

Department of Mathematics

**Undergraduate Student
Handbook 2010-2011**



UCSD Department of Mathematics
Undergraduate Student Handbook
Revised April 2010

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Introduction

Pursuing a Bachelor's Degree in Mathematics

Mathematics is the science of numbers and the relations between them. The philosopher Gauss called mathematics the "Queen of Sciences". Mathematics provides powerful intellectual tools that have led to tremendous advances in modern science and technology.

The Mathematics Department provides courses of study that introduce students to the fundamentals of mathematics. This allows them to master the most important parts of the discipline, both pure and applied.

Upon completion of a Bachelor's Degree in Mathematics you will have numerous career opportunities available to you. Mathematics is applicable to research, teaching, computing, accounting, actuarial science, operations research, engineering and medicine as well as to a variety of other areas.

The purpose of this handbook is to introduce you to the UCSD Mathematics Department and the special opportunities that we offer. If you have any questions regarding the contents of this handbook please contact the Math Advising Office located in AP&M 6016, 858 534 6009.

Pure or Applied Mathematics?

The increasing use of mathematical ideas in many disciplines has somewhat blurred the distinction between "pure" and "applied" mathematics. The application of fundamental mathematical results to a broad range of disciplines has contributed significantly to important advances in many fields.

Recent breakthroughs in physics, chemistry and astronomy have relied heavily upon mathematical ideas and the biological sciences increasingly make use of mathematical models. Mathematics is being utilized more and more in the social sciences, particularly in economics and psychology, and is the foundation for actuarial science. There are substantial interactions between computer science and mathematics and the exchange of ideas between these two disciplines has been extraordinarily fruitful. Statistics and mathematics have long benefited from considerable cross-fertilization.

Mathematical ideas have become indispensable to an impressive number of disciplines, and this list is increasing.

Visit our website at <http://math.ucsd.edu>

History of the UCSD Mathematics Department

The history of UCSD as an outgrowth of the Scripps Institution of Oceanography is documented in the book "An Improbable Venture", but there is little to be found there about the Mathematics Department.

UCSD admitted its first undergraduate students in 1964, the year after the Mathematics Department was formed. The founder of the Department was Stefan E. Warschawski, a complex analyst who had been Chair at the University of Minnesota. The Department's special fixed term Visiting Assistant Professorship, the first appointment to which was made in 1980, is named in his honor.

The department was originally housed in Urey Hall on the Revelle campus, and moved to what was called Building 2A-2A (now labeled the Applied Physics & Mathematics Building) on the Muir campus in July 1969.

The department offices currently occupy the 6th and 7th floors of AP&M in addition to parts of the 2nd and 5th floors with computing laboratories and a Calculus Lab in the basement (B402A).

Undergraduate Services

Math Advising Office

A departmental advisor is available to speak to mathematics majors and potential mathematics majors regarding course selection and progress towards a degree. If you have any questions or concerns please contact the Math Advising Office:

Advisor: AP&M 6016

Office Hours: Mon - Fri 10am-noon; 1:00pm-3:00pm

Tel: 858 534 6009

Email: mathadvising@math.ucsd.edu

Undergraduate Affairs Office

The Mathematics Department's Undergraduate Affairs Office is located on the 7th Floor of AP&M and provides services to undergraduate students. For example, you would contact the Undergraduate Affairs Office if you:

- had a question about a particular math course (such as the text used for Math 20A)
- needed to know how to get into a math class that is full
- wanted to know if the math you took at another college would transfer to UCSD
- needed to turn in any petitions related to the Mathematics Department.

Undergraduate Affairs Office: AP&M 7018

Office Hours: Mon - Fri 8:00am - 4:00pm

Tel: 858 534 3590

Fax: 858 534 5273

Email: frdesk@math.ucsd.edu

..... or - take the stairs or the elevator to the 7th floor in AP&M and you are there!

UCSD Tritons for Mathematics

The UCSD Tritons for Mathematics is an alumni association. Membership is open to graduates of the UCSD Department of Mathematics. The mission of this alumni organization is to support students, research and programs in mathematics, as well as to provide opportunities for social, professional and business contacts among the membership. The organization is a great way to keep in touch with friends, make new ones, and find out what Mathematics alumni are doing.

<http://www.math.ucsd.edu/alumni/>



UCSD Math Club

The UCSD Math Club provides opportunities for UCSD students to find out about internship and career opportunities. The club organizes social and professional networking events, community service projects and invites speakers to seminars. All mathematics majors are encouraged to participate in club activities early in their undergraduate careers. Visit the UCSD Math Club web site to learn more:

<http://math.ucsd.edu/~mathclub/>

Career Services

The Mathematics Department has several career related services available to Math Majors: Career Seminars, information on career opportunities (including internships), career insight and counseling specific to math majors, and information about graduate school.

Career Seminars for Math Majors

Sponsored by the UCSD Math Club, the Career Seminars for Math Majors enable alumni and current math students to interact. Typically the seminars consist of two to three speakers, preferably drawn from the math department alumni base.

The benefit of the seminars for math majors is to hear, first hand, the kinds of positions held by math graduates. The invited speakers are drawn from a broad range of career fields.

These Career Seminars are typically held in fall (October/November) and spring (April/May). See the Math Club web site events calendar for more details:

<http://math.ucsd.edu/~mathclub/>

Information on Career Opportunities

The Mathematics Department has information about career opportunities for people with a degree in mathematics. Stop by the Math Advising Office and take a look at this information. In addition we have information on internships for math majors. We are always receiving new materials and deadlines vary, so we advise looking at this information regularly.

Internship information is also available through the Academic Internship Program (AIP - <http://aip.ucsd.edu/>), which maintains a list of internships relevant to mathematics for the summer and the academic year. AIP offers students the opportunity to acquire valuable work experience related to academic and career interests. Academic credit is available for these internships. Undergraduate internships are strongly encouraged. See a Math Department Advisor and the AIP office for information and guidance. AIP - Literature Building, Warren College, Room 210, 858 534 4355, aipwebmaster@ucsd.edu.

The Career Services Center offers career guidance and placement services to all UCSD students. Career counselors are available to assist you in your career exploration and job search. The Career Resources Library, located in the Career Center, offers information regarding possible careers, as well as information regarding graduate school. The Campus Interview Program brings employer representatives to UCSD to discuss career opportunities with students. For more information please contact the Career Services Center, 858 534 3750, <http://career.ucsd.edu/>.

Some useful Web sites

Careers in Mathematics
www.msri.org/ext/CareersInMathematics.html

The Math Forum@Drexel
<http://mathforum.org>

Mentor Net
www.mentornet.net

Sloan Career Cornerstone
www.careercornerstone.org/math/math.htm

Young Mathematicians Network
www.youngmath.net

American Mathematical Society www.ams.org

American Physical Society www.aps.org

American Statistical Society www.amstst.org

Association for Computing Machinery www.acm.org

Association for Women in Mathematics www.awm-math.org

Institute for Operations Research and the Management Sciences
www.informs.org

Mathematical Association of America www.maa.org

Soc. for Industrial & App Mathematicians www.siam.org

Society for Mathematical Biology www.smb.org

Career Insight and Counseling

A college graduate with a bachelor's degree in mathematics can qualify for a broad range of highly paid positions in business, industry, government and education. Companies in the computer and communications industries employ many mathematicians as do oil companies, banks, insurance companies and consulting firms.

Almost every bureau and branch of the federal government employs mathematicians in some capacity. Mathematicians, statisticians, operations researchers and actuaries work in the Department of Health and Human Services, the General Accounting Office, the Office of Management and Budget and the National Institute of Standards. The Department of Energy, the Department of Defense, the National Aeronautics and Space Administration and the National Security Agency also employ many mathematicians.

University and college teaching and research have always attracted many mathematicians. In most four-year colleges and universities a PhD is necessary for full faculty status. Many mathematicians with a bachelor's or master's degree teach at the K-12 level and junior college.

Many other job titles apply to mathematicians who have specialized in an applied branch of mathematics. Actuaries assemble and analyze statistics to calculate probabilities and thereby set rates in the insurance industry. Operations Research Analysts apply scientific methods and mathematical principles to organizational problems. Statisticians design, carry out and interpret the numerical results of surveys and experiments. All of these careers begin with an education in mathematics and a curiosity about the use of mathematics to solve problems. We currently have UCSD graduates working in each of these fields.

The study of mathematics teaches one how to think, analyze and problem solve in an organized and disciplined manner. Employers are aware that mathematics is a serious discipline and the following table shows that this translates into a superior track record when math majors enter the work force.

Alumni Information

Our Alumni are a national and international group with diverse job titles. They include:

* Geoscientist, Canberra Australia * Math Department Head, Caracas Venezuela * Assistant Professor, Mangilao Guam
* Actuary, Denver Colorado * Subcontract Administrator, San Diego California * Research Fishery Biologist, Auke Bay Alaska * Software Engineer, Point Loma California

... but they all have one thing in common - they are graduates from UCSD.

U.S. Department of Labor Wage Statistics
Bureau of Labor Statistics, Occupational Outlook Handbook
www.bls.gov

Mathematicians need good reasoning ability and persistence in order to identify, analyze and apply basic principles to technical problems. Communication skills are important as mathematicians must be able to interact and discuss proposed solutions with people who may not have an extensive knowledge of mathematics.

