Independent Studies and Present Mathematical Ideas

> *Outcome 3A (Introductory Level)*: Graduates will be aware of opportunities available to mathematics graduates and accepted ethical behavior within the mathematics community and associated professional responsibilities.

Outcome 3B (Developmental Level): Graduates will be able to read, comprehend and communicate mathematical ideas, verbally and in writing, at the undergraduate level in a competent manner.

Outcome 3C (Mastery Level): Graduates will display a high level of confidence and independence in pursuing further investigations in the mathematical sciences. Graduates must be able to communicate knowledge gained in writing and through class presentations at a level deemed appropriate by the mathematics faculty.

Methods of Measurement: Transcripts are used to assess satisfactory completion of mathematics and statistics coursework with the understanding that each course in a graduate's program of study addresses the outcomes listed in Goals 1 and 2.

The *Senior Seminar Capstone Project* is used to assess each candidate's overall *growth* and *learning*. The Mathematics Seminar sequence is also used to instill (and assess) professional and ethical behavior in mathematics majors – UAS Competency #6.

Other items of Outcome 3A are not formally assessed; however, interaction with advisors and other Natural Science faculty serve to make majors aware of opportunities available to mathematics graduates.

Term projects in certain mathematics courses and the capstone project serve to assess Outcomes 3B and 3C.

4.4 – Student Resources and Opportunities

In order for the UAS mathematics B.S. degree to be accessible to a broad spectrum of students, a reliable source of academic assistance and the availability of financial aid and part-time employment or internship opportunities should be present. Information on financial aid and scholarships; discipline related part-time employment; and internship opportunities are obtained from appropriate UAS offices, the UAS Learning Center and other resources of relevance.

4.5 – Workloads, Opportunities and Availability of Resources for Faculty

The teaching effectiveness of the faculty is a function of the workload under which they operate. The UAS Mathematics Program is exclusively staffed by bipartite faculty members; formal duties include teaching and service. Institutional data is used to determine enrollment trends as well as faculty teaching loads.

Surveys of individual faculty members are used to determine whether the Mathematics faculty as a whole needs to increase or decrease their involvement in any particular important and program relevant area of service.

The availability of funding and opportunities for faculty development allow faculty the opportunity and ability to broaden their base knowledge, strengthen current skills, and share ideas with their peers.

Faculty will have access to adequate computers and appropriate software, and a frequently updated library collection in mathematics and statistics.

5 – Outline of Data Format and Content

The majority of the data identified below apply to five year Program Reviews.

5.1 – Course Summaries

Course summaries include enrollment and grade distribution statistics. These data are provided by UAS IR.

5.1.1 – Course Enrollments

Enrollment summaries for all courses offered by the UAS Mathematics Program are compiled by semester (Summer, Fall and Spring), academic year, campus (Juneau, Sitka and Ketchikan), and program overall totals. These summaries include:

- Enrollment headcounts (local courses, distance delivered courses and combined totals).
- Average class sizes (local courses, distance delivered courses and combined totals).

5.1.2 – Grade Distributions

Grade distribution summaries for all courses offered by the UAS Mathematics Program are compiled by semester, academic year, campus, and program overalls. These include:

- Grade distributions by percent (local courses, distance delivered courses and combined totals).

5.2 – Mathematics Majors and Minors

Qualitative and quantitative data are obtained from *entry interviews* of new majors, *exit interviews* of graduating majors, *student transcripts*, performance in the *mathematics senior seminar*, and *post graduation surveys*. The collection of these data is divided between the Program Coordinator and the Program Assessment Coordinator.

5.2.1 – Entry Interview of Majors

Qualitative data obtained from entry interviews of incoming majors include:

- Date of entry in the program, advisor assigned, and entry classification (high school, change of major/double major, or transfer).
- Intent (plans to complete BS degree at UAS, or plans to transfer to another school, career goals).

5.2.2 – Progress through Program of Study

In consultation with major advisors, the Program Coordinator maintains a tracking spreadsheet for mathematics majors.

