

## Mathematics

### Mission

The Mathematics Department at Western Oregon University is committed to the teaching of mathematics and the communication of mathematical ideas. Faculty members believe that both the assimilation of mathematical knowledge and the enhancement of one's capacity for mathematical reasoning are essential outcomes of a liberal arts education.

### Learning Outcomes

1. Demonstrate mastery of a body of mathematical knowledge and develop problem solving, modeling, and technological skills.
2. Demonstrate ability to make rigorous mathematical arguments, work with axiomatic systems, and precisely articulate (both in writing and orally) complicated and technical arguments (both mathematical and logical).
3. Understand the distinction between applied and theoretical mathematics, the connection between the two fields, and the breadth of each field.

#### *Extended Learning Outcomes for Majors & Minors*

Students will demonstrate:

1. Demonstrate mastery of a body of mathematical knowledge.
2. Problem Solving Skills - the ability to analyze complicated problems in a variety of subject areas, and to synthesize solutions to such problems.
3. Modeling skills - the ability to translate various real-world scenarios into mathematical models.
4. Technological skills –the ability to properly determine and effectively use computing tools and other technologies to solve problems and support conjectures.
5. Skilled use of Methods of Proof – the ability to make rigorous mathematical arguments including how to both prove and disprove conjectures. Includes working with axiomatic systems – the ability to determine if given examples satisfy the given axioms and the ability to demonstrate logical consequences of those axioms.
6. Communication skills – the ability to precisely articulate (both in writing and orally) complicated and technical arguments. These can be both mathematical and logical.
7. Subject Awareness - an awareness of the distinction between applied and theoretical mathematics, an appreciation of the connection between the two fields, and a reasonable perception of the breadth of each field.
8. Career awareness – an awareness of the career and educational opportunities for mathematics majors; this may include internship and undergraduate research experiences.

#### *Extended Learning Outcomes for pre-service and in-service K – 8 teachers*

Students will demonstrate:

1. Demonstrate mastery of a body of mathematical knowledge relevant for teaching at the K-8 grade level.
2. Problem Solving and Problem Writing Skills - the ability to create and understand complicated situations which are applications of K-8 mathematical topics and to apply learned skills and techniques to resolve them.
3. Ability to Model Problems – the ability to translate various real–world scenarios into mathematical models that can be explored by hands-on models, paper-and-pencil methods and technological applications where appropriate.
4. Communication Skills - Ability to precisely articulate (both in writing and orally) K – 8 mathematical topics in a way that is clear and understandable to elementary and middle school students.
5. Effective Classroom Management - Appreciation of a variety of pedagogical approaches and knowledge of an assortment of presentation and classroom working environments to effectively support the learning of mathematics for students with diverse learning styles.

#### *Mathematics Department Goals*

4. Facilitate the enhancement of mathematical knowledge, reasoning and problem-solving skills in comprehensive high-quality courses for majors, minors, future teachers and the general population.
5. Promote individual and collaborative learning; require comprehensive projects and integrate technology whenever applicable and appropriate.
6. Actively pursue and support campus and community outreach.

### **Program Description**

The Mathematics Department offers:

- Three majors

○ Mathematics (73 hrs)	○ Mathematics/CS (106-107 hrs)	○ Mathematics Education (65 hrs)
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- Two minors

○ Mathematics (25 - 27 hrs)	○ Mathematics Education (27 hrs)
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- Foundational series and problem solving course for all K – 8 Education Majors (15 hrs)
- Math Focus for Elem Ed (5 courses, each take 9 hrs) and MS Math Education (7 courses, each take 18 hrs)
- Graduate MS in ED math for 21 hr content core; inservice teachers (400/500: 6 summer and 3 AY courses)
- General Ed/service courses to satisfy the B.S. and B.A. graduation requirements (Math 105, 111, 243)
- Remedial Intermediate Algebra / Introductory Algebra: Math 099

Our classes are designed to be hands-on and engage the students in their learning process. Our classes give students the opportunity to learn about foundational mathematical ideas, current developments in mathematics and mathematics education and we strive to utilize effective pedagogical techniques at all levels.