Other occupations that require extensive knowledge or a degree in mathematics include actuaries, statisticians, computer programmers, computer systems analysts, database administrators, computer scientists, computer software engineers and operations research analysts. A strong background in mathematics also facilitates employment as teachers - postsecondary, preschool, kindergarten, middle, elementary and secondary; engineers, economists, market and survey researchers; financial analysts and personal financial advisors; and physicists and astronomers.

For jobs in applied mathematics, training in the field in which the mathematics will be used is very important. Mathematics is used extensively in physics, actuarial science, statistics, engineering and operations research. Computer science, business and industrial management, economics, finance, chemistry, geology, life sciences and behavioral sciences are likewise dependent on applied mathematics. Mathematicians also should have substantial knowledge of computer programming because most complex mathematical computation and much mathematical modeling are done on computers.

Definitions of Occupations and Industries with highest level of employment:

Bureau of Labor Statistics, Occupational Outlook Handbook
www.bls.org

Mathematicians

Conduct research in fundamental mathematics or in application of mathematical techniques to science, management, and other fields. Solve or direct solutions to problems in various fields by mathematical methods.

Industries: Federal government, Scientific research & development services, Management & technical consulting services, Colleges & universities, Aerospace product & parts manufacturing, Scientific research & development services, Computer systems design & related services.

Mathematical Technicians

Apply standardized mathematical formulas, principles and methodology to technical problems in engineering and physical sciences in relation to specific industrial and research objectives, processes, equipment and products.

Industries: Insurance carriers, State government, Scientific research & development services, Colleges and universities, Management & technical consulting services, Electronic instrument manufacturing, Architectural & engineering services.

Operations Research Analysts

Formulate and apply mathematical modeling and other optimizing methods using a computer to develop and interpret information that assists management with decision making, policy formulation, or other managerial functions. May develop related software, service or products. Frequently concentrates on collecting and analyzing data and developing decision support software. May develop and supply optimal time, cost or logistics networks for program evaluation, review or implementation.

Industries: Computer systems design & related services, Insurance carriers, Management & technical consulting services, Federal & State Government.

Statisticians

Engage in the development of mathematical theory or apply statistical theory and methods to collect, organize, interpret and summarize numerical data to provide useful information. May specialize in fields such as bio-statistics, agricultural statistics, business statistics, economic statistics or other fields. Include mathematical statisticians.

Industries: Federal government, Scientific research & development services, State government, Colleges & universities, Insurance carriers.

Mathematics Teachers, Postsecondary

Teach courses pertaining to mathematical concepts, statistics and actuarial science and to the application of original and standardized mathematical techniques in solving specific problems and situations. Include both teachers primarily engaged in teaching and those who do a combination of both teaching and research.

Industries: Colleges & universities, Junior colleges, Technical & trade schools, Business, computer & management training.

Math Teachers, Secondary

Instruct students in secondary public or private schools in one or more subjects at the secondary level. May be designated according to subject matter speciality such as typing instructor, commercial teachers or Math teachers. Excludes Special and Vocational Education Teachers.

Industries: Elementary & secondary schools, Employment services, Other schools & instruction, Local government, State government.

Graduate School Information

All undergraduates contemplating future graduate study in pure or applied mathematics should enroll in the Mathematics or Applied Mathematics majors. Some courses are only offered in the fall quarter. Similarly others are offered only in the winter or spring quarters. Please plan ahead (see Creating Your Quarter by Quarter Plan on p.33 of this handbook).

Successful graduate work in mathematics requires skills in formal reasoning and in constructing rigorous mathematical proofs. These skills are more essential for success at the graduate level than is knowledge of any particular topic. Foundations of Real Analysis (Math 140A-B) and Abstract Algebra (Math 100A-B) are essential in the preparation for graduate work. Most graduate mathematics programs require at least a year of each of these subjects. In addition, these courses will help in preparation for the graduate level entrance exams.

For those of you who may be interested in applying your mathematical skills to other graduate programs beside math some areas include: biomathematical sciences, cognitive sciences, computer science, industrial engineering, mathematical finance, neuroscience, oceanography, operations research, telecommunications, visual science and water resource systems engineering.

Most applications for graduate programs in mathematics must be submitted between December and February, so it is best to contact colleges during the summer or access their web sites for online applications and additional information. Please be aware that most universities will require the following materials with their applications:

1. Three letters of recommendation.
2. GRE general and mathematics subject exam.
3. A personal statement.

The letters of recommendation are very critical in your application. Get to know some professors well - attend Office Hours, ask questions, perhaps take a Math 199, Independent Study course, for a quarter. This will help the professor get to know you better apart from how you perform in the class.

Your Personal Statement is also very important. When you ask for your letters of recommendation ask the professor to critique the document. This way they get to see you motivation to attend graduate school and they can give useful feedback on the composition of the document.

You may also visit the Career Services Center to pick up a copy of their Graduate School Handbook. This handbook includes Various sites on the internet that contain graduate school information.

Consider an REU - Research Experiences for Undergraduates.

These are typically run over the summer months for around 4 weeks. They provide research experience in small groups in many different areas of mathematics - a great way to see other college campuses and interact with a new set of professors and researchers. The Mathematical Association of America lists many REU opportunities at:

<http://www.maa.org/students/reustuff/pages/reu.html>

Any information on REUs and other internships etc are posted on the Math Department Home Page under "Undergraduate News".

Some references include:

A Mathematician's Survival Guide. Graduate School and Early Career Development. Steven G Krantz, American Mathematical Society, 2003

How to Prepare for the GRE Test. Sharon Weiner Green and Ira Wolf, Barron's 15th Edition.

Cracking the GRE Math Test. The Princeton Review, 2nd Edition.

America's Best Colleges. US News & World Report, 2005 Edition.

Some useful web sites:

MSN Encarta	http://encarta.msn.com/
The Princeton Review	http://www.princetonreview.com/
Mathematical Association of America	https://www.maa.org/
American Mathematical Society	http://www.ams.org/
Society for Industrial and Applied Mathematics	http://www.siam.org/

For Actuarial Information

<http://www.soa.org>

Interested in Studying Abroad?

The Mathematics Department encourages its majors to study abroad.

Because mathematics is a fundamental and powerful intellectual tool it can provide a commonality among modern scientific and technological fields. A major in mathematics prepares students for a myriad of career paths by providing a thorough backing in logical thinking, problem solving and abstract analysis.

Studying abroad gives you an opportunity to enhance your study of mathematics by learning or applying these skills in another culture. An international educational experience will provide you with the necessary skills to work effectively in industry, academia and the public sector.

The University of California's Education Abroad Program (EAP) or UCSD's Opportunities Abroad Program (OAP) make study abroad attainable and affordable.

How do I go about this?

- Attend a First Steps meeting at the International Center • Visit <http://programsabroad.ucsd.edu> to find out more
- Start your research in the Programs Abroad Library • Meet with a Programs Abroad advisor
- Complete your academic planning form • Schedule a visit with the Math Advisor • Visit your college advising office

When is the best time to study abroad?

As a math major you have many options for your future. These include graduate school, professional training or commencing a job in industry or government. It is often better to get the required or core classes for your major completed at UCSD and then look for electives at the overseas institution you plan to attend. This is particularly the case if you intend to apply to a US math graduate school in your senior year.

As with any aspect of your academic studies it is important to plan. If you are considering studying abroad talk to the many advisors here at UC San Diego who are here to help you. We can tailor a program specifically for you!

Past Math Majors have studied at:

- * University of Hong Kong * University of Edinburgh, Scotland * Griffith University, Australia
- * University of Auckland, New Zealand * University of Queensland, Australia * University of Sussex, England
- * Lund, Sweden * Barcelona, Spain * University of Wollongong, Australia

Changes - Departmental and Campus Wide

- * Pre-requisites for all courses will be enforced through WebReg. Students will need to contact the department if they believe they have met a pre-requisite or merit a waiver for the course.
- * The official deadline to add classes is Friday of Week 2. Requests after that are only considered under extraordinary circumstances and require a petition, appropriate documentation, and approval from the academic department, college, and the Committee of Educational Policy.
- * All classes required for the major must be taken for a "Letter Grade". Grade Change Petitions for classes taken P/NP which need to be seen by the Committee of Educational Policy, are rarely approved.
- * Effective Fall 2010 the Mathematics, Applied Mathematics, Joint Mathematics-Economics and Mathematics Computer Science Majors will be awarded as BS degrees.
- * The Mathematics Applied Science Major has been revised and the changes come into effect Fall 2010. Please see Page 14 of this booklet or the General Catalog for details.

THE EIGHT MAJORS OF MATH

Disclaimer: Because our Majors undergo revisions from time to time, the actual list of required courses for certain majors may be slightly different than that described in this handbook. For the most up-to-date list of course requirements, please refer to the “Undergraduate Information” section of the UCSD Mathematics Department website.

<http://www.math.ucsd.edu/programs/undergraduate/>

MATHEMATICS (MA29) - BS

The Mathematics major is designed for students who are interested in the theory of mathematics. Pure mathematics majors often pursue Master’s degrees and Ph.D.s in Mathematics in order to prepare for a career in research or university level teaching.

APPLIED MATHEMATICS (MA27) - BS

Applied Mathematicians are interested in the classical relationships between mathematics, the physical sciences and engineering. They often seek employment in industry, utilizing their skills to solve engineering and computer related problems.

MATHEMATICS - SCIENTIFIC COMPUTATION (MA34) - BS

The Mathematics-Scientific Computation major is designed for individuals who are interested in computational solutions of scientific problems and the applications of computing. These majors often seek employment in areas similar to Applied Mathematicians.