5.2.3 – Exit Interview of Majors

Qualitative data obtained from exit interviews of graduating majors include responses to the following questions:

- What attracted you to the UAS mathematics program?
- What was your overall experience in the UAS mathematics program?
- Are there any changes you would recommend to the UAS mathematics program which would enhance the students' experience?
- Would you recommend the UAS mathematics program to a friend? Why?
- Would you be willing to respond to a short survey one year from now?
- If yes to the above, what is an effective way to contact you after graduation?

5.2.4 – Post Graduation Survey of Majors

Qualitative data obtained from post graduation interviews of recent graduates include responses to the following questions:

- Was the UAS mathematics program effective in preparing you for your current position?
- What do you perceive as being the main strengths and weaknesses of the UAS mathematics program?
- Are there any changes you might recommend to the UAS mathematics program which could have helped prepare you better for your current position?
- Would you still recommend the UAS mathematics program to a friend?

5.2.5 – Student Transcripts and Performance on Capstone Course

Information provided by these resources includes:

- Time of completion (from entry into program).
- Performance on core program course sequence.
- Brief appraisal of performance on Capstone course.
- G.P.A. on graduation.

5.2.6 – Mathematics Minors

Data on Mathematics Minors include:

- Academic year of graduation.
- Major program.

5.3 – Faculty Demographics

These data are provided by UAS IR. Data for current faculty, by academic year, include:

- Campus.
- Medium of instruction (distance, local, or both).
- Faculty name, gender and ethnicity.
- Status (tenure, tenure-track, term or adjunct/part-time).
- Rank (if applicable).
- Years experience in teaching.
- Start date of employment and years at UAS.
- Academic qualifications, discipline and degree awarding institutions.

5.4 – Faculty Productivity Data

The following include some of the data required for program self-studies for B.O.R. Institutional Program Reviews. These data serve to assess program faculty teaching workloads. Data are compiled by academic year and are provided by UAS IR or faculty surveys.

5.4.1 – Faculty Teaching

- Faculty headcount by campus, and by faculty classification.
- Full-time equivalent faculty (FTEF) by campus, and by faculty classification.
- Student credit hours generated (SCH) by campus, and by faculty classification.
- Average student credit hours per full-time equivalent faculty (SCH/FTEF) by campus, by faculty classification and by course level.
- Average class size by campus, faculty classification, and course level.
- Student/Faculty ratio.
- Comparative data from other programs/institutions when available.

5.4.2 – Faculty Service Activities

- University service summary.
- Community service summary.
- Other service.

6 – Appendices

6.1 – UAS General Student Competencies

UAS General Student Competencies

Computer and Technology Usage:	Students should have the knowledge to make efficient use of computers and information technology in their personal and professional lives because basic technological knowledge and skills apply to all fields and disciplines. Necessary skills range from a basic ability to use a keyboard through word processing concepts, spreadsheet and graphics applications to telecommunications, conferencing, and electronic mail technologies.
Information Literacy:	Competency in information literacy combines the skills of being able to 1) identify needed information; 2) locate and access the information; 3) analyze and evaluate the content; 4) integrate and communicate the information; and 5) evaluate the product and the process. Reading and writing literacies plus traditional library skills provide the foundation to access the vast availability of electronic information.
Communication:	College graduates should be able to write, speak, read, and listen effectively for a variety of purposes and audiences. Whether their aim is personal, academic, or professional, they should be able to communicate ideas and information effectively.
Quantitative Skills:	A quantitatively literate person is capable of analytical and mathematical reasoning. This individual can read and understand quantitative arguments, follow logical development and mathematical methods, solve mathematical and quantitative problems, perform mathematical calculations, express functional relationships, and apply mathematical methods. As a minimum, a student should know the mathematical techniques covered in the general education mathematical requirements.
Critical Thinking:	Competency in critical thinking reflects proficiency in modes of thought: conceptualizing, analyzing, synthesizing, evaluating, interpreting, and/or applying ideas and information. A critical thinker can approach a concept from multiple perspectives and frames of reference, compare and contrast ideas or models, and demonstrate a willingness to take intellectual risks. A critical thinker knows not only how but also when to apply particular modes of thinking. It should be noted that problem solving and analytical approaches may vary from discipline to discipline.
Professional Behavior:	Professional behavior is expected of college students. Success in professional life depends on many behaviors, including responsibility, good work habits, ethical decision making, recognition of the value of community service, and successful human relations.

