



Undergraduate Studies
in
Applied Mathematics
for the Life and Social Sciences

catalog year 2009 and beyond

PREPARE TO MAKE A DIFFERENCE

School of Human Evolution & Social Change¹

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REGENTS' PROFESSOR

BUIKSTRA, CASTILLO-CHAVEZ, CLARK

PROFESSORS

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ASSOCIATE PROFESSORS

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ASSISTANT PROFESSORS

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ASSOCIATE RESEARCH PROFESSORS

SIMON, SUGIYAMA

Description:

Applied Mathematics for the Life and Social Sciences is a new and rapidly developing cross-disciplinary field that investigates and integrates complex areas of the physical, life and social sciences. A cardinal objective of this program is to offer students the opportunities to develop purposeful competencies in mathematics as well as an appreciation for the contributions of mathematics to the fields of sciences, engineering, business, government, economics; and the power of critical thinking. The students are taught how to use theories and techniques such as mathematical modeling and computational methods to resolve real world practical problems. They will also be engaged in a coursework directed towards an understanding of mathematical theory and its relation to other fields of studies which includes an emphasis on precision of definition, reasoning to accurate conclusions, and an analyzing and developing solutions to problems using mathematical principles. Therefore, AMLSS-BS is a challenging, but fun, curriculum that will prepare a new generation of students to pursue advanced degrees in mathematical, life or social sciences. The focus of this degree is acquiring a life-long learning philosophy that will prepare students to become first-rate scientists and important agents of change in the shrinking global village.

¹ Last updated 08/17/09

After entering the program students are assessed in their courses (exams, presentations, research papers, special assignments). By the end of the program a student will have attained the following learning goals:

- Understand and apply core concepts, principles and models in applied mathematics for the life and social sciences;
- Understand and apply methodologies in interdisciplinary research;
- Understand and implement basic quantitative analysis tools;
- Develop the necessary communication skills, both written and oral, for successful professional practice and career advancements;
- Know how to participate effectively as a member of an interdisciplinary science team; and
- Abide by the values and ethics of the scientific profession.

Students in the field direct their studies towards professions in education, government, or the private sector. For example, graduates directed towards careers in education must have a basic knowledge of how to teach, and write, and should be prepared to apply to graduate schools. Graduate directed towards the private sector and government must ensure high performance in communications and collaborative skills.

B.S. Applied Mathematics for the Life and Social Sciences (AMLSS)

The major consists of a minimum of 39 semester hours. At least **12 credit** hours must be taken in residence at ASU's Tempe Campus and **at least 18** of the 39 hours must be upper-division. In addition to required courses, students select the remaining electives from the list approved courses. Other elective courses will be evaluated for suitability to count towards the major by the Executive Committee with the assistance of the School of Human Evolution and Social Change's Undergraduate Advising Office.

I. REQUIRED COURSES (27 credits)

- a. Intro Course
- b. Modeling Course
- c. Life Science Courses (2)
- d. Social Science Courses (2)
- e. Applied Math Courses (2)
- f. Capstone Seminar

II. MAJOR ELECTIVE COURES (12 credits)

*******THIS GUIDE IS NOT A CONTRACT FOR GRADUATION*******

The emphasis of this guide is to provide an outline of university general studies requirements, the College of Liberal Arts & Sciences requirements and Global Health requirements. Always consult the catalog for exact requirements: www.asu.edu/catalog.

*******THE GENERAL CATALOG FOR YOUR YEAR IS ALWAYS RIGHT*******

Students must complete a **minimum** of 120 credit hours to graduate. Of those hours only 64 can be from a two-year institution (community college). Also, 45 credits must be upper division (300 or 400 level) courses. In addition to ENG 101 & 102, students must complete MAT 119 or higher.

Course work in global health completed at other institutions will be evaluated by the SHESC Undergraduate Advisor. The College of Liberal Arts and Sciences requires that **transfer** students **complete** at least 12 hours of upper-division course work at ASU in the School of their major in order to be eligible for graduation.

In addition to a cumulative GPA of 2.00 or higher, all Global Health students must obtain a minimum grade of "C" in all upper- and lower-division SSH courses and all courses in related fields.

