139. General Oceanography. A study of the physical, chemical, biologic, and geologic aspects of the sea. An introduction to the 141 series of specialized marine science courses. Not open to students who have completed Geol. 105. Prerequisites: College Chemistry and Biology. (Lecture 3 hours; laboratory 3 hours.) Four units.

140. Geological Engineering Principles. A survey of geology applied to site investigation for dams, tunnels, and buildings. Prerequisites: Geol. 122, Math 30. (Lecture 3 hours; laboratory 3 hours.) Four units.

141. Geological Oceanography. A study of the structures, physiography and sediments of the sea bottom and shoreline. Prerequisite: Geol. 139 or consent of instructor. (Lecture 3 hours.) Three units.

143. Micropaleontology. A study of fossil micro-organisms with emphasis on stratigraphic and environmental significance of foraminifers. Prerequisite: Geol. 18, or Geol. 2 and Zool. 1. (Lecture 2 hours; laboratory 3 hours.) Three units.

147. Applied Geophysics I. Introduction to gravimetric, magnetic, electromagnetic, and radioactive prospecting. Physical and geological principles, field techniques and case histories will be discussed. Prerequisites: Geol. 122. (Lecture 2 hours, laboratory 3 hours.) Three units.

148. Applied Geophysics II. Introduction to seismic and electrical prospecting. Physical and geological principles, field techniques and case histories will be discussed. The application of communication theory to geological problems will be investigated: including filter design and numerical studies of geological data. Prerequisite: Geol. 122. (Lecture 2 hours, laboratory 3 hours.) Three units.

180. Individual Studies. Advanced laboratory and field work. Limited to majors. One to three units by arrangement.

184. Directed Reading. Assigned readings of selected books, journals and special papers, chosen with a view to filling the gaps in a student's training or to bringing him into contact with new fields. Evaluation through weekly reports and conferences. One to three units by arrangement.

Graduate Courses

(See Graduate Catalog for details)

Mathematics

MATHEMATICS DEPARTMENT
Office: MacQuarrie Hall, Room 108

Professors ANDERSON, EDGAR, FELDMAN, FOWLER, GREER, HOGGATT, KRAMER, LANGE, LARSEN, LOVAGLIA, MARKS, MYERS, OLDS, POST, PRESTON, PRUITT, SMART, THORO, WREDE; Associate Professors BILLIK, BRADSHAW, DOLBY, FEINSTEIN, FITTING, FULLER (Chairman), HALTEMAN, MICHAEL, MITCHEM, SCHWEITZER, SILLS, STEIN, SWANN, WEDDINGTON; Assistant Professors BURKE, BYRD, O'DONNELL, SIMONS

Baccalaureate Majors

Mathematics (B.A.)
Mathematics with Concentration in Statistics (B.A.)
Mathematics with Concentration in Computer Mathematics (B.A.)

CREDENTIAL PROGRAM

Single Subject Instruction Credential (Secondary Education): Mathematics is an approved single-subject instructional area under the new Teacher Preparation and Licensing Act of 1970.

Master's Degree Majors

Mathematics (M.S.)
Mathematics (M.A.)

B.A. Degree With Major in Mathematics

Semester Units
General Education ......................................................... 40
Physical Education ...................................................... 2
Requirements in the Major ............................................... 37-41
Math. 30 (or 20), 31 (or 21), 32, 35 ................................ 13-17
Twenty-four (24) units in upper division mathematics, to include Math. 131A; Math. 112 or 115; Math. 128 or 129A; and not to include Math. 106, 107A, 107B and certain special courses, such as institute courses, not listed in this Catalog.
Supporting Courses Required ........................................... 6-10
One year of college physics. On prior approval this may be replaced by 6 units of mathematics related courses from other departments.
Electives ...................................................................... 31-39
Total units required for degree ........................................... 124*

B.A. in Mathematics With Concentration in Statistics

Semester Units
General Education ......................................................... 40
Physical Education ...................................................... 2
Requirements for the Major ............................................... 37-41
Math. 30 (or 20), 31 (or 21), 32, 35 ................................ 13-17
Twenty-four (24) units in upper division mathematics, to include Math. 131A; Math. 112 or 115; Math. 129A; Math. 163; Math. 164; together with 6 units from the following courses: Math. 144A-1 (3 units); 165; 166. These courses may not include Math. 106, 107A, 107B and certain special courses such as institute courses not listed in this catalog.
*40 of the 124 units for graduation must be upper division.
**Supporting Courses Required**
One year of college physics. On prior approval this may be replaced by one year of mathematics related courses from other departments.