### **Key Changes Since the 1997 Report**

- All tenure-track faculty new since 1997; all have Ph.D. in mathematics.
- New major courses: Math 280 and 351.
- Math 403 Senior Project capstone experience implemented.
- Updated and revised K – 8 Mathematics Focus program (2001 – 2005), New Math Ed minor (2005).
- MTCS 100 GE course no longer offered.
- Audience for summer MS courses for just secondary teachers has disappeared; we no longer offer these courses.
- 2003: Reinstated successful content core in MS Mathematics for MS in Ed program; rotating schedule of two 400/500 courses/summer and one each term during the academic year; some secondary MS in Ed attend.

### **Role within the University and Relationship to Other Programs**

- Offer undergraduate majors and minors
- Offer content courses for K – 8 undergraduate education majors
- Offer content courses for K – 8 graduate education majors
- Offer general education courses to fulfill the mathematics and statistics portion of the math/cs/statistics graduation requirements (Math 105, Math 111, Math 243 and the Math 211, 212, 213 series)
- Provide foundational mathematics course such as College Algebra, Trigonometry, Introduction to Probability and Statistics, Calculus, Discrete Mathematics for CS majors and Linear Algebra to support other majors.

### **Faculty and Staff**

#### *Tenure Track*

- Dr. Cheryl Beaver, Assistant Professor, Ph.D. in Mathematics, University of Arizona, Tucson, 1997
- Dr. Scott Beaver, Assistant Professor, Ph.D. in Mathematics, University of California, Davis, 2004
- Dr. Klay Kruczek, Assistant Professor, Ph.D. in Mathematics, Rutgers University, 2004
- Dr. Hamid Behmard, Associate Professor, Ph.D. in Mathematics, Oregon State University, 1999

- Dr. Laurie Burton, Associate Professor, Ph.D in Mathematics, University of Oregon, 1995
- Dr. Maria Fung, Associate Professor, Ph.D in Mathematics, Cornell University, 1999
- Dr. Michael Ward, Professor, Ph.D. in Mathematics, University of Utah, 1979

*Adjunct faculty*

- Ms. Catherine Aune, MST in Mathematics Education, Portland State University, 1970
- Ms. Amanda Blaker, MS in Mathematics, Oregon State University, 2005
- Mr. Stanley Leung
- Mr. Dennis Palanuk, M.S. Secondary Ed, Math, Pacific University, 1977.
- Mr. Dennis Spencer, Ed.M., minor mathematics, Oregon State University, 1965, MS Interdisciplinary Mathematics, University of Oregon, 1971

*Staff*

- Ms. Sharyne Ryals, Office Specialist I, also support staff for NS office.

**Students**

<b>MATHEMATICS DEPARTMENT</b>					
<b>Number of Majors, Minors, and Graduates by Academic Year</b>					
<b>Academic Year</b>	<b>Math Majors</b>	<b>Math/CS Majors</b>	<b>Minors</b>	<b>Math Graduates</b>	<b>Math/CS Graduates</b>
2001-2002	N/A	N/A	N/A	7	1
2002-2003	42	2	N/A	4	0
2003-2004	42	1	9	8	2
2004-2005	32	8	12	6	1
2005-2006	N/A	N/A	N/A	7	2
N/A = not available at this time					

*Examples of Outstanding Student Graduates from the Past Ten Years*

1. Students participating NSF-sponsored Research Experiences for Undergraduates (or similar programs): Sarah Hoffman (summer 2003, Trinity University), A. Brian Davis (summer 2004, Iowa State and summer 2005, Texas A & M), Olga Tkachyshyn (summer 2004, Texas A & M)
2. Students accepted for NSF-sponsored Research Experiences for Undergraduates: Keith Schloeman (summer 2006, Nebraska-Lincoln; Keith's spot was given to someone else due to a communication mix-up, completely the fault of the organizer)