Consultation with the Undergraduate Advisor and a faculty mentor in the School of Human Evolution & Social Change is recommended each semester. The Undergraduate Advisor is located in SHESC 233.

GRADUATION REQUIREMENTS
College of Liberal Arts & Sciences students must satisfy the following to graduate:

- 1) University General Studies Requirements
- 2) College of Liberal Arts & Sciences Requirements
- 3) B.S. in Applied Mathematics for the Life and Social Sciences Requirements

1) Meeting the University General Studies Requirement:

A minimum of 35 semester hours plus the First-Year Composition requirement is required. Courses that fulfill the First-Year Composition requirement are ENG 101 & 102; or 105; or 107 & 108 (WAC 101 or 107 is also required in some cases).

The Five General Studies Core Areas: A single course cannot be used to satisfy two core area requirements, even if it is approved for more than one core area.

- Literacy and Critical Inquiry (**L**) – 6 semester hours with at least 3 upper-division credits.
- Mathematical Studies **MA** and **CS** Requirement – 3 semester hours **MA** and at least 3 semester hours **CS**. CLAS majors require a "C" minimum in the MA area.
- Combined **HU** and **SB** Requirement -15 semester hours, 6 semester hours must be taken in one of these two core areas and 9 hours in the other core area; and 3 of the 15 semester hours must upper-division.
- Natural Science-Quantitative (**SQ**) and Natural Science-General (**SG**) - 4 semester hours **SQ** and 4 semester hour **SQ** or **SG**.

Awareness Areas: A single course may be used to satisfy one core area and/or a maximum of two awareness area requirements. Students **must complete** courses that satisfy each of the **three awareness areas:** *Cultural Diversity in the United States (C)*, *Global Awareness (G)*, and *Historical Awareness (H)*.

General Studies course lists are available in the ASU General Catalog, the Schedule of Classes and on the web at http://catalog.asu.edu/ug_gsr

2) Meeting the College of Liberal Arts and Sciences Graduation Requirement:

a. Students pursuing BS degrees in the college must complete six semester hours (two courses) of "Science and Society" courses. Students should consult with an advisor in the department or school of their major for a list of appropriate courses. For a list of science and society courses as well as more information on requirements, go to: <http://clas.asu.edu/students/degreerequirements/scienceandsociety.htm>

b. All students are required to take a minimum of MAT 119 or higher. A grade of "C" (2.00) or higher must be earned in the chosen mathematics course.

3) Meeting the School of Human Evolution & Social Change Requirements for the B.S. in Applied Math for the Life and Social Sciences:

I. REQUIRED CORE COURSES (27 credits)

a. Intro Course

AML 100 Introduction to Applied Mathematics for the Life and Social Sciences (3)

b. Modeling Course

AML 253 Modeling in the Life and Social Sciences (3)

c. Life Sciences (choose at least two)

BIO 320 Fundamentals of Ecology (3) L
BIO 321 Introductory Ecology Laboratory (2)
BIO 336 (Could not find in catalog)
BIO 406 Computer Applications in Biology (3) CS
BIO 410 Techniques in Wildlife Conservation Bio (3) L
BIO 411 Quantitative Conservation Biology (3)
BIO 415 Biometry (4) CS
BIO 417 Experimental Design (3)
BIO 424 Mathematical Models in Ecology (4)
BCH 361 Principles of Biochemistry (3)
BIO 423 Population and Community Ecology (2-3)
BIO 455 Introduction to Comparative Genomics (3)
BIO 456 Bioinformatics and Molecular Evolution (3)
BIO 469 Computational Neuroscience (4)

d. Social Sciences (choose at least two)