6.2 – Curriculum Map for UAS General Student Competencies

Curriculum Map For UAS Competencies

Courses	General Ed. Requirements				Science Requirements		Required Mathematics Courses											Mathematics, Statistics, or other Approved Electives						
							Core Lower Div.				Appl.		Core Upper Div.			Seminar		Mathematics				Statistics		Other
	Communication GER: English and Speech	Humanities & Social sciences GER	Natural Sciences GER	Mathematics GER: MATH 107, or approved higher mathematics or statistics course.	8 Credits of General Physics (PHYS 103/104 or PHYS 211/212)	8 Credits Additional Science Courses (Selected from Biology, Chemistry, Environmental Science, Geology, Philosophy, or other approved courses)	MATH 200: Calculus I	MATH 201: Calculus II	MATH 202: Calculus III	MATH 215: Introduction to Proofs	STAT 273: Elementary Statistics	MATH 302: Differential Equations	MATH 311: Modern Algebra	MATH 314: Linear Algebra	MATH 324: Advanced Calculus	MATH 392: Junior Seminar	MATH 492: Senior Seminar	MATH 305: Geometry	MATH 410: Complex Variables	MATH 411: History of Mathematics and Science	MATH 460: Mathematical Modeling	STAT 373: Probability and Statistics	STAT 401: Regression and Analysis of Variance	STAT 400: Statistical Computing with R, and accepted upper division courses in other disciplines of the applied sciences.
Computer and Technology Usage	×	×	×	×	×	×	×	×	×		×	×		×		×	×	×			×		×	×
Information Literacy	×	×				×										×	×			×	×			
Communication	×			×			×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Quantitative Skills				×	×		×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Critical Thinking			×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Professional Behavior																×	×							

6.3 – Mathematics B.S. Degree Program Goals and Outcomes

Mathematics Program Goals and Outcomes

Goal 1: ***Competency in core subject content***		
	Outcome 1A:	(Introductory Level) Graduates will demonstrate skills in basic quantitative and analytic problem solving, and competency in basic undergraduate mathematics coursework.
	Outcome 1B:	(Developmental Level) Graduates will demonstrate an understanding of foundational theoretical concepts required to pursue further studies in mathematics.
	Outcome 1C:	(Mastery Level) Graduates will demonstrate an ability to extend and/or generalize foundational concepts, critically analyze and solve abstract problems in mathematics, and acquire a deeper understanding and appreciation of the subject.
Goal 2: ***Skills in Analysis, Application, and use of Technology***		
	Outcome 2A:	(Introductory Level) Graduates will have a broad awareness of the value of, and the ability to use technology as an aid to understanding and solving mathematical problems.
	Outcome 2B:	(Developmental Level) Graduates will have a broad awareness of the interdisciplinary connections and applications of mathematics.
	Outcome 2C:	(Mastery Level) Graduates will possess a strong foundation in utilizing skills and knowledge gained from mathematics and interdisciplinary courses to critically analyze and solve a wide variety of problems using theoretical or technological tools.
Goal 3: ***Professional Awareness, Ability to Conduct Independent Studies and Present Mathematical Ideas***		
	Outcome 3A:	(Introductory Level) Graduates will be aware of opportunities available to mathematics graduates, accepted ethical behavior within the mathematics community and associated professional responsibilities.
	Outcome 3B:	(Developmental Level) Graduates will be able to read, comprehend and communicate mathematical ideas, verbally and in writing, at the undergraduate level in a competent manner.
	Outcome 3C:	(Mastery Level) Graduates will display a high level of confidence and a degree of independence in pursuing further investigations in the mathematical sciences. Graduates must be able to communicate knowledge gained in writing and through class presentations at a level deemed appropriate by the mathematics faculty.