3. Students giving talks at national or regional mathematics meetings: Jennifer Carmichael (2005 & 2006 Pacific Northwest Sectional Meeting of the Mathematical Association of American (PNW-MAA); 2005 & 2006 MathFest national MAA meeting; won a cash award both times), Avery Cotton (2006 MathFest), Lindsey Webster (2005 MathFest), A. Brian Davis (2005 PNW-MAA).
4. Students competing in the Consortium for Mathematics and Its Applications Modeling Contest: Jennifer Carmichael, A. Brian Davis and Ronald Grover (2005)
5. Mathematics students on the NASA MicroGravity Team: William Bowers, Avery Cotton and Mandy Martin

#### *Placement Testing*

- The Mathematics Department manages the administration of the computerized COMPASS placement test. UCS manages the technical components of the test. This is done on a per student basis throughout the academic year and in group sessions during SOAR and New Student Week. The Mathematics Office Specialist organizes and oversees the group sessions in the summer.
- Incoming WOU students: a) Take the BA graduation requirement, Mth 105, which has no prerequisite and no need for placement testing,, b) place into Mth 111 or 211 based on their SAT/ACT scores, c) place into Mth 251, 252 or 253 based on their AP calculus scores, d) transfer in prerequisite courses or e) take the COMPASS placement test to place into the correct Mathematics course.

#### **Resources** (*Facilities, Technology, Budgets etc*)

##### *Facilities*

- Mathematics is housed in Arnold Arms, from the current WOU Master Plan “Arnold Arms is in serious disrepair and is not economical to renovate.” Mathematics has been told that it will move into a remodeled DPSSST building by fall term 2008
- 3 designated classrooms for Mathematics in Arnold Arms

○ 101: cap 40, smart room	○ 104: cap 45, smart room	○ 202: cap 20, chalkboard and overhead
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- 7 tenure track faculty and 3 small adjunct offices in AA; 1 adjunct office in NS and 1 adjunct office in ITC.
- Mathematics Department office
- Mathematics copy room and Resource Center (mathematics manipulatives resources for student checkout)
- Testing center: Two computer stations for the Mathematics Placement Exam and three tables for paper and pencil exams. Located near Mathematics Office but not in line of sight of office specialist.
- Student study centers co-located with faculty offices on 2<sup>nd</sup> and 3<sup>rd</sup> floors. Study rooms each contain two UCS computer stations for student use. 3<sup>rd</sup> floor room has UCS student printer linked to 2<sup>nd</sup> and 3<sup>rd</sup> floor stations.
- Small printer and storage room, 2<sup>nd</sup> floor.

### *Technology*

- AA 101 and 104 are smart rooms with computer stations, projection systems and document cameras.
- U.S. Department of Education grant providing funds to update three rooms in NS to smart rooms shared by Math.
- Two department laptops (one used for sabbatical leaves), one scanner located in 3<sup>rd</sup> floor student study room.
- Computer in every office (tenure-track faculty, adjunct faculty, Mathematics Office)
- Network licenses: Maple (20 concurrent), Geometer's Sketchpad, Fathom, MatLab (10 concurrent).
- Individual licenses: Dreamweaver (11), Paintshop (1), Adobe Pro/PageMaker(6), Mathematica (2), MatLab (2)
- 3<sup>rd</sup> floor faculty printer in Mathematics Office, 2<sup>nd</sup> floor faculty printer in printer/storage room.
- Graphing calculators (20; provided free of charge by TI in connection with TI use in our classrooms).