<table>
<thead>
<tr>
<th>Electives</th>
<th>31-39</th>
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</table>

**Total units required for degree**
124*  

**B.A. in Mathematics With Concentration in**
**Computer Mathematics**

<table>
<thead>
<tr>
<th>Semester Units</th>
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<tbody>
<tr>
<td><strong>General Education</strong></td>
</tr>
<tr>
<td><strong>Physical Education</strong></td>
</tr>
<tr>
<td><strong>Requirements for the Major</strong></td>
</tr>
<tr>
<td>Math. 30 (or 20), 31 (or 21), 32, 35</td>
</tr>
<tr>
<td>Twenty-four (24) units in upper division mathematics to include Math. 131A; Math. 112 or 115; Math. 129A; Math. 143; Math. 144A-J (3 units); Math. 163; Math. 179. These courses may not include Math. 106, 107A, 107B and certain special courses such as institute courses not listed in this catalog.</td>
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</table>

**Supporting Courses Required**
One year of college physics. On prior approval this may be replaced by 6 units of mathematics related courses from other departments.

<table>
<thead>
<tr>
<th>Electives</th>
<th>31-39</th>
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<tbody>
<tr>
<td>(Engr. 150 and E.E. 174 are recommended)</td>
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</tr>
</tbody>
</table>

**Total units required for degree**
124*  

**MINOR IN MATHEMATICS**

<table>
<thead>
<tr>
<th>Semester Units</th>
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<tbody>
<tr>
<td>For Baccalaureate Degrees</td>
</tr>
<tr>
<td>A total of 20 units of Math., including Math. 30 (or 20), 31 (or 21), 35</td>
</tr>
<tr>
<td>Eight units of upper division mathematics, including one semester of algebra and one semester of geometry</td>
</tr>
<tr>
<td>Three units of other mathematics electives, upper or lower division</td>
</tr>
</tbody>
</table>

The following courses may not be counted toward the minor in mathematics: Math. 12, 70, 106, 107A, 107B, and certain special courses, such as institute courses, not listed in this catalog.

**HONORS PROGRAMS IN MATHEMATICS**
The requirements for mathematics majors to graduate with departmental honors are: (1) at least a 3.0 G.P.A. overall, (2) at least a 3.5 G.P.A. in mathematics, and (3) completion of at least one Honors Seminar, and recommendation of that instructor.  
The Department also may offer a lower division honors program extending over a period of four semesters.

**Restriction on Enrollment for Credit**
Enrollment for credit in Math. 5, 7, 8, 12, 70, 71, 106, and 107A, B will not be allowed for students who have received credit in Math. 29, 30, 31, or 32, unless the particular course in question must be taken in order to fulfill major, minor or credential requirements.

*40 of the 124 units for graduation must be upper division.
106. Intuitive Geometry. Basic ideas of metric and non-metric geometry including a study of measurement of lengths, angles, and regions, separations in a plane, congruence, parallelism, and similarity. An introduction to logic, proof, and graphing of functions and other relations. Prerequisite: Math. 12 or equivalent. Three units.

107A. The Structure of Elementary Algebra. An axiomatic study of the real numbers as a complete ordered field. The complex number field. The role of the set in the solution of open sentences. The function concept as a unifying element in elementary algebra. Prerequisite: Math. 106 or equivalent. Three units.

107B. The Structure of Elementary Geometry. Concepts of betweenness, separation in the plane, congruence, measures, parallelism, and similarity. The nature of deductive proof and a continuation of the study of coordinate geometry. Prerequisite: Math. 106 or equivalent. Three units.

