Mathematical and Physical Sciences

[College of Letters and Science]
Louise H. Kellogg, Ph.D., Program Director
Program Office: 118 Everson Hall

Committee in Charge
Andreas J. Albrecht, Ph.D. (Physics)
Sheila David, Ph.D. (Chemistry)
Joel Hass, Ph.D. (Mathematics)
Isabel P. Montalvo, Ph.D. (Earth and Planetary Sciences)

Motiuchio Mulase, Ph.D. (Mathematics)
Academic Senate Distinguished Teaching Award
Wolfgang Polonik, Ph.D. (Statistics)
Francisco J. Samaniego, Ph.D. (Statistics)
Academic Senate Distinguished Teaching Award
Howard J. Spero, Ph.D. (Earth and Planetary Sciences)
Xiangdong Zhu, Ph.D. (Physics)

The Program of Study
The Division of Mathematical and Physical Sciences teaches students the concrete mathematical and experimental studies and theoretical analyses to find solutions to real world problems. Students learn to address issues such as cleaning up the environment, preserving natural resources and creating innovative materials for the future. From the study of atoms to the examination of distant galaxies, from abstract number theory to the development of new chemical compounds, the division provides students with the skills to build the world of tomorrow.

The program in Mathematical and Physical Sciences provides an organizational structure within the College of Letters and Science for facilitating the development of innovative curricular initiatives across the mathematical and physical sciences, including offering broadly conceived, integrative undergraduate- and graduate-level courses. The program also may house resident faculty pursuing interdepartmental research and teaching in this area of inquiry.

Courses in Mathematical and Physical Sciences (MPS)

Lower Division

1. General Science: Science in the News (4)
   Lecture—3 hours; laboratory/discussion—1 hour. Prerequisite: lower division standing. Basic principles in science including numeracy, scale, energy, and time; the scientific method; good and bad science. Emphasis on science topics recently in the news. GE credit: SciGen—III. 11A-11B. Mathematical and Physical Sciences Seminar (2-2)
   Lecture—2 hours. Prerequisite: mentorship for undergraduate research participants in the physical and mathematical sciences. Research and writing in the mathematical and physical sciences. Presentations by various science faculty members.—III. [III.]

Mathematics

See Mathematics; and Applied Mathematics (A Graduate Group), on page 165. 390

Mathematics

[College of Letters and Science]
Joel Hass, Ph.D., Chairperson

Department Office: 1130 Mathematical Sciences Bldg.
530-752-0827; studentservices@math.ucdavis.edu; http://www.math.ucdavis.edu

Faculty
Eric Babson, Ph.D. Professor
Zhaojun Bai, Ph.D., Professor (Computer Science)
Craig Benkman, Ph.D., Professor
Joseph Biello, Ph.D., Associate Professor
James Bremer, Ph.D., Assistant Associate Professor
Angela Y. Cheer, Ph.D., Professor
Jesus De Loera, Ph.D., Professor
C. Albert Fannjiang, Ph.D., Professor
Roland Freund, Ph.D., Professor
Dmitry B. Fuchs, Ph.D., Professor
Janko Gravner, Ph.D., Professor
Robert Guy, Ph.D., Associate Professor
Joel Hass, Ph.D., Professor
John K. Hunter, Ph.D., Professor
Michael Kapovich, Ph.D., Professor
Matthias Koepepe, Ph.D., Professor
Gregory J. Kuperberg, Ph.D., Professor
Timothy Lewis, Ph.D., Associate Professor
Fu Liu, Ph.D., Professor
Kevin Luli, Ph.D., Assistant Professor
Alexander I. Mogilner, Ph.D., Professor
Ben Morris, Ph.D., Professor
Motoko Muri, Mathematics Professor
Academic Senate Distinguished Teaching Award
Bruno I. Nachtergaele, Ph.D., Professor
Brian Osserman, Ph.D., Associate Professor
Alessandro Pizzetti, Ph.D., Associate Professor
E. Gerry Puckett, Ph.D., Professor
Dan Romik, Ph.D., Associate Professor
Naoki Saito, Ph.D., Professor
Anna Schilling, Ph.D., Professor
Jennifer Schilling, Ph.D., Professor
Albert Schwarz, Ph.D., Professor
Steve Shkolli, Ph.D., Professor
Alexander Soshnikov, Ph.D., Professor
Thomas Strohmer, Ph.D., Professor
J. Blake Temple, Ph.D., Professor
UC Davis Distinguished Professor 2012
Becca Thomases, Ph.D., Associated Associate Professor
Abigail Thompson, Ph.D., Associate Professor
Mathematics 22A, 108 OR (b)
Mathematics 67... 4-7
Computer Science 30 or Engineering 6, 4 Mathematics 22AL or equivalent MATLAB knowledge.—0.1 Additional Non-Mathematics courses chosen from natural sciences—12
NOTE: Basic knowledge of MATLAB is required for both Mathematics 67 and 22A. Students can learn it on their own, enroll in Engineering 6, Mechanical Engineering 5 or in the one unit course Mathematics 22AL (can be taken concurrently).

Depth Subject Matter—37-42
A. Entry Level (Optional) 0.4
   Suggested choice; one course from:
   Mathematics 108, 114, 115A, 141, 145
   B. Core 16
      Mathematics 125A
      Mathematics 125B
      Mathematics 135A
      Mathematics 150A
   C. Choose one Plan from the following two:
      up to 4 of these 18 units may be approved
      upper division courses outside of the
      Department of Mathematics with extensive
      use of mathematics—18

Quarter Offered: I=Fall, II=Winter, III=Spring, IV=Summer; 2015-2016 offering in parentheses
Pre-Fall 2011 General Education (GE): AH=Arts and Humanities; SCI=Science and Engineering; SS=Social Sciences; DD=Domestic Diversity; WRT=Writing Experience
Fall 2011 and on Revised General Education (GE): AH=Arts and Humanities; SE=Science and Engineering; SS=Social Sciences; ACH=American Cultures; DD=Domestic Diversity; OL=Oral Skills; Quantitative; SL=Scientific; VL=Visual; WC=World Cultures; WRT=Writing Experience
Plan 1: General Mathematics
Additional upper division mathematics units selected in consultation with and subject to approval of an adviser…………….18
Plan 2: Secondary Teaching
Mathematics 111.................................4
Mathematics 115A...............................4
Mathematics 141...............................4
Additional upper division mathematics units selected in consultation with and subject to approval of an adviser.