### *Resources*

- 2005-2006 Mathematics budget is \$5500, previous two academic years each \$5000
- Math Ed Lab fee (Mth 211, 212, 213: \$2/student, Mth 391 - 6, 492, 494, 495: \$3/student).
- Division travel: \$7000/year, as of 04-05, for approximately 32 NSM tenure track and 0.5 FTE or higher adjuncts.
- Faculty Development Travel and Research funds
- Library and Media Services: 05-06 budget—Library Serials: \$1,491.22, 05-06 budget—Library Books: \$2963.14. K – 12 Mathematics Education holdings at WOU excellent. Mathematics holdings at WOU good. Access to multiple holdings through SUMMIT excellent. Occasional computer lab access for classes (HL 108) good.

### *Mathematics Budget Expenditures*

- Annual memberships (MAA, PME, PRIMUS journal, faculty MatLab license renewal), software and computer peripherals purchases, office furniture for new faculty, office supplies, manipulatives (pre 2005), pay for student graders, annual Sonia Kovalevsky Day costs, refreshments for presentations.

### *Mathematics Education Lab Fee Expenditures (2005 and continuing)*

- Annual memberships (Math Forum), Manipulatives and other student supplies.

## **SWOT Overview and the Future**

### *Three Primary Strengths*

1. Math majors have research-like experiences via small group presentations and individual capstone projects, all of which involve significant independent study guided by faculty, oral presentations, and a written paper.
  - Action Plan: Coordinate small group presentations to ensure that all majors participate in two or more small group presentations. Continue the capstone project as a graduation requirement.
2. Middle school mathematics and elementary mathematics education courses exceed national recommendations for content, breadth and pedagogical approach.
  - Action Plan: Continue to review and improve courses to maintain effective pedagogical approaches; continue to work with COE to maintain close-knit working relationship.
3. Seven tenure-track faculty, new to WOU since 1997, all dedicated to student success in the areas of mathematics and mathematics education and all very active professionally.
  - Action Plan: Continue to support faculty growth in various professional development programs.

### *Three Primary Challenges*

1. Incoming WOU students unprepared for college level mathematics courses.
  - Action Plan: Offer Math 099, open evening tutoring lab, advertise day and evening tutoring options
2. Loss of tenure track faculty from 9 (pre 1997) to 7 (current) creates over reliance on adjunct teaching.
3. Attracting more mathematics majors.

### *Looking Ahead to the Future*

Communicate assessment plans and actions, engage in regular program review

### **List of Supplemental Materials**

- Course guides for majors and minors
- Focus area guides for K – 8
- Web pages for:
  - Math
  - Advanced Placement, Placement Testing, Succeeding in Math
  - Degree Plans
  - Advising for degrees
  - Math club, news & activities, outreach programs such as Sonia Kovalevsky Day
  - MS in Ed Content Area
  - Every faculty member (tenure track and adjunct)

- Vitas for every faculty member (tenure track and adjunct)
- Catalog pages:
  - Graduation requirements (general education requirements)
  - Majors and minors

## Unit Assessment Plan

**Primary assessment contact:** Michael Ward, Klay Kruczek

**I. Statement of unit mission:** The Mathematics Department at Western Oregon University is committed to the teaching of mathematics and the communication of mathematical ideas. Faculty members believe that both the assimilation of mathematical knowledge and the enhancement of one's capacity for mathematical reasoning are essential outcomes of a liberal arts education.

The department mission statement has been approved by the Office of Institutional Research, so we assume it is aligned with and supportive of the University Mission and Institutional Aspirations for Learning.

## II. Unit intended objectives/outcomes:

**a.** Demonstrate mastery of a body of mathematical knowledge and develop problem solving, modeling and technological skills.

**b.** Demonstrate ability to make rigorous mathematical arguments, work with axiomatic systems, and precisely articulate (both in writing and orally) complicated and technical arguments (both mathematical and logical).

**c.** Understand the distinction between applied and theoretical mathematics, the connection between the two fields, and the breadth of each field.