108. Problem Solving in Mathematics. A study of general ideas useful in solving mathematical problems; generalization, specialization, analogy, induction, recursion, and others. Practice in applying these ideas to a variety of non-routine problems. Prerequisite: at least one mathematics course numbered above 110. Two units.

112. Vector Analysis and Euclidean Geometry. Algebra and calculus of vectors; metric structure of Euclidean space; transformations, vector fields, integration and applications; introduction to Cartesian tensors. Prerequisite: Math. 32. Three units.


115. Modern Geometry and Transformations. Synthetic and analytic theory of projective transformations, similarities, Euclidean motions; inversive geometry. Prerequisite: Math. 32. Three units.

116. Special Topics in Modern Geometry. Axiomatic systems for Euclidean, non-Euclidean, and finite geometries. Convexity and selected topics from modern synthetic geometry. Prerequisite: Math. 112 or Math. 115. Three units.

128. Algebraic Structures. Groups, rings, and fields, their structures and morphisms, including quotient groups, transformation groups, ideals, quotient rings, integral domains, field extensions. Prerequisite: Math. 35 and Math. 31 (or 21). Three units.

129A. Linear Algebra I. Matrices, systems of linear equations, vector spaces, vector geometry, linear transformations. Prerequisites: Math. 35 and Math. 31 (or 21). Three units.


133. Differential Equations. A course in ordinary differential equations; numerical solutions; introduction to Fourier series. Prerequisite: Math. 32. Three units.

134. Advanced Calculus. Limits, continuity, and partial differentiation of functions of several variables. Implicit function theorems. Line and surface integrals and volume. Emphasis throughout will be on 2 and 3 variables. Prerequisite: Math. 32. Three units.


144A-J. Programming Techniques and Analysis. Each unit gives one-third of a semester of problem solving on one of the topics: A. Fortran IV programming; B. Monte Carlo methods; C. Numerical solution of differential equations; D. Assembly language programming; E. Statistical information processing; F. Iterative matrix techniques; G. Number theory; H. Non-numerical techniques; I. Error Analysis; J. Fourier approximation. A total of 6 units may apply toward a degree. Math. 144A (Fortran IV programming) or equivalent to precede other units. Prerequisite: Math. 32 or consent of instructor. One unit each.


151. Theory of Numbers I. Divisibility, prime numbers, congruences of first and higher degrees, theorems of Fermat, Euler, and Wilson, quadratic residues. Prerequisites: Math. 35 and Math. 31 (or 21). Three units.


166. Applied Statistics. Probability distributions; acceptance sampling; hypothesis testing; estimation of extreme values, rejection of data; linear, non-linear curve fitting; regression; polynomial models; analysis of variance; non-parametric procedures; discrimination and recognition. Prerequisite: Math. 163 or permission of instructor. Three units.

171. Foundations of Mathematics. Fundamental and unifying principles of logic, algebra and geometry with emphasis on the nature of proof and the axiomatic approach. Prerequisite: One semester each of upper division algebra and geometry. Three units.


179. Introduction to Graph Theory. Hamiltonian and Eulerian properties of graphs. Trees, connectivity, graph valued functions. Coloring problems and planarity. Ramsey number, the Ulam-Kelly conjecture. Prerequisite: Math. 128 or 129A or permission of instructor. Three units.

180. Individual Studies. Individual study in a specific field. Registration to be approved by department chairman. One to four units.

195. Honors Seminar. Subject matter is determined by the instructor and the departmental honors committee. At least one Honors Seminar is required for graduation with honors in mathematics. Prerequisite: Junior standing and consent of instructor. Three units.
San Jose State University

Mathematics Education

MthEd. 184F Secondary School Student Teaching. (See Education Section for description.) Four units.

MthEd. 184Y. Student Teaching III — Classroom Teaching. Prerequisite: Joint approval of major and education departments. Minimum 80–120 class periods of classroom teaching, laboratory or field teaching in appropriate single subjects, grades K-12, and related teaching activities and seminar. Four to six units.

MthEd. 184Z. Student Teaching IV — Classroom Teaching. (Same as 184Y, but may be in different subject, or in a different school, and will be at a different grade level.) Four to six units.


Graduate Courses

(See Graduate Catalog for details)