6.4 – Curriculum Map for Mathematics B.S. Degree Program Goals

Curriculum Map For Mathematics Program Goals

Courses	General Ed. Requirements				Science Requirements		Required Mathematics Courses											Mathematics, Statistics, or other Approved Electives						
							Core Lower Div.				Appl.		Core Upper Div.			Seminar		Mathematics				Statistics		Other
	Communication GER: English and Speech	Humanities & Social sciences GER	Natural Sciences GER	Mathematics GER: MATH 107, or approved higher mathematics or statistics course.	8 Credits of General Physics (PHYS 103/104 or PHYS 211/212)	8 Credits Additional Science Courses (Selected from Biology, Chemistry, Environmental Science, Geology, Philosophy, or other approved courses)	MATH 200: Calculus I	MATH 201: Calculus II	MATH 202: Calculus III	MATH 215: Introduction to Proofs	STAT 273: Elementary Statistics	MATH 302: Differential Equations	MATH 311: Modern Algebra	MATH 314: Linear Algebra	MATH 324: Advanced Calculus	MATH 392: Junior Seminar	MATH 492: Senior Seminar	MATH 305: Geometry	MATH 410: Complex Variables	MATH 411: History of Mathematics and Science	MATH 460: Mathematical Modeling	STAT 373: Probability and Statistics	STAT 401: Regression and Analysis of Variance	STAT 400: Stistical Computing with R, and accepted upper division courses in other disciplines of the applied sciences.
Outcome 1A: (Introductory Level)				I			I	I		I														
Outcome 1B: (Developmental Level)							D	D		D			D	D	D									
Outcome 1C: (Mastery Level)													M	M	M									
Outcome 2A: (Introductory Level)				I			I	I	I		I	I		I				I			I		I	I
Outcome 2B: (Developmental Level)			D	D	D	D	D	D	D		D	D								D	D		D	D
Outcome 3C: (Mastery Level)											M	M	M	M	M			M	M	M	M	M	M	M
Outcome 3A: (Introductory Level)																I								
Outcome 3B: (Developmental Level)												D	D	D	D	D	D	D	D	D	D	D	D	
Outcome 3C: (Mastery Level)												M	M	M	M		M	M	M	M	M	M	M	

6.5 – Sample Assessment Excerpts from Course Syllabi

Excerpts of assessment relevant content from sample course syllabi are given below. These illustrate the assessment phases of *introductory, developmental* and *mastery* level skills, referred to as *outcomes*, in each of the three *assessment goals* listed above.

100-Level Courses

Such courses are either remedial or developmental in nature, serve as GER course, or as prerequisites for subsequent courses. College algebra, which is a GER course, provides a means of assessing *quantitative skills* and *critical thinking*. These are two of the six *UAS competencies*. In college algebra and other 100-level courses students are introduced to fundamental concepts in mathematics needed for other disciplines and later mathematics courses.

MATH 107: College Algebra

Objectives: Math 107 students should develop an understanding of mathematical concepts and techniques which can be used to formulate and solve quantitative and analytic problems. These concepts and techniques, and the critical thinking their use requires, can be generalized to other academic disciplines and applied in professional careers.

Assessment of Competencies: *Quantitative skills* will be assessed by assignment of homework problems and examination questions that require a variety of mathematical techniques for their solution. *Critical thinking* will be *assessed* by assignment of homework and examination questions that require mathematical problem solving.

Assessment tools: These include homework assignments, semester tests and a comprehensive final examination, standardized for multi-section/multi-campus courses.

MATH 108: Trigonometry

Objectives: MATH 108 is a mathematics course which provides students with *analytical and quantitative skills* needed in a wide range of liberal arts, sciences, and educational careers. The course will help students gain an understanding of trigonometric functional relationships with their *real world applications* through symbolic, graphical, and numerical methods. The emphasis will be on *gaining perspective and understanding the mathematical concepts and principles* and the usage of a variety of *problem solving skills*. Students will be asked to *analyze problems, construct valid arguments, use acquired knowledge* and relationships to explain their reasoning, verify and interpret their results. They will *apply mathematical concepts and reasoning* to situations within and outside of this course.