NOTE: Students who wish to satisfy the single subject matter waiver for the teaching credential should see an adviser as early as possible.

D. Capstone Course: Mathematics 189 or 192 (Internship in Applied Mathematics or 194 (Undergraduate Thesis) or 180 (Special Topics) are approved substitute in consultation with the Undergraduate Vice Chair……………………………………………………………..3-4

Total Units for the Major………………..80-92

Applied Mathematics

B.S. Major Requirements:

Preparatory Subject Matter………………42-52
Mathematics 12 (or high school equivalent) …………………….0-3
One of the following two options: (a) Mathematics 22A and 108 OR (b) Mathematics 67…………………..4-7
Mathematics 189 or 192 (Internship in Applied Mathematics or 194 (Undergraduate Thesis) are not to be counted. Students can learn it on their own, enroll in Engineering 6, Mechanical Engineering 5 or in the one unit course Mathematics 22AL can be taken concurrently.

Depth Subject Matter…………………51-56

A. Entry Level (Optional)……………….0-4
Suggested choice; one course from: Mathematics 108, 114, 115A, 141, 145

B. Core……………………………………32
Mathematics 150A……………………….4
Mathematics 135A……………………….4
Mathematics 125A...............................4
Mathematics 128A……………………….4
Mathematics 128B……………………….4
Mathematics 185A……………………….4

C. Enrichment Courses……………………16
3. Choice of one course from: Mathematics 119A, 124, 128A, 128B, 129, 133, 167, 168 or one approved upper division course outside the Department of Mathematics with extensive use of mathematics………………..4
D. Capstone Course: Mathematics 189 or 192 (Internship in Applied Mathematics or 194 (Undergraduate Thesis) or 180 (Special Topics) or an approved substitute in consultation with the Undergraduate Vice Chair………………..3-4

Plan 2: Mathematics for Secondary Teaching

A. Entry Level (Optional)……………….0-4
Suggested choice; one course from: Mathematics 108, 114, 145

B. Core……………………………………28
Mathematics 150A……………………….4
Mathematics 135A……………………….4
Mathematics 125A...............................4
Mathematics 128A……………………….4
Mathematics 185A……………………….4

C. Enrichment Courses……………………20
3. One approved upper division course outside the Department of Mathematics with extensive use of mathematics………………..4
D. Capstone Course: Mathematics 189 or 192 (Internship in Applied Mathematics or 194 (Undergraduate Thesis) or 180 (Special Topics) or an approved substitute in consultation with the Undergraduate Vice Chair………………..3-4

Total Units for the Major………………..93-108

Mathematics

B.S. Major Requirements:

Preparatory Subject Matter………………34-42
Mathematics 12 (or high school equivalent) ………………………..0-3
One of the following two options: (a) Mathematics 22A and 108 OR (b) Mathematics 67…………………..4-7
Computer Science 30 or Engineering 6…………………..1-4
Physics 9A (Plans 1 and 2) or one course from: Physics 7A, Statistics 13, 32, 100 (Plan 2)…………………..3-5
NOTE: Basic knowledge of MATLAB is required in both Mathematics 67 and 22A.

Depth Subject Matter…………………51-56
Choose one plan from the following two:

Plan 1: General Mathematics

A. Entry Level (Optional)……………….0-4
Suggested choices; one course from: Mathematics 108, 114, 115A, 141, 145

B. Core……………………………………28
Mathematics 150A……………………….4
Mathematics 135A……………………….4
Mathematics 125A...............................4
Mathematics 128B...............................4
Mathematics 185A……………………….4

C. Enrichment Courses……………………20
2. Choice of one course from: Mathematics 119A, 124, 128A, 128B, 129, 133, 167, 168 or one approved upper division course outside the Department of Mathematics with extensive use of mathematics………………..4
D. Capstone Course: Mathematics 189 or 192 (Internship in Applied Mathematics or 194 (Undergraduate Thesis) or 180 (Special Topics) or an approved substitute in consultation with the Undergraduate Vice Chair………………..3-4

Plan 2: Mathematics for Secondary Teaching

A. Entry Level (Optional)……………….0-4
Suggested choice; one course from: Mathematics 108, 114, 145

B. Core……………………………………28
Mathematics 150A……………………….4
Mathematics 135A……………………….4
Mathematics 125A...............................4
Mathematics 128B...............................4
Mathematics 185A……………………….4

C. Enrichment Courses……………………20
D. Choice one Emphasis from the following two:……………………20
Computational and Mathematical Biology Emphasis
Mathematics 124……………………….4
One approved upper division course in Biology………………..4
Computational and Mathematical Emphasis…Mathematics 168………………..4
One approved upper division course involving extensive computation or theory of computation………………..4
E. Capstone Course: Mathematics 189 or 192 (Internship in Applied Mathematics or 194 (Undergraduate Thesis) or 180 (Special Topics) or an approved substitute in consultation with the Undergraduate Vice Chair………………..3-4

Total Units for the Major………………..86-98

Recommended Language Preparation, Bachelor of Science degree candidates are advised, but not required, to satisfy the same language requirement as that for a Bachelor of Arts degree candidate, and to fulfill it in French, German, or Russian.

Major Advisers. For a current list of faculty and staff advisers, contact the Student Services office at studentservices@math.ucdavis.edu, or our website at https://www.math.ucdavis.edu/undergrad/advising/advisers/.

Depth Subject Matter Requirements, Certain mathematically oriented courses given by other departments are admissible in partial satisfaction of the depth subject matter requirements with prior departmental approval. Up to three units of Mathematics 194 may be counted toward the depth sub-
Mathematics Placement Requirement. Students who wish to enroll in Mathematics 12, 16A, 17A, 21A, 21AH, and 36 must satisfy the mathematics placement requirement by taking an online exam. Students who do not satisfy the requirement will be administratively dropped from these courses. For more information, including preparation tips and how to access the online exam, please see the Department of Mathematics’ website (http://www.math.ucdavis.edu/undergrad/math_placement) well in advance of enrolling.

Department Honors. Students who have completed at least 135 units with a minimum GPA of 3.50 in courses towards their major will be considered for Department Honors. Students who are eligible will be notified of their standing by the department at the beginning of the fall quarter of their senior year. Students who meet the minimum GPA requirement for honors at graduation for the College of Letters and Science and who complete a senior project as part of Math 194 or 199 units in consultation with their faculty adviser may also be recommended by the department for graduation with High Honors or Highest Honors. Recommendations will be based on evaluations of students’ academic achievements in their major and the quality of their senior project. For complete details, see our website at http://www.math.ucdavis.edu.