MATHEMATICS - APPLIED SCIENCE (MA31) - BA

The Mathematics-Applied Science major is intended for those students who are interested in mathematics, but who also have a substantial interest in the applications of mathematics to other areas. Students majoring in Mathematics-Applied Science often pursue careers in actuarial science, medicine, management consulting, engineering, financial planning, accounting, or operations research. Students who major in Mathematics-Applied Science may pursue one of the following plans or, upon approval, one can be individually designed:

- Chemistry, Biochemistry & Geology
- Applied Mechanics & Engineering
- Cognitive Science and Psychology
- Medical and Life Sciences
- Electrical and Computer Engineering
- Biology and Bioengineering

MATHEMATICS - COMPUTER SCIENCE (MA30) - BS

The Mathematics-Computer Science major trains mathematically oriented computer scientists who have specialized knowledge in the mathematical aspects and foundations of computer science or in the computer applications of mathematics.

MATHEMATICS AND ECONOMICS JOINT MAJOR (MA33 - BS

The Bachelor of Arts in Mathematics and Economics is particularly appropriate preparation for graduate study in economics. All the top-ranked graduate programs in this field require strong mathematical qualifications for admission. It gives an excellent background to students applying to finance programs in graduate schools of management. The joint major also prepares students for graduate study in operations research or applied mathematics. It provides a solid foundation for entry-level employment and majors are encouraged to undertake an undergraduate internship related to the major.

MATHEMATICS - SECONDARY EDUCATION (MA32) - BA

Mathematics-Secondary Education is a major designed for students who have a substantial interest in teaching mathematics at the secondary level.

MATHEMATICS - PROBABILITY and STATISTICS (MA35) - BS

Students with training in probability and statistics are employed as quantitative analysts in many industries and government agencies including agriculture, environmental protection, investment banking, insurance, manufacturing, pharmaceuticals, public health and regulatory bodies. Students electing this major will also find it very useful preparation for graduate study in a variety of fields including biometrics, biostatistics, mathematical finance, operations research, probability and statistics.

The Requirements of the Eight Majors

General Requirements for all Math Major Programs

There are specific requirements that apply to all students majoring in Mathematics. These requirements include, but are not limited to the following:

All Math Majors must obtain a minimum 2.0 Grade Point Average (GPA) in the upper-division courses to satisfy the Major requirements.

Math Majors must receive a grade of C- or better in any course to be counted toward fulfillment of the Major requirements.

All courses to fulfill the Major must be taken for a letter grade.

It is recommended that declared and prospective Math Majors discuss their curriculum with a departmental advisor upon entrance to UCSD, and then at least annually until they graduate.

Math 20D, E and F do not need to be taken in order. It is recommended to take Math 20F as early as possible, followed by 20D and 20E.

Honors Calculus

An Honors Calculus Sequence 31AH-31BH-31CH, commenced in FA08.

Prerequisite: AP Calculus BC score of 5 (or an "A" grade in Math 20B or an equivalent).

Math 31AH \approx Math 20F

Math 31BH \approx Math20C

Math 31CH \approx Math 20E

Students completing Math 31CH may substitute an upper-division elective for Math 109.

Mathematics-Economics Joint Majors would take only Math 31AH and 31BH.

Department of Mathematics, University of California, San Diego

PRELIMINARY DEGREE CHECK MAJOR in MATHEMATICS (MA29)

Name: _____ PID: _____

Admit quarter: _____ Graduating Quarter: _____ Major GPA: _____

Lower-Division Requirements

- | | |
|---|--|
| 1. Math 20A Calc for Sci & Eng | 4. Math 20D Intro to Diff. Eqs |
| 2. Math 20B Calc for Sci & Eng | 5. Math 20E/31CH Vector Calculus |
| 3. Math 20C/31BH Calc & Analy. Geom | 6. Math 20F/31AH Linear Algebra |

To be well prepared for upper-division courses, students should complete the last three quarters of the 20 sequence and Math 109 before the end of their sophomore year.

Upper-Division Requirements (13)

A total of 13 one quarter courses of upper-division mathematics courses, including:

1. Math 109 Mathematical Reasoning (spring quarter of sophomore year)
2. Math 140A-B Foundations of Real Analysis
OR Math (142A-B, Introduction to Analysis and Math 120A, Complex Analysis)
3. Math 100A-B Abstract Algebra
OR Math (103A-B, Modern Algebra and Math 102)
4. Math Electives - to complete 13 upper-div 4 unit courses

Notes:

Either Math 140A-B (142A-B & 120A) or 100A-B (103A-B & 102) should be taken during junior year. As with all departmental requirements, more advanced courses on the same material may be submitted with written approval from the department advisor.

Course Selections

1. Math _____ 109 (4 units)
2. Math _____ (4 units)
- Math _____ (4 units)
3. Math _____ (4 units)
- Math _____ (4 units)
4. Math _____ (4 units)
- Math _____ (4 units)
- Math _____ (4 units)
- Math _____ (4 units)
- Math _____ (4 units)
- Math _____ (4 units)
- Math _____ (4 units)
- Math _____ (4 units)
- Math _____ (4 units)
- Math _____ (4 units)

Mathematics Department Evaluation

Comments: _____

Advisor: _____

Date: _____

Department of Mathematics, University of California, San Diego

PRELIMINARY DEGREE CHECK MAJOR in APPLIED MATHEMATICS (MA27)

Name: _____ PID: _____

Admit quarter: _____ Graduating Quarter: _____ Major GPA: _____

Lower-Division Requirements

Mathematics (24 units total):

- 1. Math 20A Calc for Sci & Eng
- 2. Math 20B Calc for Sci & Eng
- 3. Math 20C/31BH Calc & Analyt. Geom
- 4. Math 20D Intro to Diff. Eqs
- 5. Math 20E/31CH Vector Calculus
- 6. Math 20F/31AH Linear Algebra

Programming - one of the following:

- MAE 9 C/C++ Programming
- CSE 8A-AL-B Intro to Comp Sci: Java
- CSE 11 Intro to Comp Sci: Java
- (Accelerated Pace)

Upper-Division Requirements (13)

At least 13 upper-division courses must be completed in Mathematics as outlined below, except:

a) Up to 3 courses may be outside the department in an approved applied mathematical area. A petition approved by an applied math advisor is required. No such units may also be used for a minor or program of concentration.

b) MAE 107, Econ 120A-B-C, Math 195-199 cannot be counted toward the upper division requirement.

- 1. Math 109 Mathematical Reasoning
(should be taken in sophomore year)
- 2. One of the following:
 - Math 102 Applied Linear Algebra OR
 - Math 170A Intro to Numerical Analysis
- 3. One of the following calculus sequences:
(should be taken in junior year)
 - Math 140A-B Foundations of Real Analysis OR
 - Math 142A-B Introduction to Analysis.
- 4. Applied Math Sequence:
 - Math 180A-B-C-181A Probability & Statistics OR
 - Math 180A-181A and any two from 181B-C-E OR
 - (Math 183 or Math 180A-181A) and any three from 170A-B-C-175-179 Numerical Methods
- 5. One additional sequence from the above list or from the following:
 - Math 110A-120A-130A PDE, Complex Analysis, ODE
 - Math 120A-B Complex Analysis
 - Math 130A-110B DEs, Elements of PDE & Int Eqns
 - Math 152-154, Math & Comp/Discrete Math
 - Math 152-184A, Math & Comp/Combinatorics
 - Math 154-184A, Discrete Math/ Combinatorics
 - Math 155A-B Computer Graphics
 - Math 171A-B Mathematical Programming
 - Math 193A-B Actuarial Math
- 6. Upper-division Electives - to complete 13 upper-div 4 unit courses

- 1. Math 109 (4 units)
- 2. Math _____ (4 units)
- 3. Math _____ (4 units)
- 4. Math _____ (4 units)
- 5. Math _____ (4 units)
- 6. Math _____ (4 units)
- 7. Other Dept (or Math) Course Selections
 - Math/____ (4 units)
 - Math/____ (4 units)
 - Math/____ (4 units)

Mathematics Department Evaluation

Comments:

Advisor: _____

Date: _____

Department of Mathematics, University of California, San Diego

PRELIMINARY DEGREE CHECK

MAJOR in MATHEMATICS-SCIENTIFIC COMPUTATION (MA34)

Name: _____ PID: _____

Admit quarter: _____ Graduating Quarter: _____ Major GPA: _____

Lower-Division Requirements

Mathematics (24 units total):

- 1. Math 20A Calc for Sci & Eng
- 2. Math 20B Calc for Sci & Eng
- 3. Math 20C/31BH Calc & Analyt. Geom
- 4. Math 20D Intro to Diff. Eqns
- 5. Math 20E/31CH Vector Calculus
- 6. Math 20F/31AH Linear Algebra

Basic Computation:

- 1. Math 15A (or CSE 20)
- 2. Math 15B (or CSE 21)
- 3. CSE 12

Programming:

- 1. MAE 9
- 2. CSE 8A-AL-B or CSE 11

Upper-Division Requirements - 15 courses

- 1. Math 109 Mathematical Reasoning (should be taken in sophomore year)
- 2. Math 102 Applied Linear Algebra
- 3. Probability & Statistics:
Math 183 OR Math 180A AND 181A
- 4. One of the following sequences:
Math 140A-B Foundations of Real Analysis OR
Math 142A-B Introduction to Analysis
- 5. Introduction to Numerical Analysis:
Math 170A-B-C OR
Math 170A-B and Math 175 (was 172)
- 6. Numerical Optimization Math 171A-B
- 7. Computational & Applied Math 179 (was 173)
- 8. Upper-division electives - to complete 15 upper-div 4-unit courses chosen from:
Math 107A, 107B, 110A, 110B, 120A, 120B, 130A, 130B, 152, 154, 155A, 155B, 170C, 175.

