will ask ourselves: what does an educated person need to know about media today in order to take full advantage of everything they are offering us, and yet guard against potential negative influences?

**MCMA 204-3 Alternative Media in a Diverse Society.** (University Core Curriculum) The freedoms guaranteed in the First Amendment have resulted in a multitude of alternatives to the establishment media. These alternative media give voice to a range of communities ignored or suppressed by the dominant culture. Publications, alternative art spaces, film, radio and television messages and the groups and individuals who create them are examined.

**MCMA 396-3 Publishing on the WWW.** The class provides instruction in designing for the WWW. Students learn the basics of HTML, and are provided an opportunity to develop literacy in networked, interactive communication. Students learn the basics of good interface design and apply these skills in interactive multimedia such as interactive news and information display, training development, business marketing applications, asynchronous learning materials, and entertainment products. Lab fee: $50.

**MCMA 497-1 to 6 Special Interdisciplinary Study.** Designed to offer and test new and experimental courses and series of courses within the College of Mass Communication and Media Arts. Incorporation course fee: $25.

**MCMA 499-1 to 3 Independent Study.** (Same as IST 392) Supervised research, project, or creative work. The area of study is proposed by the student with the approval of a Mass Communication and Media Arts faculty member. Not for graduate credit. Special approval needed from the instructor.

# Mathematics

**(Department, Major, Courses, Faculty)**

Opportunities for mathematics majors have expanded greatly in recent years. Mathematics majors become actuaries, statisticians, mathematical computer scientists, applied mathematicians, operations research analysts and mathematical researchers. Mathematics is growing and changing and holds fascinating challenges for inquiring minds.

As an undergraduate mathematics major at Southern Illinois University Carbondale, you may work toward a Bachelor of Science degree in the College of Science or the College of Education and Human Services, or a Bachelor of Arts degree in the College of Liberal Arts. The classes in the mathematics major curriculum are small and are taught by senior faculty members. A strong support system of college and departmental advisement is available to you at SIU throughout the year.

A student planning for employment with a bachelor's degree should consider a minor or a second major in some field in which mathematics is applied. Many students earn a double major in mathematics and computer science. All of the bachelor's degree programs in mathematics, including the Bachelor of Science degree in the College of Education and Human Services, have sufficient flexibility to allow you to prepare for alternate career possibilities.

To prepare to major in mathematics at SIU, you should have a solid high school preparation in algebra, geometry in two and three dimensions, and trigonometry, including a substantial study of functions and graphing. Students transferring to SIU after two years at a community college should have completed the calculus sequence, linear algebra and a course in a high-level computer programming language.

As a mathematics major at SIUC, you will meet with a Department of Mathematics advisor at least once each semester for planning and departmental approval of courses appropriate to your goals and interests.

A grade of *C* or better is required in every mathematics course used to satisfy departmental requirements. A student cannot repeat a course or its equivalent in which a grade of *B* or better was earned without the consent of the department. A math major is required to obtain the permission of the department for a second repeat (third attempt) of a course that is required or elective for the major.

## Double majors in mathematics and related fields

Special provisions are made for students to earn a double major in mathematics and a field in which mathematics is extensively applied. The courses MATH 447, 449, 471, 472, and 475 carry credit in both mathematics and computer science. See Bachelor of Science Degree, College of Science for specific requirements in mathematics for students who also earn a major or minor in computer science.

For students pursuing a double major in math and engineering, physics, or chemistry, the mathematics requirements are MATH 150, 221, 250, 251, 305 and five additional mathematics courses numbered above 300, including at least three courses above 400, and including two of the three areas of algebra, analysis, probability and statistics. A mathematics department advisor must approve the courses.

Students majoring in business may obtain a second major in mathematics. The requirements are MATH 150, 221, 250, 251, and five approved mathematics courses at the 300-400 level, of which at least four are at the 400-level. Recommended courses for this program include MATH 471, 472, 475, 483, 484.

## Option in Statistics

A student majoring in mathematics in the College of Science may choose to concentrate in statistics.

For this option, the 300- and 400-level course requirements include: 302; either 417 or 421; either 305 or 472; one of 352, 450, or 455; 480; 483; at least two of 473, 481, 484, 485 and one additional approved upper division mathematics course

## Bachelor of Science Degree in Mathematics, College of Science

*University Core Curriculum Requirements* ..... 39
*College of Science Academic Requirements* ..... 12[1]
Biological Sciences: six hours (not University Core Curriculum courses)
(Three hours included in the UCC Life Science hours).....3
Mathematics: completed with the major
Physical Sciences: six hours (not University Core Curriculum courses)
(Three hours included in the UCC Life Science hours) .....3
Supportive Skills: a two-semester sequence in a foreign language, or three years of one foreign language in high school with no grade lower than *C.* .....6

*Requirements for Major in Mathematics* ..... 42
MATH 150, 221, 250, 251
(Three hours included in UCC mathematics hours).....11
Computer Science 202 or approved substitute .....4
Mathematics 302 .....3
At least one course from each of the following groups:...12
(One group may be waived for students with a minor in CS)
Group A: Algebra/Discrete Math/Linear Algebra: 319, 349, 419, 421
Group B: Analysis: 352, 450, 455
Group C: Applied Math/Numerical Analysis: 305, 471, 472, 475
Group D: Probability/Statistics: 380, 480, 483
Four additional courses in mathematics numbered above 299 (excluding 300I, 311A, 311B, 321, 322, 388, 389, 411, 412) ..12
A minimum of 5 400-level math courses must be taken. Each student's program must be approved by a mathematics department advisor.
Courses taken Pass/Fail will not count toward the major.
*Electives* ..... 27
*Total* ..... 120

The student must work with the Advisement Office to ensure that SIUC'S 42 Senior-Hours requirement is met by appropriate choices of core, college, major and elective coursework.