Minor Program Requirements:

| UNITS | Mathematics | 20 |
| Minor Program Requirements: |
| Upper division units in mathematics; exclusive of Mathematics 192, 197TC, 198, 199, 199P | 20 |

Teaching Credential Subject Representative. Ali Dad-del

Graduate Study. The Department offers programs of study and research leading to the M.A. and Ph.D. degrees in Mathematics. Information regarding graduate study can be obtained by consulting our website, and by sending an email to student advising services at math.ucdavis.edu.

Courses in Mathematics (MAT)

| Lower Division |
| B. Elementary Algebra (no credit) |
| Lecture—3 hours. Basic concepts of algebra, including polynomials, factoring, equations, graphs, and inequalities. Offered only if sufficient number of students enroll. Not open to Concurrent student enrollment. (P/NP grading only) | I, II, III |
| C. Trigonometry (no credit) |
| Lecture—2 hours. Basic concepts of trigonometry, including trigonometric functions, identities, inverse functions, and applications. Offered only if sufficient number of students enroll. Not open to Concurrent student enrollment. (P/NP grading only) | I, II, III |
| D. Intermediate Algebra (no credit) |
| Lecture—3 hours. Basic concepts of algebra, prepares student for college work in mathematics, such as course 16A or 21A. Functions, equations, graphs, logarithms, and systems of equations. Offered only if sufficient number of students enroll. Not open to Concurrent student enrollment. (P/NP grading only) | I, II, III |
| 12. Precalculus (3) |
| Lecture—3 hours. Prerequisite: two years of high school algebra, plane geometry, plane trigonometry, and satisfying the Mathematics Placement Requirement. Topics selected for their use in calculus, including functions and their graphs, slope, zeros of polynomials, exponential, logarithmic and trigonometric functions, sketching surfaces and solids. Not open for credit to students who have completed any courses 16A, 16B, 16C, 17A, 17B, 17C, 21A, 21B, or 21C with a C- or better. GE credit: SciEng | QI, SE, SL—I, II, III, (II, III) |
| Note: Mathematics 16A, 16B, and 16C are intended for students who will take no more Mathematics courses. Mathematics 17A, 17B, and 17C have the same level of rigor as 16A, 16B, and 16C, yet are much more broad mathematically (containing calculus, especially probability, besides traditional calculus), and are intended for biology students who do not wish to take more rigorous Mathematics courses. |
| 16A. Short Calculus (3) |
| Lecture—3 hours. Prerequisite: two years of high school algebra, plane geometry, plane trigonometry, and satisfying the Mathematics Placement Requirement. Limit; differentiation of algebraic functions; analytic geometry; applications, in particular to maxima and minima problems. Not open for credit to students who have completed course 17B, 17C, 21A, 21B, or 21C. Only 2 units of credit to students who have completed course 17A. GE credit: SciEng | QI, SE, SL—I, II, III, (II, III) |
| 16B. Short Calculus (3) |
| Lecture—3 hours. Prerequisite: course 16B, 17B, or 21B. Differential equations; partial derivatives; double integrals; applications; series. Not open for credit to students who have completed course 21C. Only 2 units of credit to students who have completed course 17C. GE credit: SciEng | QI, SE, SL—I, II, III, (II, III) |
| 16C. Short Calculus (3) |
| Lecture—3 hours. Prerequisite: course 16B, 17B, or 21B. Differential equations; partial derivatives; double integrals; applications; series. Not open for credit to students who have completed course 21C. Only 2 units of credit to students who have completed course 17C. GE credit: SciEng | QI, SE, SL—I, II, III, (II, III) |
| 17A. Calculus for Biology and Medicine (4) |
| Lecture—3 hours; discussion—1 hour. Prerequisite: two years of high school algebra, plane geometry, plane trigonometry, and analytical geometry, and satisfying the Mathematics Placement Requirement. Introduction to differential calculus via applications in biology and medicine. Not open for credit to students who have completed course 16B, 16C, 21A, 21B, or 21C; only 2 units of credit to students who have completed course 16A. GE credit: SciEng | QI, SE, SL—I, II, III, (II, III) |
| Note: Mathematics 16A, 16B, and 16C are intended for students who will take no more Mathematics courses. Mathematics 17A, 17B, and 17C have the same level of rigor as 16A, 16B, and 16C, yet are much more broad mathematically (containing algebra, differential equations and probability, besides traditional calculus), and are intended for biology students who do not wish to take more rigorous Mathematics courses. |
| 17B. Calculus for Biology and Medicine (4) |
| Lecture—3 hours; discussion—1 hour. Prerequisite: course 16A, 17A, or 21A. Introduction to integral calculus and elementary differential equations via applications to biology and medicine. Fundamental theorem of calculus, concepts of integration including integral tables and numerical methods, improper integrals, elementary first order differential equations, applications in biology and medicine. Not open for credit to students who have completed course 16C, 21B, or 21C. Only 2 units of credit for students who have completed course 16B. GE credit: SciEng | QI, SE, SL—I, II, III, (II, III) |
| 17C. Calculus for Biology and Medicine (4) |
| Lecture—3 hours; discussion—1 hour. Prerequisite: course 16B, 17B, or 21B. Matrix algebra, functions of several variables, partial derivatives, systems of differential equations, and applications to biology and medicine. Not open for credit to students who have completed course 21C, only 2 units of credit to students who have completed course 16C. GE credit: SciEng | QI, SE, SL—I, II, III, (II, III) |

17A. Honors Calculus (4)

Lecture/discussion—4 hours. Prerequisite: A Precalculus Diagnostic Examination score significantly higher than the minimum for a 21A is required. More intensive treatment of material covered in course 21A. Offered irregularly. GE credit: SciEng | QI, SE |

17B. Calculus (4)

Lecture—3 hours; discussion—1 hour. Prerequisite: Two years of high school algebra, plane geometry, plane trigonometry, and analytic geometry, and satisfying the Mathematics Placement Requirement. Functions, limits, continuity. Slope and derivative. Differentiation of algebraic and transcendental functions. Applications to motion, natural growth, graphing, extrema of a function. Differentials. L’Hospital’s rule. Not open for credit to students who have completed course 16B, 16C, 17B, or 17C. Only 2 units of credit to students who have completed course 16A or 17A. GE credit: SciEng | QI, SE, SL—I, II, III, (II, III) |