- 1. Math _____ 109 (4 units)
- 2. Math _____ 102 (4 units)
- 3. Math _____ (4 units)
- 4. Math _____ (4 units)
- 5. Math _____ 170A (4 units)
- Math _____ 170B (4 units)
- Math _____ 170C/175 (4 units)
- 6. Math _____ 171A (4 units)
- Math _____ 171B (4 units)
- 7. Math _____ 179 (4 units)
- 8. Math _____ (4 units)
- Math _____ (4 units)
- Math _____ (4 units)
- Math _____ (4 units)

Mathematics Department Evaluation

Comments:

Advisor: _____

Date: _____

Department of Mathematics, University of California, San Diego

PRELIMINARY DEGREE CHECK MAJOR in MATHEMATICS-APPLIED SCIENCE (MA31)

Name: _____ PID: _____

Admit quarter: _____ Graduating Quarter: _____ Major GPA: _____

Lower-Division Requirements

- | | |
|--|--|
| <ul style="list-style-type: none"> 1. Math 20A Calc for Sci & Eng 2. Math 20B Calc for Sci & Eng 3. Math 20C/31BH Calc & AnalyGeom 4. Math 20D Intro to Differential Eqns 5. Math 20E/31CH Vector Calculus 6. Math 20F/31AH Linear Algebra | <ul style="list-style-type: none"> 7. Programming: One of the following is required MAE 9 C/C++ Programming CSE 8A-AL-B Intro to Comp Sci: Java CSE 11 Intro to Comp Sci: Java (Accelerated Pace) |
|--|--|

Upper-Division Requirements

Requires at least 7 upper-division mathematics courses (certain courses must be included - see below) and 7 additional upper-division courses selected from one or two of the following departments: Physics, Biology, Chemistry, Biochemistry, Cognitive Science, Computer Science, Economics, Management Science or Engineering. At least 3 of the 7 non-math courses must have a prereq of 3 quarters of calculus.

Mathematics

- 1. Math 109 Mathematical Reasoning (should be taken sophomore year)
- 2. One of the following:
 - Math 102 Applied Linear Algebra OR
 - Math 170A Numerical Linear Algebra
- 3. Math 140A-B or Math 142A-B Analysis
- 4. Any two-quarter upper-division Math sequence
- 5. Any three other upper-division Math courses for a total of at least 7 upper-division Math courses

Applied Science

Seven additional upper-division courses selected from one or two other departments, of which at least three require 3 quarters of calculus as a prerequisite(*).

Mathematics Course Selections

- 1. Math _____ 109 (4 units)
- 2. Math _____ (4 units)
- 3. Math _____ (4 units)
- Math _____ (4 units)
- 4. Math _____ (4 units)
- Math _____ (4 units)
- Math _____ (4 units)

Applied Science Course Selections

- 5. _____ (4 units)
- _____ (4 units)
- _____ (4 units)
- _____ (4 units)
- _____ (4 units) *
- _____ (4 units) *
- _____ (4 units) *

Mathematics Department Evaluation

Comments: _____

Advisor: _____

Date: _____

Department of Mathematics, University of California, San Diego

PRELIMINARY DEGREE CHECK

MAJOR in MATHEMATICS-COMPUTER SCIENCE (MA30)

Name: _____

PID: _____

Admit quarter: _____

Graduating Quarter: _____

Major GPA: _____

Lower-Division Requirements

Mathematics (24 units total):

- 1. Math 20A Calc for Sci & Eng
- 2. Math 20B Calc for Sci & Eng
- 3. Math 20C/31BH Calc & Analyt. Geom
- 4. Math 20D Intro to Diff. Eqns
- 5. Math 20E/31CH Vector Calculus
- 6. Math 20F/31AH Linear Algebra

Computer Science:

- 1. CSE 8A-AL-B Intro to Comp Sci: Java
- OR
- CSE 11 Intro Java (Accelerated Pace)
- 2. CSE 12 Data Struct. & Object-oriented Prog
- 3. CSE 30 Comp Organization & Systems

The Mathematics Department requires that students complete the required lower division mathematics courses with a minimum GPA of 2.5 before acceptance into the major will be granted. **Note: Some CSE courses may have prerequisites not listed here.

Upper-Division Requirements (14 courses)

- 1. Math 109 Mathematical Reasoning
- 2. Math 103A-B Modern Algebra (or Math 100A-B)
(Complete by end of junior year)
- 3. Math 166 Theory of Computability (or CSE 105)
- 4. Math 176 Advanced Data Structures (or CSE 100)
- 5. Math 180A Intro to Probability OR Math 183 Stat Methods
- 6. Math 184A Combinatorics
- 7. Math 188 Design & Analysis of Algorithms (or CSE 101)

9. Any eight units from List B:

- Math 152 Applicable Math & Computing
- Math 154 Discrete Math & Graph Theory
- Math 155A (or CSE 167)-B Computer Graphics
- Math 168A Topics in App Math-CS
- Math 187 Intro to Cryptography
- CSE 120-121 Comp Operating Systems
- CSE 130 Programming Languages
- CSE 131A-B Compiler Construction
- CSE 140-140L Comp & Design Techniques for Digital Systems
- CSE 141-141L Intro to Comp Architecture

8. Any eight units from List A:

- Math 170A Intro to Num Analysis: Linear Algebra
- Math 170B Intro to Num Analysis: Approx & Nonlinear Eqns
- Math 170C Intro to Num Analysis: Ordinary Diff Eqns
- Math 175 Numerical Methods in Partial Diff Eqns
- Math 179 Projects in Comp & App Math
- Math 174 Numerical Methods (Duplication of credit with Math 170ABC)

10. Any additional 8 units from List A or B or from the following mathematics upper-division courses:

102 Applied Linear Algebra, 110A Intro to Partial Diff Eqns, 110B Elements of PDE & Integral Equations, 111A-B Math Modeling, 120A-B Complex Analysis, 130A-B Ordinary Diff Eqns, 140A-B Foundations of Analysis, 142A-B Advanced Calculus, 150A-B Diff Geom/Calc on Manifolds, 171A-B Intro to Num Optimization, 181A-B-C Intro to Stats, 185 Math Foundations Comp Sci.

Course Selections

- 1. Math 109 (4 units)
- 2. Math _____ (4 units)
- Math _____ (4 units)
- 3. Math/CSE 166/105 (4 units)
- 4. Math/CSE 176/100 (4 units)
- 5. Math _____ (4 units)
- 6. Math 184A (4 units)
- 7. Math/CSE 188/101 (4 units)
- 8. Math _____ (4 units)
- Math _____ (4 units)
- 9. _____ (4 units)
- _____ (4 units)
- 10. _____ (4 units)
- _____ (4units)

Mathematics Department Evaluation

Comments: _____

Advisor: _____

Date: _____

Department of Mathematics, University of California, San Diego

PRELIMINARY DEGREE CHECK JOINT MAJOR in MATHEMATICS & ECONOMICS (MA33)

Name: _____

PID: _____

Admit quarter: _____

Graduating Quarter: _____

Major GPA: _____

Lower-Division Requirements

Mathematics (20 units total):

1. Math 20A Calc for Sci & Eng
2. Math 20B Calc for Sci & Eng
3. Math 20C/31BH Calc & Analyt. Geom
4. Math 20D Intro to Diff. Eqns
5. Math 20F/31AH Linear Algebra

Economics (12 units total):

1. Econ 1 Microeconomics
2. Econ 2 Macroeconomics(optional)
3. Econ 3 Macroeconomics

Upper-Division Requirements - 15 courses

Requires a total of 15 upper-division courses in Mathematics and Economics, with a minimum of 7 courses in each department chosen from the courses listed below:

Mathematics:

1. Math 109 Mathematical Reasoning
2. One of the following:
Math 102 Applied Linear Algebra OR
Math 100A-B Algebra OR
Math 170A Numerical Linear Algebra
3. One of the following:
Math 140A Foundations of Real Analysis I OR
Math 142A Introduction to Analysis I
4. At least one of the following:
Math 130A Ordinary Differential Equations OR
Math 140B Foundations of Real Analysis II OR
Math 142B Introduction to Analysis II

Economics:

5. Econ 100A-B-C Microeconomics
6. One of the following three-course sequences :
Econ 120A-B-C Econometrics OR
Math 180A and Econ 120B-C OR
Math 180A and Math 181A and Econ 120C
(Duplication of credit: Math 180A & Econ 120A;
Math 181A & Econ 120B)
7. One of the following two-course sequences:
Econ 110A-B Macroeconomics OR
Math 171A-B Intro to Numerical Optimization OR
Any two courses from the following:
Econ 171 Decisions Under Uncertainty OR
Econ 172A-B Intro to Operations Research

1. Math _____ 109 (4 units)
2. Math _____ (4 units)
3. Math _____ (4 units)
4. Math _____ (4 units)
- Math _____ (4 units)
- Math _____ (4 units)
- Math _____ (4 units)
- Math _____ (4 units)