GCU 495 Quantitative Methods in Geography (3) CS
GCU 496 Geographic Research Methods (3) L
GPH 370 Geographic Information Technologies (3) CS
GPH 371 Intro to Cartography and Georepresentation (3) CS
GPH 483 Geographic Information Analysis (3)
ASM 345 Disease and Human Evolution (3)
ASM 465 Quantification and Analysis for Anthropology (3)
JUS 301 Research in Justice Studies (3) SB
JUS 302 Basic Statistical Analysis in Justice Studies (3) CS
POS 301 Empirical Political Inquiry (3) SB
POS 401 Political Statistics (3) CS
POS 485 Political Economy (3) SB
SOC 331 Environmental Sociology (3) SB & G
SOC 390 Social Statistics (3) SB & G
SOC 391 Sociological Research (3) L or SB
SOC 433 Applied Demography (3) SB
SOC 448 Epidemics and Society (3 SB & G)
ECN 384 Economics of Social Behavior (3) SB

e. Applied Mathematics (choose at least two)

MAT 300 Mathematical Structures (3) L
MAT 371 Advanced Calculus (3)
MAT 451 Mathematical Modeling (3)
MAT 343 Applied Linear Algebra (3)
MAT 351 Mathematical Methods for Genetic Analysis (3)
MAT 355 Intro to Computational Molecular Bio (3)
MAT 362 Adv Math for Engineers and Scientists (3)

f. Capstone Course

AML 406 Direct Reading and Research in Applied Mathematics for the Life and Social Sciences (3)

II. MAJOR ELECTIVE COURSES (12 credits)

Students have the flexibility of taking the remaining 12 credit hours in any combination of the life sciences, social sciences, applied math (listed above) and/or mathematics education listed below. **Suggested courses for students interested in focusing in one area are listed below.**

i. Life Science

1. 1-4 additional life science courses from “c” above and/or any other courses from the list above

ii. Social Science

1. 1-4 additional social science courses from “d” above and/or any other courses from the list above

iii. Applied Math

1. At least two additional applied mathematics courses from “e” above
2. One probability course (highly recommended)
STP 421 Probability (3)
3. One statistics course (highly recommended)
STP 420 Introductory Applied Statistics (3) CS

iv. Mathematics Education Courses*

MAT 371 Advanced Calculus (3)
MAT 451 Mathematical Modeling (3)
MAT 343 Applied Linear Algebra (3)
MAT 351 Mathematical Methods for Genetic Analysis (3)
MAT 355 Intro to Computational Molecular Bio (3)
MAT 362 Adv Math for Engineers and Scientists (3)

1. One probability course (highly recommended)
STP 326 Intermediate Probability (3) CS or STP 421 Probability
2. One statistics course (highly recommended)
*STP 226 Elements of Statistics (3) or
STP 231 Statistics for Life Sciences (3) CS or
STP 420 Introductory Applied Statistics (3) CS*

* The College of Teacher Education and Leadership offers concurrent degree programs in Secondary Education along with Math, Chemistry, Biology, Physics, English, Spanish, or

History. Their BS/BA and BAE concurrent degree programs provide students with an incredible undergraduate experience and greater employment options and marketability when they graduate. They'll be prepared to teach in grades seven through twelve and will be eligible to apply for secondary teacher certification in Arizona. Pursuing a concurrent degree program will also prepare students for graduate school in various fields of study. **Students interested in Mathematics Education should consult with an advisor in the College of Teacher Education and Leadership Advising, Recruiting, and Retention Office.** Their website is <http://education.asu.edu> or you may call 480-965-5555.

In addition to completing the degree, students must also take the following pre-requisite courses:

*CSE 100 Principles of Programming with C++ (3) CS **OR**
CSE 110 Principles of Programming with Java (3) CS*

*BIO 187 General Biology I (3) SQ *
BIO 188 General Biology II (3) SQ*

*MAT 270 Calculus with Analytic Geometry I (3) MA
MAT 271 Calculus with Analytic Geometry II (3) MA
MAT 272 Calculus with Analytic Geometry III (3) MA
MAT 274 Elementary Differential Equations (3) MA
MAT 275 Modern Differential Equations (3) MA
MAT 342 Linear Algebra (3) or MAT 343 Applied Linear Algebra (3)*

*BIO 187/188 needed to take upper-division Life Science Courses

**Students should take SOC 101, ASB 102, PSY 101, POS 101, or any other intro Social Science Course to be able to take upper-division electives in the Social Science track