17CH or the regular 21C. Offered irregularly. GE credit: SciEng | QI, SE |

121A. Emerging Scholars Program Calculus Workshop (2)

Workshop—6 hours. Prerequisite: concurrent enrollment in course 21A. Functions, limits, continuity. Slope and derivative. Same course content as course 21A. Enrollment for students in the Emerging Scholars Program by instructor’s invitation only. Offered irregularly. (P/NP grading only.) GE credit: SE |

121B. Calculus (4)

Lecture—3 hours; discussion—1 hour. Prerequisite: Two years of high school algebra, plane geometry, plane trigonometry, and analytic geometry, and satisfying the Mathematics Placement Requirement. Introduction to differential calculus via applications in biology and medicine. Not open for credit to students who have completed course 16B, 16C, 21A, 21B, or 21C. Only 2 units of credit to students who have completed course 17B. GE credit: SciEng | QI, SE, SL—I, II, III, (II, III) |

17B. Calculus (4)

Lecture—3 hours; discussion—1 hour. Prerequisite: Two years of high school algebra, plane geometry, plane trigonometry, and analytic geometry, and satisfying the Mathematics Placement Requirement. Introduction to differential calculus via applications in biology and medicine. Not open for credit to students who have completed course 16B, 16C, 17B, or 17C. GE credit: SciEng | QI, SE, SL—I, II, III, (II, III) |

17B. Calculus (4)

Lecture—3 hours; discussion—1 hour. Prerequisite: Two years of high school algebra, plane geometry, plane trigonometry, and analytic geometry, and satisfying the Mathematics Placement Requirement. Introduction to differential calculus via applications in biology and medicine. Not open for credit to students who have completed course 16B, 16C, 17B, or 17C. GE credit: SciEng | QI, SE, SL—I, II, III, (II, III) |

17B. Calculus (4)

Lecture—3 hours; discussion—1 hour. Prerequisite: Two years of high school algebra, plane geometry, plane trigonometry, and analytic geometry, and satisfying the Mathematics Placement Requirement. Introduction to differential calculus via applications in biology and medicine. Not open for credit to students who have completed course 16B, 16C, 17B, or 17C. GE credit: SciEng | QI, SE, SL—I, II, III, (II, III) |

17B. Calculus (4)

Lecture—3 hours; discussion—1 hour. Prerequisite: Two years of high school algebra, plane geometry, plane trigonometry, and analytic geometry, and satisfying the Mathematics Placement Requirement. Introduction to differential calculus via applications in biology and medicine. Not open for credit to students who have completed course 16B, 16C, 17B, or 17C. GE credit: SciEng | QI, SE, SL—I, II, III, (II, III) |
21CH. Honors Calculus (4)  Lecture/discussion—4 hours. Prerequisite: a grade of B or better in course 21B or 21BH. More intensive treatment of material covered in course 21C. Offered infrequently. GE credit: SciEng | SE.

21CL. Emerging Scholars Program Calculus Workshop (2)  Workshop—6 hours. Prerequisite: course 21B or 21BH; concurrent enrollment in 21C. Continuation of course 21B. Same course content as course 21C. Enrollment for students in the Emerging Scholars Program by instructor’s invitation only. P/NP grading only. Offered irregularly. GE credit: SciEng | SE.

21D. Vector Analysis (4)  Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C or 21CH. Continuation of course 21C. Definite integrals over plane and solid regions in various coordinate systems. Line and surface integrals. Green’s theorem, Stoke’s theorem, divergence theorem. GE credit: SciEng | QL, SE.—I, II, III, IV.

21M. Accelerated Calculus (5)  Lecture/discussion—4 hours; discussion/laboratory—1 hour. Prerequisite: grade of B or higher in both semesters of high school calculus or a score of 4 or higher on the Advanced Placement Calculus AB exam, and obtaining the required score on the Pre-Calculus Diagnostic Examination and its trigonometric component. Accelerated treatment of material from courses 21A and 21B, with detailed presentation of theory, definitions, and proofs, and treatment of concepts of calculus at a condensed but sophisticated level. Not open for credit to students who have completed course 21A or 21B or 21CH. Only 2 units of credit will be allowed to students who have completed course 16B. Offered irregularly. GE credit: SciEng | SE.

22A. Linear Algebra (3)  Lecture—3 hours. Prerequisite: nine units of college mathematics and Engineering 6 and Knowledge of Matlab or course 22AL [to be taken concurrently]. Matrices and linear transformations, determinants, eigenvectors, eigenvectors, diagonalization, factorization. Not open for credit to students who have completed course 67. GE credit: SciEng | QL, SE.—I, II, III, I, II, III.

22AL. Linear Algebra Computer Laboratory (1)  Laboratory—2.3 hours. Prerequisite: nine units of college mathematics. Introduction to Matlab and its use in linear algebra. (P/NP grading only.) GE credit: SciEng | QL, SE.—I, II, III, I, II, III.

22B. Vector Analysis (3)  Lecture—3 hours. Prerequisite: courses 21C or 21AL or 22A or 67. Solutions of elementary differential equations. GE credit: SciEng | QL, SE—II, III, I, II, III.


36. Fundamentals of Mathematics (3)  Lecture—3 hours. Prerequisite: satisfaction of the Mathematics Placement Requirement. Introduction to fundamental mathematical ideas selected from the principal areas of modern mathematics. Properties of the primes, the fundamental theorems of arithmetic, properties of the rationals and irrationals, binary and other numerical systems. Not open for credit to students who have completed course 108. Offered irregularly. GE credit: SciEng | IV.

67. Modern Linear Algebra (4)  Lecture/discussion—4 hours. Prerequisite: course 21A or consent of instructor. Rigorous treatment of linear algebra; topics include vector spaces, bases and dimensions, orthogonal projections, eigenvalues and eigenvectors, similarity transformations, singular value decomposition and positive definiteness.

Only one unit of credit to students who have completed course 22A. GE credit: SciEng | SE—II, I, II.

71A-71B. Explorations in Elementary Mathematics (3-3)  Lecture—2 hours; laboratory—3 hours. Prerequisite: two years of high school mathematics. Weekly explorations of topics related to the elementary school curriculum will be carried out by cooperative learning groups. Lectures will provide background and synthesize the results of group exploration. (Enrollment pending completion of sequence.) Offered irregularly.