- optional if taking 8 U-D Econ)

5. Econ _____ (4 units)
- Econ _____ (4 units)
- Econ _____ (4 units)
6. Econ _____ (4 units)
- Econ _____ (4 units)
7. Econ _____ (4 units)
- Econ _____ (4 units)
- Econ _____ (4 units)

- optional if taking 8 U-D Econ)

Mathematics Department Evaluation

Comments: _____

Advisor: _____

Date: _____

Department of Mathematics, University of California, San Diego

PRELIMINARY DEGREE CHECK

MAJOR in MATHEMATICS-SECONDARY EDUCATION (MA32)

Name: _____ PID: _____

Admit quarter: _____ Graduating Quarter: _____ Major GPA: _____

Lower-Division Requirements

Mathematics (24 units total):

1. Math 20A Calc for Sci & Eng
2. Math 20B Calc for Sci & Eng
3. Math 20C/31BH Calc & Analyt. Geom
4. Math 20D Intro to Diff. Eqns
5. Math 20E/31CH Vector Calculus
6. Math 20F/31AH Linear Algebra

One of the following is recommended:

- CSE 8A-AL-B Intro to Comp Sci: Java
- MAE 9 C/C++ Programming

Upper-Division Requirements - 13 courses

1. Math 109 Mathematical Reasoning
2. Math 104A Number Theory
3. Math 163 History of Mathematics
4. EDS 129A-B-C Pre-Internship Practicum in Teaching
5. One of the following:
 - Math 155A Computer Graphics OR
 - Math 170A Intro to Num Analysis: Linear Algebra OR
 - Math 187 Introduction to Cryptography
6. One of the following:
 - Math 180A Introduction to Probability OR
 - Math 183 Statistical Methods (duplication of credit with Math 180A)
7. One of the following:
 - Math 150A Differential Geometry OR
 - Math 151 Topics in Geometry OR
 - Math 153 Geometry for Secondary Teachers OR
 - Math 190 Introduction to Topology
8. One of the following:
 - Math 100A Abstract Algebra OR
 - Math 102 Applied Linear Algebra OR
 - Math 103A Modern Applied Algebra
9. One of the following:
 - Math 140A Foundations of Real Analysis
 - Math 142A Introduction to Analysis
10. One sequence from the following list:
 - 100A-B, 103A-B, 103A-102, 104A-B, 110A-120A, 110A-130A, 110A-110B, 120A-B, 130A-110B, 130A-B, 140A-B, 142A-B, 150A-B, 152-154, 152-184A, 154-184A, 155A-B, 170A-B, 170A-175, 170A-179, 170A-171A, 171A-B, 180A-B, 180A-181A, 193A-B.

Course Selections

1. Math 109 (4 units)
2. Math 104A (4 units)
3. Math 163 (4 units)
4. EDS 129A (4 units)
- EDS 129B (4 units)
- EDS 129C (4 units)
5. Math _____ (4 units)
6. Math _____ (4 units)
7. Math _____ (4 units)
8. Math _____ (4 units)
9. Math _____ (4 units)
10. Math _____ (4 units)
- Math _____ (4 units)

Mathematics Department Evaluation

Comments: _____

Advisor: _____

Date: _____

Department of Mathematics, University of California, San Diego

PRELIMINARY DEGREE CHECK

MAJOR in MATHEMATICS-Probability & Statistics (MA35)

Name: _____ PID: _____
 Admit quarter: _____ Graduating Quarter: _____ Major GPA: _____

Lower-Division Requirements

Mathematics (24 units total):

1. Math 20A Calc for Sci & Eng
2. Math 20B Calc for Sci & Eng
3. Math 20C/31BH Calc & Analyt. Geom
4. Math 20D Intro to Diff. Eqs
5. Math 20E/31CH Vector Calculus
6. Math 20F/31AH Linear Algebra

One of the following:

- | | |
|---|--|
| MAE 9 C/C++ Programming | |
| CSE 8A-8AL-8B Intro to Comp Sci: Java | |
| CSE 11 Intro to Comp Sci: Java | |
| (Accelerated Pace) | |

Upper-Division Requirements

At least 15 upper-division courses must be completed in Mathematics as outlined below, except:
 Up to 2 courses may be outside the department in an approved applied mathematical area. A petition approved by an Probability/Statistics math advisor is required. No such units may also be used for a minor or program of concentration.

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Math 109 Mathematical Reasoning
(should be taken in sophomore year) 2. One of the following:
 Math 102 Applied Linear Algebra
 OR Math 170A Numerical Linear Algebra 3. One of the following sequences:
(should be taken in junior year)
 Math 140A-B Foundations of Real Analysis
 OR Math 142A-B Introduction to Analysis 4. One of the following:
 Math 174 Numerical Methods in Sci & Eng
 (Duplication of credit with Math 170A)
 OR Math 170A-B Intro to Numerical Analysis | <ol style="list-style-type: none"> 5. Probability & Stochastic Processes: Math 180A-B-C 6. Mathematical Statistics: Math 181A-B 7. At least one of the following:
 Math 181C, 181E, 193A, 193B, 194 8. Computational Statistics: Math 185 9. Upper-division electives to complete 15 courses to be
 chosen from:
 Math 100A-B-C, 103A-B, 110A-B, 120A-B, 130A,
 140C, 152 (only once), 154, 155A, 170A-B-C, 171A-B,
 175, 176 (CSE100), 179, 181C, 181E, 184A, 187,
 188(CSE101), 193A-B, 194. |
|---|---|
-
- | | | | | | | | | | | | | | | | | | | | |
|--|---|--|----------------------------------|-------------------------------------|--|----------------------------------|--|-------------------------------|--|------------------------------------|--|----------------------------|--|---|--|-------------------------------|--|----------------------------|--|
| <ol style="list-style-type: none"> 1. Math <u>109</u> (4 units) 2. Math _____ (4 units) 3. Math _____ (4 units) Math _____ (4 units) 4. Math _____ (4 units) 5. Math <u>180A</u> (4 units) Math <u>180B</u> (4 units) | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="width: 50%;">Math <u>180C</u> (4 units)</td> </tr> <tr> <td>6. Math <u>181A</u> (4 units)</td> <td></td> </tr> <tr> <td> Math <u>181B</u> (4 units)</td> <td></td> </tr> <tr> <td>7. Math _____ (4 units)</td> <td></td> </tr> <tr> <td>8. Math <u>185</u> (4 units)</td> <td></td> </tr> <tr> <td> Math _____ (4 units)</td> <td></td> </tr> <tr> <td colspan="2" style="text-align: center;">Other Dept (or Math) Course Selections</td> </tr> <tr> <td>9. Math _____ (4 units)</td> <td></td> </tr> <tr> <td> Math _____ (4 units)</td> <td></td> </tr> </table> | | Math <u>180C</u> (4 units) | 6. Math <u>181A</u> (4 units) | | Math <u>181B</u> (4 units) | | 7. Math _____ (4 units) | | 8. Math <u>185</u> (4 units) | | Math _____ (4 units) | | Other Dept (or Math) Course Selections | | 9. Math _____ (4 units) | | Math _____ (4 units) | |
| | Math <u>180C</u> (4 units) | | | | | | | | | | | | | | | | | | |
| 6. Math <u>181A</u> (4 units) | | | | | | | | | | | | | | | | | | | |
| Math <u>181B</u> (4 units) | | | | | | | | | | | | | | | | | | | |
| 7. Math _____ (4 units) | | | | | | | | | | | | | | | | | | | |
| 8. Math <u>185</u> (4 units) | | | | | | | | | | | | | | | | | | | |
| Math _____ (4 units) | | | | | | | | | | | | | | | | | | | |
| Other Dept (or Math) Course Selections | | | | | | | | | | | | | | | | | | | |
| 9. Math _____ (4 units) | | | | | | | | | | | | | | | | | | | |
| Math _____ (4 units) | | | | | | | | | | | | | | | | | | | |

Mathematics Department Evaluation

Comments:

Advisor: _____

Date: _____

Department of Mathematics - Courses

Lower-Division Courses

- 3C. Pre-calculus
- 4C. Pre-calculus for Science & Engineering
- 10A. Calculus
- 10B. Calculus
- 10C. Calculus
- 11. Elementary Probability & Statistics
- 15A. Discrete Mathematics
- 15B. Mathematics for Algorithm & Systems
- 20A. Calculus for Science & Engineering
- 20B. Calculus for Science & Engineering
- 20C. Calculus and Analytic Geometry for Science & Engineering
- 20D. Introduction to Differential Equations
- 20E. Vector Calculus
- 20F. Linear Algebra
- 31AH-BH-CH. Honors Calc for entering freshmen
- 87. Freshman Seminar (1)