### 1. Academic Affair Goal 2:

a. Track student retention in 100 and 200 series level mathematics courses

b. Increased proficiency in K-8 mathematics topics for students enrolled in mathematics 211-212-213 courses

c. The Mathematics Department will identify potential mathematics majors and minors

### 2. Academic Affair Goal 3

Not applicable at the department level.

### 3. Academic Affair Goal 4

Not applicable at the department level.

### 4. Academic Affair Goal 5

The mathematics department will serve as a resource for the surrounding community, region, and state.

## III. Tactics for achieving the objectives:

Unit intended objectives/outcomes



- a. Problem solving is inevitable in any mathematics course; we are reviewing and developing our tactics for modeling and technological skills (see “Self-study” below in IV).
- b. Senior Capstone Project, class presentations, critiques of written arguments and expository writing in all classes
- c. Under review and development (see “Self-study” below in IV).

#### **Academic Affair Goals**

- 1a. The mathematics department will collect data on student progress in 100- and 200- level courses
- 1b. The mathematics department will continue to deliver skills tests in 212 and 213
- 1c. The mathematics department will continue to present students with up-to-date information on course offerings and program changes and well-defined degree plans
- 4. The mathematics department will continue to support the Mathematics Club, the Pi Mu Epsilon Student Chapter, and innovative outreach programs (such as NSM Career Days, Sonya Kovalevsky Day, Pi Day, WAMS)

### **IV. Basic approach for assessing our unit intended objectives/outcomes**

Self-study: This year the Mathematics Department is conducting a thorough self-study, complete with a visit by three outside consultants in late February. Our intent is to thoughtfully develop an assessment plan as part of our written self-study document. Until the document is finished and we have feedback from the consultants, it is premature to list detailed tactics, assessment approaches and benchmarks, other than some fairly obvious ones which are already in place. In other words, we want to develop those in tandem with an overall review of our program. Therefore, in this document, we often write “(under development)” pending completion of the self-study.

#### **A. BENCHMARKS FOR SUCCESS:**

##### **Unit intended objectives/outcomes**

- a. Senior Capstone Presentation (video tape and thesis); Exit exam (PRAXIS, GRE, or ETS Major Field Test, depending on post graduate plans); Final exams; Conferences/Academic Excellence Day presentations; projects – problem solving using technology
- b. Senior Capstone Project (video tape and thesis); Exit exam (PRAXIS, GRE, or ETS Major Field Test, depending on post graduate plans); Final exams; Essays from writing intensive courses; Conferences/Academic Excellence Day presentations;
- c. Exit interviews with graduating seniors

#### **Academic Affair Goals**

- 1a. through 4-under development

### **B. RELEVANT QUANTITATIVE AND/OR QUALITATIVE EVIDENCE:**

##### **Unit intended objectives/outcomes**

Evidence for Objective a: Successful Senior Capstone Presentation (video tape and thesis); Successful completion of a Senior Capstone Project; in the future, scores on the exit exam (PRAXIS, GRE Subject Test, or ETS Major Field Test, depending on post graduate plans)

Evidence for Objective b: Successful Senior Capstone Presentation (video tape and thesis); Successful completion of a Senior Capstone Project; in the future, scores on the exit exam (PRAXIS, GRE Subject Test, or ETS Major Field Test, depending on post graduate plans)

Evidence for Objective c: Exit interviews with graduating seniors

#### **Academic Affair Goals**

1a. through 4-under development

**C. MISCELLANEOUS DATA COLLECTION ISSUES:** *Any special issues regarding data collection and instrument design, as well as pertinent timelines, procedures and stakeholders:*

#### **D. ANALYSIS & INTERPRETATION OF EVIDENCE**

#### **E. RESULTS AND REPORTS**

Next winter we will submit our self-study report and the report of the outside evaluators. That is the first phase of our unit assessment.

After that, we will be in a position to file a more complete version of this planning document.

#### **F. FOLLOW-UP AND CONTINUOUS IMPROVEMENT: THE FEEDBACK LOOP**