89. Elementary Problem Solving (1)  Lecture—1 hour. Prerequisite: high school mathematics through precalculus. Solve and present solutions to challenging and interesting problems in elementary mathematics. May be repeated one time for credit. (P/NP grading only.) Offered irregularly.

98. Directed Group Study (1-5)  Prerequisite: consent of instructor. (P/NP grading only.)—I, II, III, I, II, III.

99. Special Study for Undergraduates (1-5)  Prerequisite: consent of instructor. (P/NP grading only.)—I, II, III, I, II, III.

Upper Division

108. Introduction to Abstract Mathematics (4)  Lecture/discussion—4 hours. Prerequisite: course 21B. A rigorous treatment of mathematical concepts with emphasis on the ability to understand abstract mathematical ideas, to read and write mathematical concepts, and to prove theorems. Designed to serve as preparation for the more rigorous upper division courses. GE credit: SciEng; Wrt 1—SE—II, III, I, II, III.

111. History of Mathematics (4)  Lecture—3 hours; term paper or discussion. Prerequisite: eight units of upper division Mathematics; one of the following: Math 67, 105B, 114, 115A, 141, or 145. History of mathematics from ancient times through the development of calculus. Mathematics from Arab, Hindu, Chinese and other cultures. Selected topics of modern mathematics. GE credit: SciEng | QL, SE—II, III, I, II, III.

114. Convex Geometry (4)  Lecture/discussion—4 hours. Prerequisite: courses 21C, 22A or 67. Topics selected from the theory of convex bodies, convex functions, geometric inequalities, combinatorial geometry, and integral geometry. Designed to serve as preparation for the more rigorous upper-division courses. Offered in alternate years. GE credit: SciEng; Wrt 1—SE—II, III, I, II, III.

115B. Number Theory (4)  Lecture—3 hours; extensive problem solving. Prerequisite: courses 22A or 67 (or equivalent) and 115A (or equivalent). Euler function, Moebius function, congruences, primitive roots, quadratic reciprocity law. Offered in alternate years. GE credit: SciEng | QL, SE—II, III.


118A. Partial Differential Equations: Elementary Methods (4)  Lecture—3 hours; problem solving. Prerequisite: courses 22A; 22B or 67. Derivation of partial differential equations; separation of variables; equilibrium solutions and Laplace’s equation; Fourier series; method of characteristics for the one dimensional wave equation. Solution of nonhomogeneous equations. GE credit: SciEng | QL, SE—II, III.

118B. Partial Differential Equations: Eigenfunction Expansions (4)  Lecture—3 hours; extensive problem solving. Prerequisite: course 118A. Sturm-Liouville Theory; self-adjoint operators; mixed boundary conditions; partial differential equations in two and three dimensions. Eigenvalue problems in circular domains, nonhomogeneous problems and the method of eigenfunction expansions; Poisson’s Equations. GE credit: SciEng | QL, SE—II, III.

118C. Partial Differential Equations: Green’s Functions and Transforms (4)  Lecture—3 hours; extensive problem solving. Prerequisite: course 118B. Green’s functions for one-dimensional problems and Poisson transforms; Green’s functions for time dependent problems; Laplace transform and solution of partial differential equations. Offered irregularly. GE credit: SciEng | QL, SE—II, III.

119A. Ordinary Differential Equations (4)  Lecture—3 hours; extensive problem solving. Prerequisite: courses 21D; 22A or 67. Scalar and planar autonomous systems; nonlinear systems and linearization; existence and uniqueness of solutions; matrix solution of linear systems; phase plane analysis; stability analysis; bifurcation theory; Liapunov’s method; limit cycles; Poincare Bendixon theory. GE credit: SciEng | QL, SE—II, III.

119B. Ordinary Differential Equations (4)  Lecture—3 hours; extensive problem solving. Prerequisite: course 119A. Lorentz equations; Poincare maps; center manifolds and normal forms; scalar and planar maps; phase space analysis for iterated maps; period-doubling bifurcation; Lyapunov exponent; chaos and symbolic dynamics; strange attractors; fractals. GE credit: SciEng | QL, SE—II, III.

124. Mathematical Biology (4)  Lecture—3 hours; project. Prerequisite: courses 22A or 67. 228B. Methods of mathematical modeling of biological systems including difference equations, ordinary differential equations, stochastic and dynamic programming models, and simulation models applied to biological systems. Applications to population growth, cell biology, physiology, evolutionary ecology and protein clustering. MATLAB programming required. Offered in alternate years. GE credit: SciEng | QL, SE—II—III.

125A. Real Analysis (4)  Lecture/discussion—4 hours. Prerequisite: course 25. Functions, limits of functions, continuity and uniform continuity, sequences of functions, series of real numbers, series of functions, power series. Not open for credit to students who have completed former course 127B. GE credit: SciEng | SE—II, III, I, II, III.

125B. Real Analysis (4)  Lecture/discussion—4 hours. Prerequisite: course 67 and 125A. Theory of the derivative, Taylor series, integration, partial derivatives, Implicit Function Theorem. Not open for credit to students who have completed former course 127C. GE credit: SciEng | SE—II, III, I, II, III.

128A. Numerical Analysis (4)  Lecture—3 hours; project. Prerequisite: Computer Science: Engineering 30 or equivalent; course 21C; Error analysis, approximation, interpolation, numerical differentiation and integration. Programming in language such as Pascal, FORTRAN or BASIC required. GE credit: SciEng | QL, SE—II—III.

128B. Numerical Analysis in Solution of Equations (4)  Lecture—3 hours; project. Prerequisite: Computer Science: Engineering 30 or equivalent; course 21C; 22A or 67. Solution of nonlinear equations and nonlinear systems. Minimization of functions of several variables. Simultaneous linear equations. GE credit: SciEng | QL, SE—II, III.

Quarter Offered: Fall, Winter, Spring, Summer. Fall 2015-16 offering in parenthesis.

Mathematics
128C. Numerical Analysis in Differential Equations (4) Lecture—3 hours; project. Prerequisite: Computer Science Engineering 30 or equivalent; courses 22A or 67; 22B. Difference equations, operators, numerical solutions of ordinary and partial differential equations. Programming in language such as Pascal, Fortran, or BASIC required. GE credit: SciEng | QL, SE—III. (III.)

129. Fourier Analysis (4) Lecture—3 hours; extensive problem solving. Prerequisite: courses 21D, 22A or 67, 22B, or consent of instructor. Fourier series and integrals, orthogonal sets of functions. Topics selected from trigonometric approximation, orthogonal polynomials, applications to signal and image processing, numerical analysis, and differential equations. GE credit: SciEng | QI, SE—III. (III.)