Upper-Division Courses

- 100A-B-C. Abstract Algebra I-II-III
- 102. Applied Linear Algebra
- 103A-B. Modern Algebra I-II
- 104A-B-C. Number Theory
- 109. Mathematical Reasoning
- 110A. Introduction to Partial Differential Equations
- 110B. Elements of Partial Differential Equations & Integral Equations (*WI10 - renumbered from 132A)
- 111A-B. Mathematical Modeling I-II
- 120A. Elements of Complex Analysis
- 120B. Applied Complex Analysis
- 121A. Foundations of Teaching & Learning Mathematics I
- 121B. Foundations of Teaching & Learning Mathematics II
- 130A. Ordinary Differential Equations I
- 130B. Ordinary Differential Equations II
- 140A-B-C. Foundations of Real Analysis I-II-III
- 142A-B. Introduction to Analysis I-II
- 150A. Differential Geometry
- 150B. Calculus on Manifolds
- 151. Topics in Geometry
- 152. Applicable Mathematics & Computing
- 153. Geometry for Secondary Teachers
- 154. Discrete Mathematics & Graph Theory
- 155A. Geometric Computer Graphics
- 163. History of Mathematics
- 166. Introduction to the Theory of Computation (CSE105)
- 168A. Topics in Applied Mathematics-Computer Science
- 170A. Introduction to Numerical Analysis: Linear Algebra
- 170B. Introduction to Numerical Analysis: Approximation and Nonlinear Equations
- 170C. Introduction to Numerical Analysis: Ordinary Differential Equations
- 171A. Introduction to Numerical Optimization: Linear Problems
- 171B. Introduction to Numerical Optimization: Nonlinear Problems
- 174. Numerical Methods in Science & Engineering
- 175. Numerical Methods for Partial Differential Equations
- 179. Projects in Computational & Applied Mathematics
- 180A. Introduction to Probability
- 180B. Introduction to Stochastic Processes I
- 180C. Introduction to Stochastic Processes II
- 181A. Introduction to Mathematical Statistics I
- 181B. Introduction to Mathematical Statistics II
- 181C. Mathematical Statistics I
- 181E. Mathematical Statistics II
- 183. Statistical Methods
- 184A. Combinatorics
- 185. Introduction to Computational Statistics
- 186. Probability Statistics for Bioinformatics
- 187. Introduction to Cryptography
- 188. Design & Analysis of Algorithms (CSE101)
- 190. Introduction to Topology
- 191. Topics in Topology
- 193A. Actuarial Mathematics I
- 193B. Actuarial Mathematics II
- 194. The Mathematics of Finance
- 195. Introduction to Teaching in Mathematics
- 196. Student Colloquium (1)
- 199. Independent Study for Undergraduates (2-4)
- 199H. Honors thesis research for Undergraduates (2-4)

Note: All courses are 4 units unless otherwise specified

Other Department Courses

- CSE8A-B. Introduction to Computer Science: Java
- CSE11. Introduction to Computer Science & Object-Oriented Programming: Java
- CSE12. Basic data Structure and Object-Oriented Design
- CSE30. Computer Organization & Systems Programming
- CSE100. Advanced Data Structures
- CSE101. Design & Analysis of Algorithms
- CSE105. Theory of Computability
- CSE120. Principles of Computer Operating Systems
- CSE121. Operating Systems: Architecture & Implementation
- CSE130. Programming Languages: Principles & Paradigms
- CSE131A-B. Compiler Construction I & II
- CSE140. Components & Design Techniques for Digital Systems
- CSE140L. Digital systems Laboratory (2)
- CSE141. Introduction to Computer Architecture
- CSE141L. Project in Computer Architecture (2)
- MAE9. C/C++ Programming
- MAE107. Computational Methods in Engineering
- Econ1-2-3. Elements of Economics I, II & III
- Econ100A-B. Microeconomics A & B
- Econ120A-B-C. Econometrics A, B & C*
- Econ171. Decisions Under Uncertainty
- Econ172A-B-C. Introduction to Operations Research
- EDS129A-B-C. Introduction to Teaching & Learning (Secondary)

* There are duplication of credit issues with Math180A and Econ120A and Math181A and Econ120B.

MINORS IN MATHEMATICS

Minor in Mathematics - MA29 Effective Fall 1990

This minor offers students the opportunity to complement the course work they are pursuing in their concentration with mathematics. Combining a minor in mathematics with a major in the areas of biology, physics, economics or computer science (to name a few) can enhance one's career options and learning experience.

Upper Division Requirements

The Mathematics Minor consists of seven or more courses. At least four of these courses must be upper-division courses taken from the UCSD Mathematics Department.

1. At least four courses must be upper-division courses taken from UCSD's Mathematics Department.
2. Math 195, 196, 197, 198 & 199 are NOT acceptable courses for the mathematics minor.
3. Courses may be taken P/NP or for a letter grade.
4. Upper division major and minor courses may not overlap.

Acceptable Lower-Division Courses

1. 20D Introduction to Differential Equations
2. 20E/31CH Vector Calculus
3. 20F/31AH Linear Algebra



Education Studies in Mathematics Education - MO66 Effective Fall 2006

This minor is intended for students interested in understanding how people learn mathematics including students who are interested in K-12 teaching as a career or teaching at the college level to becoming better, more reflective learners. All majors are welcome, but the Calculus 10 or 20 sequence is a pre-requisite for some of the required upper-division courses.

http://physicalsciences.ucsd.edu/academic/science_math.ed/about.htm

Proposed Minor Course Schedule

Academic Year	Fall	Winter	Spring
Freshman		Math 87: Teaching Math - The Challenge (Freshman Seminar) Not required	
Sophomore		Math 95 / EDS 30 Intro to Teaching Math (2) & EDS 39: Practicum (2)	
Junior	EDS 117: Language, Culture & Education (4)	Math 121A / EDS 121A Foundations of Teaching & Learning Mathematics I (4)	Math 121B / EDS 121B Foundations of Teaching & Learning Mathematics II (4)
Senior	EDS 129A: Intro to Teaching & Learning (4) EDS 139: Practicum (2)	EDS 129B: Intro to Teaching & Learning (4) EDS 139: Practicum (2)	EDS 129C: Intro to Teaching & Learning (4) EDS 139: Practicum (2)

Honors Program

The Department of Mathematics offers an honors program for those students who have demonstrated excellence in their major. Successful completion of the honors program entitles the student to graduate with departmental honors (see Department Honors in the academic Regulations section of the UCSD general catalog). Application to the program should be made the spring quarter before the student is at senior standing.

Requirements for admission to the program are:

- Junior standing.
- An overall GPA of 3.0 or higher.
- A GPA in the major of 3.5 or higher.
- Agreement from a Mathematics Department Professor to be your Math Honors Program Advisor.
- Completion of Math 109 - Mathematical Reasoning and at least one of Math 100A, 103A, 140A or 142A. (Completion of additional major courses is strongly recommended.)

Completion of the Honors Program requires the following:

- At least one quarter of the Student Colloquium, Math 196.
- The minimum 3.5 GPA in the major must be maintained.
- An honors thesis. The research and writing of the thesis will be conducted over at least two quarters of the junior/senior years under the supervision of a faculty advisor. This research will be credited as eight to twelve units of Math 199H. The completed thesis must be approved by the department's Honors Committee, and presented orally at the Undergraduate Research Conference or another appropriate occasion.

The department's Honors Committee will determine the level of honors to be awarded based on the student's GPA in the major and the quality of the honors project work.

FOR JOINT MATHEMATICS AND ECONOMICS MAJORS:

To graduate with honors requires the following:

At least one quarter of the Student Colloquium, Math. 196 (Note: Math. 196 is only offered in the fall quarter.)

At least one Economics honors course: Econ 100AH, 100BH, 110AH, 110BH, 120AH, 120BH, 120CH. Note: enrollment in these honors classes is by special permission; check with the undergraduate advisors in the Economics Student Services Office (SH 245).

An Honors Thesis. The research and writing of the thesis will be conducted over two quarters of the senior year under the supervision of a faculty advisor. The completed thesis must be approved by the Joint Mathematics and Economics Honors Committee, which comprises the Mathematics Honors Committee and the Economics Honors Committee, and presented orally at the Undergraduate Research Conference or another appropriate occasion.

If the student is a declared major in the mathematics department (MA33), this thesis will be credited as eight units of Math 199H. Enrollment in Math 199H is by special permission; check with the advisors in the mathematics department Undergraduate Affairs Office (AP&M 7018) or the Mathematics Advising Office (AP&M 6016).

If the student is a declared major in the economics department (EN28), the student must enroll in Econ 191A-B. Enrollment in Econ 191 is by special permission; check with the undergraduate advisors in the Economics Student Services Office (SH 245).

A minimum GPA of 3.0 overall, 3.5 in the upper-division courses required for the major and a 3.5 in the following four classes: Math. 196, Economics Honors class and either Econ 191A-B or two quarters of Math. 199H.

Some recent Honor's Theses titles include:

- Noncommutative Polynomials with Almost Positive Second Derivatives
 - Multilevel Iterative Methods
- Planting the (Intellectual) Need From Which Learning Grows
 - Decomposing Hackenbush
- Simulation of a Quantum Random Walk
 - Distance 2 Permutation Statistics and Symmetric Functions
- Necessary Conditions for the Non-Existence of Odd Perfect Numbers
 - Non-Commutative Subharmonic and Harmonic Polynomials

To see the texts in their entirety please go to: <http://www.math.ucsd.edu/programs/undergraduate/>

Creating Your Quarter by Quarter Plan

Planning is important, especially as a mathematics major.

Why?

First, the Mathematics Department does not offer every course every quarter. In fact not every upper-division course is offered every year - some are offered every other year.

Second, two students majoring in math may have completely different ways in which they complete the major depending on their respective priorities.

Third, and probably most important to many of you, planning can make sure you graduate on time.

Follow these five steps:

1. Obtain the Major Requirements Sheet that corresponds to the math major you will be completing, a requirement sheet for each of the eight programs follows.