Assessment tools: These include homework assignments, semester tests and a comprehensive final examination, standardized in case of multi-section/multi-campus courses.

200-Level Courses

Such courses include those which provide students with additional *preparation for upper level mathematics* as well as those which may be viewed as important *service courses for other disciplines*. The objectives of such courses vary, depending on the course in question. Excerpts from three typical 200 level courses, each serving a different purpose, are listed.

MATH 200: Calculus I

Objectives: This course is designed to give an *intuitive introduction* to Calculus. As you will see, the text is written in a formal definition-theorem-proof-example style. This is one of the classic Calculus texts and will serve as a good reference book. We will cover most of the sections in the first 6 chapters of the text. Subject matter includes limits, differentiation and integration of functions, as well as applications of differentiation and integration. A majority of class time will be spent introducing and discussing certain examples, *definitions*, *theorems* and *proofs*.

The main objectives of this course are to: Enhance your *mathematical intuition*; empower you with new approaches to *problem solving*; help you develop a *competency* in limits, differentiation and integration; and help you to have a great time as you acquire a taste for the calculus.

Assessment Tools: These include homework assignments, semester tests and a final examination.

STAT 273: Elementary Statistics

Objectives: Statistics 273 students should develop an *understanding of basic mathematical and statistical concepts* and *techniques* used to *analyze data*, *solve quantitative and analytical problems of a statistical nature*, and acquire the *ability to review, understand and discuss statistical reports in a critical and knowledgeable manner*.

Students will be assessed for *written (statistical) communication* and *quantitative skills*, *technology usage*, *problem solving* and *critical thinking*. Students should expect to *write observations about data*; *solve quantitative problems* that arise from the data using appropriate concepts introduced in this course; take advantage of, and *effectively use technology* where appropriate; and develop their *problem solving* and *critical thinking* skills.

Assessment Tools: These include homework assignments, semester tests, a final examination and/or a term project.

MATH 215: Introduction to Proofs

Objectives: This course is designed to give an introduction to *reading and writing proofs*. The main goals of this course are for students to acquire: enhanced *logic skills*; an understanding of the role and importance of *sentence structure in arguments*; an increased *competency in reading and writing proofs*; and an *appreciation* of the nature of upper division mathematics.

Assessment Tools: These include class presentations, homework assignments, semester tests and a final examination.

Upper-Division Courses

Such courses include *pure courses* intended mainly for students planning to pursue further studies in mathematics at the graduate level, as well as those courses having an *applications emphasis*. The later courses are fairly heavily attended by students from other majors in the Natural Sciences. The objectives of upper-division mathematics and statistics courses may vary. Excerpts from two upper-division mathematics courses are listed.

MATH 311: Modern Algebra

Objectives: After completing this course, the student will be able to

- *Define, recognize*, and give examples of different types of *algebraic structures*;
- State *basic properties* of various *algebraic structures*;
- Explicitly *identify* similarities and differences among various *algebraic structures* and to *illustrate* these similarities and differences with examples;
- *Demonstrate* enhanced *mathematical maturity* by *writing coherent proofs* of basic properties of various algebraic structures;
- *Demonstrate* enhanced *mathematical maturity* by verbally *presenting coherent explanations* of logical mathematical arguments; and
- Better *appreciate* the nature of mathematics and the need for an *axiomatic treatment of the subject*.

Assessment of Competencies: These include homework assignments, tests, and class presentations.

MATH 460: Mathematical Modeling

Objectives: Students with an emphasis in mathematics will learn of the *value of mathematics in other fields* and the *relevance of underlying physical or biological principals in the modeling process*. Students with an emphasis in the biological or physical sciences will be exposed to *mathematical methods and concepts* which will enable them to better *understand and solve mathematical modeling problems* they may encounter in their respective careers. The course will also *familiarize* students with the process by which a researcher may go about *seeking answers to questions encountered in the process of constructing mathematical models*.

Students will be assessed for *verbal communication*, *quantitative skills*, *technology usage*, *problem solving abilities*, *critical thinking*, and *writing ability*.

Assessment Tools: These include participation in classroom discussions, homework assignments, and the term project.