133. Mathematical Finance (4) Lecture—3 hours; extensive problem solving. Prerequisite: courses 67, 135A. Analysis and evaluation of deterministic and random cash flow streams, yield analysis, and pricing of basic financial instruments, interest rate theory, meanvariance portfolio theory, capital asset pricing models, utility functions, and general principles. MATLAB programming required. Offered in alternate years. GE credit: SciEng | QI, SE, SL—III.

135A. Probability (4) Lecture/discussion—4 hours. Prerequisite: course 125A. Probability spaces, discrete probability, combinatorial analysis; independence, conditional probability; random variables, discrete and continuous distributions, probability mass function, joint and marginal density functions, expectation, moments, variance, Chebyshev inequality; sums of random variables, random walk, large number law, central limit theorem. Not open for credit to students who have completed former course 132A. GE credit: SciEng | QI, SE—I, II. (II.)

135B. Stochastic Processes (4) Laboratory/discussion—4 hours. Prerequisite: courses 135A, 22A or 67. Generating functions, branching processes, Martingales, Markov chains; convergence of random variables, law of iterated logarithm; random processes, Brownian motion, stationary processes, renewal processes, queuing theory, martingales. Not open for credit to students who have completed former course 132A. GE credit: SciEng | QI, SE—I, II. (II.)

145. Combinatorics (4) Lecture/discussion—4 hours. Prerequisite: course 21B. Combinatorial methods using basic graph theory, counting methods, generating functions, and recurrence relations. Designed to serve as preparation for the more rigorous introduction to combinatorics. GE credit: SciEng | SE, VL—III. (III.)

146. Algebraic Combinatorics (4) Lecture/discussion—4 hours. Prerequisite: courses 25, 22A or 67; 45. Enumeration, Polya theory, generating functions, current topics in algebraic combinatorics. Not open for credit to students who have completed former course 149B. GE credit: SciEng | QI, SE—I, II. (II.)

147. Topology (4) Lecture—3 hours; extensive problem solving. Prerequisite: courses 22A or 67; 125A. Basic notions of point-set and combinatorial topology. GE credit: SciEng | SE—III. (III.)

148. Discrete Mathematics (4) Lecture/discussion—4 hours. Prerequisite: course 67; or courses 22A and 25. Coding theory, error correcting codes, finite fields and the algebraic concepts needed in their development. Not open for credit to students who have completed former course 149B. GE credit: SciEng | SE—I, II. (II.)

150A. Modern Algebra (4) Lecture/discussion—4 hours. Prerequisite: course 67. Basic concepts of groups, symmetries of the plane. Emphasis on the techniques used in the proof of the ideas of applications (e.g., developing these concepts. Precise thinking, proof writing, and the ability to deal with abstraction. GE credit: SciEng | SE—I. (I.)

150B. Modern Algebra (4) Lecture/discussion—4 hours. Prerequisite: course 150A. Bilinear forms, rings, factorization, modules. GE credit: SciEng | SE—II. (II.)

150C. Modern Algebra (4) Lecture/discussion—4 hours. Prerequisite: course 150B. Group representations, fields, Galois theory. GE credit: SciEng | SE—III. (III.)

160. Mathematical Foundations of Database Theory, Design and Performance (4) Lecture—3 hours; project. Prerequisite: course 22A or 67, one of the following courses: 25, 108, 114, 115A, 141, or 145. Relational model, relational algebra, relational calculus, normal forms, functional and multivalued dependencies. Separability, Cost-benefit analysis of physical database design and reorganization. Performance via analytical modeling, simulation, and queueing theory. Block access; relational; operating system contention; CPU intensive operations. Offered irregularly. GE credit: SciEng | QL, SE—III. (III.)

165. Mathematics and Computers (4) Lecture—3 hours; project. Prerequisite: Computer Science Engineering 30 or equivalent; course 22B and one of the following courses: 25, 67, 108, 114, 115A, 141 or 145. Introduction to computational mathematics, symbolic computation, and computer generated/verified proofs in algebra, analysis, and geometry. Investigation of rigorous new mathematical connections in conjunction with modern computational questions and the role that computers play in mathematical discovery and experimentation. GE credit: SciEng | QL, SE—I. (I.)

167. Applied Linear Algebra (4) Lecture—3 hours; extensive problem solving. Prerequisite: course 22A or 67; knowledge of a programming language. Applications of linear algebra, LU and QR matrix factorizations, eigenvalue and singular value matrix decompositions. GE credit: SciEng | QI, SE—I, II. (II.)

168. Optimization (4) Lecture—3 hours; extensive problem solving. Prerequisite: Computer Science Engineering 30 or equivalent; courses 21D or 25; 22A or 67. Linear programming, simplex method. Basic properties of unconstrained nonlinear problems, descent methods, conjugate direction method. Constrained minimization. Programming language required. GE credit: SciEng | QI, SE—III. (III.)

180. Special Topics (3) Lecture—3 hours. Prerequisite: courses 25 and 67, or consent of instructor. Special topics from various fields of modern, pure, and applied mathematics. Some recent topics include Knot Theory, General Relativity, and Fuzzy Sets. May be repeated for credit when topic differs from semester to semester. GE credit: SciEng | SE—I, II. (II.)

185A. Complex Analysis (4) Lecture—3 hours; extensive problem solving. Prerequisite: courses 67, 125A, or consent of instructor. Theory of Cauchy’s integral theorem, conformal mappings, elementary functions, complex integration, power and Laurent series expansions, residue theory. GE credit: SciEng | SE—II. (II.)

185B. Complex Analysis (4) Lecture—3 hours; extensive problem solving. Prerequisite: course 185A. Analytical functions, elementary functions and their mapping properties, applications of Cauchy’s integral theorem, conformal mapping and applications to heat flow and fluid mechanics. Offered in alternate years. GE credit: SciEng | SE—I. (I.)

189. Advanced Problem Solving (3) Lecture—3 hours. Prerequisite: courses 21D; 22A or 67; 25. Solution and presentation of advanced problem solving techniques. Solve and present interesting and challenging problems from all areas of mathematics. Offered irregularly. GE credit: SciEng, WRJ | QL, QL, SE, WE—III. (III.)