2. Take out the Planning Matrix that follows the Major Requirement Sheets.

3. Spend some time with both of these documents and the UCSD General Catalog:

- Look at what the requirements are for your major.
- Look up the courses and decide which courses you are interested in taking.
- List these courses on your Planning Matrix along with the prerequisites - note there is a column on the Planning Matrix where you can list the prerequisites.

4. Next, look each course up on our Planned Course Offering list. Print the Planned Course Offerings from our web site - it is the most up-to-date version:

http://www.math.ucsd.edu/resources/course_offerings/

- Make a check mark in the appropriate place on your Planning Matrix for each quarter a course is offered.
- Note that we do not offer every course every quarter. Some courses we only offer every other year (ie Math 193A-B). So, use the Planned Course Offerings as a tool, remembering that there is no guarantee that you will be able to take a certain course when you plan on taking it. You may even want to come up with a plan "B" for certain requirements.
- You can meet with the Math Advisor once you come up with your quarter by quarter plan. The Math Advisor can review your plan and point out where any issues may exist.

5. Take out the Quarter by Quarter Planning Sheet. This sheet follows the Planning Matrix sheet in this booklet.

- Using the completed Planning Matrix create your Quarter by Quarter Plan.
- Use a pencil - you will probably have to move things around a few times before you come up with a workable plan. Work into your plan:
 - a. Prerequisite courses.
 - b. Courses that are requirements with no choice.
 - c. Courses you want to take that are only offered one quarter a year.
 - d. Remaining courses, electives etc.

Remember it is your responsibility to know the requirements of your major and to complete those requirements on time. Ideally, you will meet annually with academic advisors in both your college and major department to ensure satisfactory academic progress towards your degree. You can meet with your departmental advisors quarterly once you commence upper-division courses - those numbered 100 to 194.

The Math Advising Office is located in AP&M 6016. Walk-in advising hours are: Monday through Friday 10am-Noon and 1pm-3pm. Appointments are recommended.

Mathematics Curriculum Planner

Fall Quarter _____

Winter Quarter _____

Spring Quarter _____

Summer Session

--	--

Fall Quarter _____

Winter Quarter _____

Spring Quarter _____

Summer Session

--	--

Fall Quarter _____

Winter Quarter _____

Spring Quarter _____

Summer Session

--	--

Fall Quarter _____

Winter Quarter _____

Spring Quarter _____

Summer Session

--	--

UC San Diego Mathematics Department

Undergraduate Student Petition Process

Department Exceptions - Used for course equivalencies, EAP coursework, and major exceptions.

Courses from other institutions:

1. Check the Mathematics Course Equivalencies to see if a course equivalency already exists for your course work.
<http://www.math.ucsd.edu/programs/undergraduate/equivalencies/>
If one does, you do not need to petition.
2. Fill the petition out completely, including your contact information and the UCSD course number for which you think your coursework is equivalent.
3. Attach to the petition a detailed syllabus for the course from the other institution. The syllabus must include the name of the textbook that was used in the course and the material that was covered.
4. Submit your completed petition to the: Undergraduate Student Affairs Office AP&M 7018 or email to mathadvising@ucsd.edu
5. If you intend to take courses abroad, out-of-state or at any other institution you should check if the course can be used towards your UC San Diego requirements. Please contact either the Math Department Front Desk or the Math Advisor to obtain the relevant faculty advisor's contact details.

Major Requirement Substitutions:

1. Meet with the Math Advisor before petitioning for a major substitution within one of the math major programs. For a major other than one of the math programs, meet with an advisor in your major department.
2. After meeting with the Math Advisor, you may need to meet with your faculty advisor (the Math Advisor will direct you to the appropriate person) to discuss your substitution.

University Exceptions - Used for late add/drop, retroactive add/drop, late change of grading option and retroactive incomplete.

Late/Retro Add/Drop:

1. Obtain an undergraduate student petition from either your major department or your college advising office.
2. Complete the petition. Include the reason why the deadline was missed and, if applicable any documentation to support your reason.
3. Take the petition to the instructor, if available, for signature. Bring the signed petition to the Mathematics Department Undergraduate Student Affairs Office (AP&M 7018).
4. The Undergraduate Student Affairs Officer will route your petition to the Vice Chair and your college for final approval.

Change of Grading Option after Deadline:

Changes from Letter to P/NP after the deadline are **almost never approved**. A course for which a P grade has been assigned may be petitioned to be counted as satisfying Major, but each case is considered individually.

Retroactive Incomplete:

1. Submit a petition to the Mathematics Department Undergraduate Student Affairs Office (AP&M 7018) with the request for the retroactive incomplete and include the reason why you missed the deadline.
2. Attach an incomplete form to the petition. If the petition is approved, the incomplete form will be submitted to the Registrar and the "I" will be posted.
3. Attach documentation supporting the reason why you need an incomplete.
Examples: A doctor's note stating the dates you were ill, a copy of a death certificate for a family member.

FREQUENTLY ASKED QUESTIONS

Q: How much should I study?

A: That depends on the individual. In one study, successful students put in about 14-15 hours per week to get an A, some more, some less. Just keep up with the class. Cramming doesn't work.

Q: I don't like my Teaching Assistant (TA). Can I get into another section?

A: It may be impossible to switch sections the second week of the quarter. However, ideally you should instead find another student with whom you can work. In addition, the Calculus Tutoring Lab provides free drop-in tutoring. There is also free drop-in tutoring available in the Office of Academic Support and Instructional Services (OASIS), as well as study groups.

Q: I thought I knew the material, but I did poorly on the midterm. Should I drop the class?

A: Speak to your TA and a Math Advisor about your options. If you decide to stay in the class, you need to change your study habits and do extra problems.

Q: My professor goes too fast in lectures and I get lost. What should I do?

A: If you are behind, catch up on your reading. In addition, it's amazing how much reading before the lecture helps. You don't have to know it all; skimming the main ideas will enable you to follow the lecture.

Q: The lectures are useless because the professor doesn't show me how to do the homework problems.

A: The purpose of the lecture is to give you the tools to attack difficult problems, not to show you the solutions to homework problems. Typically these tools involve a combination of techniques from several sections and require theoretical understanding. On the exams, some of the problems, or even all of them, may be of this type. It is inefficient to try to memorize solutions to problems. What matters is the attack. Strive to understand the concepts your professor is teaching. Then you will be able to use those concepts to solve a variety of homework problems.

Q: I'm terrified of my professor and afraid of seeing him during office hours; he seems impatient and will not show me how to do the problems.

A: Most math professors are happy to help you if you have struggled with the problem. However, do not expect them to solve the problem for you. They want to see that you've spent more than two minutes on it and looked at the theory in the book so you can ask a precise question. "I can't do #5" will not advance the conversation.

Add/Drop/Wait List Procedures

Students enroll in classes via Web Reg. A step-by-step guide to the enrollment process is explained at:
<http://blink.ucsd.edu/Blink/External/Topics/Policy/0,1162,17915,00.html>

1. Go to WebReg.
2. Choose your registration term and student level.
3. Enroll in the class you want to take.
4. If you can't get into a class you want, WebReg lets you either enroll in another section of the same class or wait-list it.
5. On WebReg you see a confirmation after each class you enroll in, including any that you wait-listed.
6. Check your class list in WebReg, including grading option and number of units.

Ten Tips for Transfer Students

1. Read your email often. Your @ucsd.edu email is the official means of campus communication and the way your college, professors, and department offices will contact you. It is your responsibility to make sure it is not full and that messages don't bounce. If you want your mail to be sent to an off-campus account, go to <http://www-no.ucsd.edu/> to forward your account.
2. The quarter system is only ten weeks! Plan your time wisely and start your assignments right away. Avoid procrastinating because the quarter goes by so fast that you'll be through it before you realize that there may not be enough time to do all the work.
3. Go to your professors' office hours to talk about how you are doing in your courses. Find faculty specializing in areas of interest to you. Make yourself known in the Math Department. You have only two (or three) years to create the networks needed to receive recommendations and to meet the people who can assist with graduate school applications.
4. Get involved with other transfer students. The ACTA (All Campus Transfer Association) is an organization designed to give transfer students the opportunity to become involved with UCSD. Go to <http://transfer.ucsd.edu> for more information.
5. Get together with other students in your classes. If you're having problems with a topic, others are probably having the same problem. Study collectively; get together to form study-groups. The Math Department can help find you the space to meet on a regular basis.
6. Get a UCSD General Catalog (available on-line, or at the bookstore) and read it. Pay attention to requirements as you are ultimately responsible for making sure you adhere to University policy. Review the academic, enrollment, and registration calendars available on TritonLink for deadlines.
7. Become familiar with the Geisel Library, and specifically the Science & Engineering Library and Library Reserves. All lower-division courses, and many upper-division courses will have the textbook available on reserve for temporary check-out.
8. Join the Math Club or at least go to their website (<http://math.ucsd.edu/~mathclub>). Meet other students interested in Mathematics and talk about your classes. The website also has academic and career resources.
9. Meet with the math advisors early and often – discuss your course plans and make sure you are on track for graduation.
10. It should go without saying, but...
Attend All Your Classes.
Go to lecture,
go to discussion and
go to office hours.

Recommended first classes for Transfer Students:

When you start at UC San Diego we hope you have the equivalent to our Math 20A, 20B, 20C, 20D and 20F. Then we recommend for your first quarter Math 109 (Mathematical Reasoning) and 20E (Vector Calculus).