192. Internship in Applied Mathematics (1-3) Internship, final report. Prerequisite: upper division standing; project approval by faculty sponsor prior to enrollment. Supervised work experience in applied mathematics. May be repeated for credit for a total of 10 units. (P/NP grading only)—I, II, III. (I, II, III.)

194. Undergraduate Thesis (3) Prerequisite: consent of instructor. Independent research under supervision of a faculty member. Student will submit written report in thesis form. May be repeated with consent of Vice Chairperson. (P/NP grading only) GE credit: SE—I, II, III. (I, II, III.)

197TC. Tutoring Mathematics in the Community (1-5) Seminars 1-2 hours; laboratory 2-6 hours. Prerequisite: upper division standing and consent of instructor. Special projects in mathematical education developing techniques for mathematics instruction and tutoring on an individual or small group basis. May be repeated one time for credit. (P/NP grading only)—I, II, III. (I, II, III.)

198. Directed Group Study (1-5) Prerequisite: consent of instructor. (P/NP grading only) GE credit: SE—I, II, III. (I, II, III.)

199. Special Study for Advanced Undergraduates (1-5) (P/NP grading only) GE credit: SE—I, II, III. (I, II, III.)

Graduate

200A-200B. Problem-Solving in Analysis (1-1) Lecture—1 hour; extensive problem solving. Prerequisite: courses 201ABC. Problem-solving in graduate analysis: continuous functions, metric spaces, Banach and Hilbert spaces, bounded linear operators, the spectral theorem, distributions, Fourier series and transforms, Lp spaces, Sobolev spaces. May be repeated two times for credit. (Deferred grading only, pending completion of sequence)—I, II, III. (I, II, III.)


205. Complex Analysis (4) Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: course 185A or the equivalent, or consent of instructor. Analytic continuation, Riemann surfaces, conformal mappings, Riemann mapping theorem, entire functions, special functions, elliptic functions. —III. (III.)
205A. Complex Analysis (4) Lecture—3 hours; term paper or discussion—1 hour. Cauchy’s theorem, Cauchy’s integral formula, meromorphic functions, Cauchy’s integral theorem, entire functions, Weierstrass infinite product formula, the gamma and zeta functions, and prime number theorem. (I.)

205B. Complex Analysis (4) Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: course 205A or consent of instructor. Conformal mappings, the Schwarz lemma, analytic automorphisms, the Riemann mapping theorem, elliptic functions and elliptic series, the Jacobi theta functions, asymptotics, Bessel functions, the Airy function, topics on special functions and Riemann surfaces. May be repeated two times for credit if topic varies. (II.)

206. Measure Theory (4) Lecture—3 hours; extensive problem solving. Prerequisite: course 125B. Introduction to measure theory. The study of lengths, surface areas, and volumes in general spaces and its application to integration theory. Offered in alternate years. —III.

207A-207B-207C. Methods of Applied Mathematics (4-4-4) Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: graduate standing or consent of instructor. Ordinary differential equations and dynamical systems. Variational principles. Eigenfunctions, integral equations and Green’s functions. Complex analysis and contour integration. Laplace’s equation. Diffusion equations. Wave phenomena. Dimensional analysis and scaling. Asymptotic expansions and perturbation theory. Stochastic processes and Brownian motion. (I—III.)

215A-215B-215C. Topology (4-4-4) Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: graduate standing or consent of instructor. Fundamental group and covering space theory. Homotopy and cohomology. Manifolds and duality. CW complexes. Fixed point theorems. Offered in alternate years. —III—III.


218A-218B-218C. Partial Differential Equations (4-4-4) Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: 218A—201ABC, 218B—218A, 218C—218B; or consent of the instructor. A year-long sequence on PDEs which covers linear transport, Laplace, heat, and wave equations. Techniques and applications. Emphasis on analytical methods. Offered in alternate years. —II—II.

220A. Mathematical Fluid Dynamics (4) Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: course 212A. Introduction to the kinetic theory of gases and the Navier-Stokes equations. Vorticity dynamics. Irrotational flow. Low Reynolds number flows and the Stokes equations. High Reynolds number flows and boundary layers. Compressible fluids. Shock waves. Offered in alternate years. —II.

220B. Mathematical Fluid Dynamics (4) Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: course 212A. Kinematics and dynamics of fluids. The Euler and Navier-Stokes equations. Vorticity dynamics. Irrotational flow. Low Reynolds number flows and the Stokes equations. High Reynolds number flows and boundary layers. Compressible fluids. Shock waves. Offered irregularly. —II.

226A. Numerical Methods: Fundamentals (4) Lecture—2 hours; term paper or discussion—1 hour. Prerequisite: course 128B or equivalent, or consent of instructor. Familiarity with some programming language. Fundamental principles and methods in numerical analysis, including the concepts of stability of algorithms, error analysis, numerical solutions to differential, integral, and algebraic problems, numerical methods for interpolation and integration, eigenvalue problems, singular value decomposition and its applications. Offered in alternate years. —I.

226B. Numerical Methods: Large-Scale Matrix Computations (4) Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: course 126 or equivalent, or consent of instructor. Familiarity with some programming language. Numerical methods for large-scale matrix computations, including direct and iterative methods for the solution of linear systems, the computation of eigenvalues, and the solution of least-squares problems, matrix compression methods, for the solution of linear programs. Offered in alternate years. —II.

227. Mathematical Biology (4) Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: graduate standing or consent of instructor. Nonlinear ordinary and partial differential equations and stochastic processes of cell and molecular biology. Scaling, qualitative, and numerical analysis of mathematical models. Applications to nerve impulse, chemotaxis, muscle contraction, and morphogenesis. Offered in alternate years. —I.

228A-228B-228C. Numerical Solution of Differential Equations (4-4-4) Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: course 128C. Numerical solutions of initial-value, eigenvalue and boundary-value problems for ordinary differential equations. Numerical solution of parabolic, hyperbolic partial differential equations. Offered in alternate years. —III—III.

230A-230B-230C. Global Analysis (4-4-4) Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: course 228C. Topics in advanced analysis and differential geometry. Topics may include: differential manifolds, vector fields, transversality, Sard’s theorem, examples of differential manifolds, intersection theory, index of vector fields, differential forms, integration, Stokes’ theorem, deRham cohomology, Morse functions, Morse lemma, index of critical points. —I—III.

235A-235B-235C. Probability Theory (4-4-4) Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: course 240A; intended primarily for 2nd-year graduate students. Probability measure, expectation, independence, limit theorems, martingales, Brownian motion. Offered in alternate years. —III.

236B. Stochastic Dynamics and Applications (4) Lecture—3 hours; extensive problem solving. Prerequisite: course 235A or course/Statistics 235B; consent of instructor. Introduction to modern stochastic processes and its applications. Emphasis on stochastic processes of cell and molecular biology. Diffusions, connections with partial differential equations, stochastic finance. Offered in alternate years. —II.

240A. Differential Geometry (4) Lecture—3 hours; extensive problem solving. Prerequisite: course 230A. Introduction to modern differential geometry. Offered in alternate years. —III.

242A. Algebraic Combinatorics (4) Lecture—3 hours; extensive problem solving. Prerequisite: course 245 or consent of instructor. Algebraic and geometric aspects of combinatorics. The use of structures such as groups, graphs, rings, and simplicial complexes to solve combinatorial problems. Offered in alternate years. —II.


249A. Problem-Solving in Algebra (1) Lecture—1 hour; extensive problem solving. Prerequisite: courses 250A & B. Problem-solving in graduate algebra: groups, rings, modules, matrices, tensor products, representation theory. Galois theory, ring extensions, commutative algebra and homological algebra. May be repeated two times for credit. (Deferred grading only, pending completion of sequence.)—I.

249B. Problem-Solving in Algebra (2) Lecture—1 hour; extensive problem solving. Prerequisite: courses 250A & B. Problem-solving in graduate algebra: groups, rings, modules, matrices, tensor products, representation theory. Galois theory, ring extensions, commutative algebra and homological algebra. May be repeated two times for credit. (Deferred grading only, pending completion of sequence.)—III.


**258A. Numerical Optimization (4)**
Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: courses 25, 167. Numerical methods for infinite dimensional optimization problems. Newton and Quasi-Newton methods, linear and sequen- tial quadratic programming, barrier methods, large- scale optimization, theory of approximations; infinite and semi-infinite programming; applications to opti- mal control, stochastic optimization and distributed systems. Offered in alternate years. —II.

**258B. Variational Analysis (4)**
Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: courses 25, 167, or consent of the instructor. Foundations of optimization theory. The design of solution procedures for optimization prob- lems. Modeling issues, and stability analysis. Offered in alternate years. —II.

**261A. Lie Groups and Their Representations (4)**
Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: courses 215A, 240A, 250A-250B or the equivalent or consent of instructor. Lie groups and Lie algebras. Classification of semi-simple Lie groups. Classical and compact Lie groups. Representa- tions of Lie groups and Lie algebras. Root systems, weights, Weil character formula, Kac-Moody and Virasoro algebras. Applications. Offered in alternate years. —II.

**261B. Lie Groups and Their Representations (4)**

**265. Mathematical Quantum Mechanics (4)**
Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: courses 215A, 240A, 250A-250B or the equivalent or consent of instructor. Mathematical foundations of quantum mechanics: the Hilbert space and Operator Algebra formula- tions; the Schrödinger and Heisenberg equations, symmetry in quantum mechanics, basics of spectral theory and perturbation theory. Applications to atoms and molecules. The Dirac equation. Offered in alternate years. —I.

**266. Mathematical Statistical Mechanics and Quantum Field Theory (4)**
Lecture—3 hours; term paper or discussion—1 hour. Prerequisite: course 265 or consent of instructor. Mathematical principles of statistical mechanics and quantum field theory. Topics include classical and quantum lattice systems, variational principles, spon- taneous symmetry breaking and phase transitions, second quantization and Fock space, and funda- mentals of quantum field theory. May be repeated one time for credit. Offered in alternate years. —II.

**271. Applied and Computational Harmonic Analysis (4)**
Lecture—3 hours; extensive problem solving. Prereq- site: courses 1228 or 201C, and 1288 or 167, and 129 or equivalent, or consent of instructor. Intro- duction to mathematical basic building blocks (wave- lets, local Fourier basis, and their relatives) useful for diverse fields (signal and image processing, numeri- cal analysis, and statistics). Emphasis on the connec- tion between the continuum and the discrete worlds. Offered in alternate years. —II.

**280. Topics in Pure and Applied Mathematics (3)**
Lecture—3 hours. Prerequisite: graduate standing. Special topics in various fields of pure and applied mathematics. Topics selected based on the mutual interests of students and faculty. May be repeated for credit when topic differs. —I, II, III, III.

**290. Seminar (1-6)**
Seminar—1–6 hours. Advanced study in various fields of mathematics, including analysis, applied mathematics, discrete mathematics, geometry, math- ematical biology, mathematical physics, optimization, partial differential equations, probability, and topology. May be repeated for credit. [S/U grading only]—I, II, III, III, III.

**298. Group Study (1-5)**

**299D. Dissertation Research (1-12)**
(S/U grading only.)—I, II, III. (I, II, III.)

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**Medical Informatics (A Graduate Group)**

**Medical Pharmacology and Toxicology**

See Medicine, School of, on page 396.

**Medical Microbiology**

See Medicine, School of, on page 396.

**Medical School of**

Julie Ann Freischlag, M.D.
Vice Chancellor of Human Health Sciences Dean, School of Medicine

Fred Meyers, M.D., M.A.C.P.
Vice Dean, School of Medicine

Thomas Nesbitt, M.D., M.P.H.
Associate Vice Chancellor for Strategic Technologies and Alliances; Director, Center for Health and Tech- nology

David Acosta, M.D.
Associate Vice Chancellor for Equity, Diversity and Inclusion

Lars Berglund, M.D., Ph.D.
Senior Associate Dean for Clinical Research

Edward Callahan, Ph.D.
Associate Dean for Academic Personnel

James Goodnight, Jr., M.D.
Associate Dean for Cancer Center

Mark Henderson, M.D.
Associate Dean for Admissions and Outreach

Darin Latimore, M.D.
Associate Dean for Student and Resident Diversity

James Nuovo, M.D.,
Associate Dean for Graduate Medical Education

Andreea Seritan, M.D.
Associate Dean for Student Wellness

Mark Servis, M.D.
Senior Associate Dean for Curriculum and Compe- tency Development

School of Medicine Dean’s Office

**Medical Informatics (A Graduate Group)**

See Health Informatics (A Graduate Group), on page 333.

**Medical Informatics (A Graduate Group)**

To search for current faculty, see http://www.ucdmc.ucdavis.edu/search/faculty/

**Faculty**

To search for current faculty, see http://www.ucdmc.ucdavis.edu/search/faculty/searchdetail.asp?searchtype=3