Other classes to consider:

Math 102	Applied Linear Algebra	Pre-requisite: 20F
Math 170A	Numerical Linear Algebra	Pre-requisite: 20F
Math 174	Numerical Methods for Physical Modeling	Pre-requisites: 20D and 20F
Math 180A*	Introduction to Probability	Pre-requisite: 20C
Math 183	Statistical Methods	Pre-requisite: 20C

Taking Math 180A in the first Fall Quarter is important for Applied Math and Probability & Statistics Majors. Math 180A is a pre-requisite for many of the classes in these majors. Taking it early gives the student more class options in later quarters.

Hints for Succeeding in Math at UC San Diego

This information is relevant for any student on this campus who is enrolled in a math class!

The sure path to passing your math classes, particularly 3C, 4C, 10A-B-C & 20A-B-C can be achieved by:

- * Attending your lecture and discussion group.
- * Reviewing the appropriate sections of the text prior to the lecture.
- * Reviewing lecture material after class.
- * Attending your discussion group.
- * Visiting Office Hours. Both your professor and TA hold office hours each week. If you have a problem that was not resolved in lecture or the discussion time attend office hours.

http://www.math.ucsd.edu/people/office_hours/faculty_hours.pl

http://www.math.ucsd.edu/people/office_hours/ta_hours.pl

Tip: Go with a problem you have tried to solve – it helps the professor/TA to see where you are not understanding the course material.

- * Visiting the Calc Lab in APM B402A/B. It operates 8:00 am – 6:00 pm Monday through Friday. There are usually 2-4 tutors available to help with your homework problems or class examples. A schedule can be found:

<http://www.math.ucsd.edu/resources/tutoring/>

- * Considering OASIS; a campus-wide program for undergraduates of all majors. The program provides free tutoring and helps improve study habits. It is a more structured program and students need to sign up for sessions and attendance is then mandatory. OASIS also has drop-in study tables on the 3rd floor of Center Hall.

<http://sea.ucsd.edu/oasis/>

- * Getting together with friends to form a study/problem solving group. Just remember to turn in your own homework!

General Math Department information

Advising:

M - F 10:00 am – noon and 1:00 pm – 3:00 pm (or by appointment)

APM 6016 Undergraduate Advisor 858 534-6009

Alternate Advising

APM 7018 Math Dept Front Desk 858 534-3592

For petitions, class schedules, textbook information etc go to the Math Dept Front Desk, APM 7018.

For information on our Math Majors and general department information see:

<http://www.math.ucsd.edu/programs/undergraduate/>

*** * * Remember: If you are having any problems act immediately. * * ***
Do not leave it until the last week of classes. Let us know!

The Math Club

<http://www.math.ucsd.edu/~mathclub/>

Check the website for updated information including upcoming events.

Appendix

Scholarships

While many scholarship opportunities are listed on the Financial Aid web site, a number of scholarships are available specifically targeted to Math Majors, they include [the Bishop, Rimmel, BAE Systems, Eckart and Reynolds](#). Applications for these are made through the Financial Aid Office.

The Academic Enrichment Program Sponsors the [CSEMS](#) and [UC Leads](#) programs.

The San Diego Foundation also lists numerous opportunities, but of particular interest is [the Reuben H. Fleet Memorial Scholarship](#).

Other scholarships listed individually include the [Goldwater, Schafer and Hispanic](#) awards.

But ... there could be more! Please let the [Math Advisor \(jbitmead@ucsd.edu\)](mailto:jbitmead@ucsd.edu) or 858 534 6009 know if you discover further funding sources.

Errett A. Bishop Memorial Scholarship

http://orpheus.ucsd.edu/finaid/Scholarships_UCSDScholarships_CurrentStudents_01.htm#Bishop

Awarded to upper-division mathematics majors with an outstanding academic record in upper-division mathematics and with demonstrated financial need. Preference will be given to UCSD graduating seniors. The number of awards and award amount varies each year.

Tenie Rimmel Memorial Scholarship

http://orpheus.ucsd.edu/finaid/Scholarships_UCSDScholarships_CurrentStudents_01.htm#Rimmel

Awarded based on academic merit and demonstrated financial need to a full-time student in the Division of Physical Sciences. This is a one-year award up to \$1,000.

BAE SYSTEMS Scholarships

http://orpheus.ucsd.edu/finaid/Scholarships_UCSDScholarships_CurrentStudents_01.htm#BAE

Awarded to full-time students who will be seniors in the 2004-2005 academic year, with a minimum 3.2 GPA, majoring in computer science, applied mathematics, computer or electrical engineering with a computer science emphasis, are U.S. citizens, and plan to pursue a career in computer sciences in San Diego. This is a one-year award up to \$5,000.

Klara D. Eckart Scholarship

http://orpheus.ucsd.edu/finaid/Scholarships_UCSDScholarships_CurrentStudents_01.htm#Eckart

Awarded to current promising students in the fields of computation, mathematics, and physics. This is a one-year award and the amount varies.

Gary C. Reynolds Memorial Scholarship

http://orpheus.ucsd.edu/finaid/Scholarships_UCSDScholarships_CurrentStudents_01.htm#Reynolds

Awarded to students who will be juniors or seniors in 2004-2005, who are mathematics-computer science majors, who show exceptional promise for making future contributions in their field of study. This is a one-year award and the amount varies.

The Computer Science, Engineering and Mathematics Scholarship (CSEMS) Program

<http://aep.ucsd.edu/default2.htm>

The Computer Science, Engineering and Mathematics Scholarship (CSEMS) Program is a two-year program for UCSD upper-division undergraduates enrolled full-time in any major within the Jacobs School of Engineering or Mathematics Department. The CSEMS Program is funded by a grant from the National Science Foundation with a focus on increasing the participation of low-income and underrepresented groups in computer science, engineering or mathematics. To this end, the program provides educational opportunities to low-income, academically talented students through scholarships.

The University of California Leadership Excellence through Advanced DegreeS (UC LEADS) Program

<http://aep.ucsd.edu/default2.htm>

The University of California Leadership Excellence through Advanced Degrees (UC LEADS) Program is a one year program for UCSD upper-division undergraduates majoring in science, engineering, or mathematics and interested in pursuing the Ph.D. degree. The UC LEADS Program is funded by the University of California Office of the President (UCOP) with the main goal of developing California's future leaders in government, industry, and academia. The program provides its scholars numerous educational opportunities that will lead to graduate and fellowship opportunities. Scholars conduct research and participate in activities that facilitate the formation of networks among scholars and current California leaders. The UC LEADS Program at UC San Diego is jointly operated by the Academic Enrichment Programs (AEP) and the Office of Graduate Studies and Research (OGSR).

The University of California Leadership Excellence through Advanced DegreeS (UC LEADS) Program

<http://aep.ucsd.edu/default2.htm>

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The Goldwater Scholarship

<http://www.act.org/goldwater/>

The purpose of the Barry M. Goldwater Scholarship and Excellence in Education Foundation, as stated in the enabling legislation, is to alleviate a critical current and future shortage of highly qualified scientists, mathematicians, and engineers. A more realistic statement of the purpose, in today's terms, is to provide a continuing source of highly qualified individuals to those fields of academic study and research.

The Rueben H. Fleet Memorial Scholarship

<http://www.sdfoundation.org/scholarships/fleet.shtml>

Open to college students who are pursuing an undergraduate degree in science, engineering or math. Students must have already completed 54 semester units or 72 quarter units and maintained a minimum 3.0 GPA on a 4.0 scale. Applicants must be enrolled at an accredited four-year university in San Diego County, or be a San Diego County resident attending an accredited four-year university in the United States. Students enrolled currently at an accredited two-year college may apply so long as they submit a letter of acceptance from the four-year university to which they will be transferring at the time they receive the scholarship. Past recipients may re-apply and will compete with all other applicants. This scholarship may be used for tuition, books, fees, and room & board.

Alice T. Schafer Prize

Schafer Prize Nomination Deadline: October 1, 2004

<http://www.awm-math.org/schaferprize.html>

The Executive Committee of the Association for Women in Mathematics (AWM) calls for nominations for the Alice T. Schafer Mathematics Prize to be awarded to an undergraduate woman for excellence in mathematics. All members of the mathematical community are invited to submit nominations for the Prize. The nominee may be at any level in her undergraduate career but must be an undergraduate as of October 1, 2004. She must either be a U.S. citizen or have a school address in the United States.

Hispanic Scholarship Fund

<http://www.hsf.net/>

The Hispanic Scholarship Fund (HSF) is proud to be the nation's leading organization supporting Hispanic higher education and is committed to providing opportunities for students like you. Our vision is to strengthen our country by advancing the college education of Hispanic Americans. Their mission is to double the rate of Hispanics earning a college degree.

HSF offers different scholarship programs for students of various educational backgrounds. All applicants must be U.S. citizens or legal permanent residents of Hispanic heritage.

Successful candidates are chosen on the basis of academic achievement, personal strengths, leadership and financial need. The selection of HSF scholars is assisted by the efforts of the ACT Recognition Program and by regional readers.

Jack Kent Cooke Foundation

<http://www.jackkentcookefoundation.org/>

The Foundation seeks excellent students beginning a graduate degree in the fall. A candidate must be nominated by their undergraduate institution; be a current student at an accredited US college or university with senior status or a recent graduate; have a cumulative GPA of 3.5 or better; be planning to attend a full-time graduate degree program in the fall. The maximum award available per student is \$50,000 per year and may be used at any accredited graduate school in the US or abroad.

The application deadline is typically May 1.