*For your individualized curricular guide, see your Student Education Planner in DegreeWorks.*

## Bachelor of Arts Degree in Mathematics, College of Liberal Arts

*University Core Curriculum Requirements* ..... 39
*College of Liberal Arts Academic Requirements* ..... 12-15
English Composition
(one of ENGL 290, 291, 390, 391, 392).....3
One approved writing intensive course (MATH 302)
(accounted for in the major)
Foreign Language .....6
International Coursework: 2 courses from the Global Studies Minor, Section A. Three hours MAY possibly be used for both International and UCC requirements .....3-6
*Requirements for a Major in Mathematics* ..... 42[1]
MATH 150, 221, 250, 251 .....11
(Three hours are accounted for in UCC)
CS 202 or approved substitute .....4
MATH 302.....3
At least one course from each of the following groups: ..12
(One group may be waived for students who have a minor in Computer Science)
Group A: Algebra/Discrete Math/Linear Algebra: 319, 349, 421
Group B: Analysis: 352, 450, 455
Group C: Applied Math/Numerical Analysis: 305, 471, 472, 475
Group D: Probability/Statistics: 380, 480, 483
Four additional courses in mathematics numbered above 299 (excluding 300I, 311A-B, 321, 322, 388, 389, 411, 412) ..... 12
*Secondary Concentration Requirements*[2] ..... 6-9
6-9 hours approved by the Mathematics Department in one of the following areas: engineering, computer science, physics, economics, business & administration. A minor in any department of the College of Liberal Arts or College of Science my be substituted for this requirement.
*Electives to make a total of 120 hours* ..... 15-21
*Total* ..... 120

Each student's program must include at least 5 mathematics courses at the 400 level. Courses taken Pass/Fail will not count toward the major. Mathematics majors are required to meet with a departmental advisor for approval of their courses prior to registering each semester.

[1]Three hours of mathematics course work are accounted for in the 39-hour Core Curriculum requirement.

[2]Secondary Concentration Requirement (Choose one of the following options)

i) PHYSICS: six hrs from 205A, 205B, or 300-level courses with math prerequisites.

ii) ENGINEERING: six hrs of ENGR courses with math prerequisites numbered above 222.

iii) COMPUTER SCIENCE: CS 215, 220, and one of CS 306 or 311.

iv) ECONOMICS: six hrs from the following, including 3 hours above the 200 level: ECON 240, 241, 340, 341, 440, 441, 465.

v) BUSINESS: ACCT 220 & 230 plus one additional course chosen from ECON 240, ECON 241, MATH 139.

vi) CHEMISTRY: CHEM 200 and 210, plus one advanced CHEM with a math prerequisite.

vii) ANY MINOR in the College of Science or the College of Liberal Arts.

*For your individualized curricular guide, see your Student Education Planner in DegreeWorks.*

## Specialization in Actuarial Mathematics

Students pursuing the Bachelor of Arts degree with a major in mathematics in the College of Liberal Arts may choose to specialize in Actuarial Mathematics. Actuaries put a price on risk, and Actuaries are often ranked as a top ten job with high pay. The Actuarial program at Southern Illinois University Carbondale provides course work in Mathematics to prepare students for work as Actuaries. Students become Actuaries by taking three Validation by Educational Experience (VEE) course sequences and by passing professional examinations given by the society of Actuaries (SOA, see www.soa.org) and Casualty Actuarial Society (CAS, see www.casact.org). The professional exams cover probability, financial mathematics for investments including interest theory and financial derivatives, life contingencies: mathematics for life insurance, and loss models. More information about Actuaries and the professional exams can be found at (www.beanactuary.com).

Freshmen admitted to the program should have at least a 24 Math ACT score. Students can also enroll as Math majors and transfer to the Actuarial program after receiving a C or higher in MATH 250. The program offers preparation for four Actuarial exams and for the three VEE course sequences. Students are required to complete three VEE course sequences and are encouraged to pass Exam P/1, FM/2 and either MLC/3L or C/4.

## Specialization in Actuarial Mathematics, College of Liberal Arts

*University Core Curriculum Requirements* ..... 39
To include MATH 150, ECON 240, MATH 300I and FL.
*College of Liberal Arts Academic Requirements*.....12-15
English Composition
(one of ENGL 290, 291, 390, 391, 392) ..... 3

One approved writing intensive course (MATH 302) (accounted for in the major)
Foreign Language.....6
International Coursework: 2 courses from the Global Studies Minor, Section A.
Three hours MAY possibly be used for both International and UCC requirements.....3-6
*Requirements for Actuarial Specialization* ..... 47
MATH (150), 221, 250, 251
(Three hours included in UCC mathematics hours).....11
CS 202..... ..... 4
MATH 302 and 483 ..... 7
At least one course from each of the following groups.. 9
Group A: Algebra/Discrete Math/Linear Algebra: 319, 349, 421
Group B: Analysis: 352, 450, 455
Group C: Applied Math/Numerical Analysis: 305, 471, 472, 475
MATH 400, 474, and 484 .....10
*Either* MATH 401 and 402 *or* MATH 403 and 404 ..... 6
Additional courses required for VEE examinations:
ECON 240 (if not already included in Core) and 241.....6
FIN 330 and 361.....6
Accounting courses required as prerequisites for FIN 330:
ACCT 220, 230..... 9
Electives if needed to make a total of 120 hours ..... 4-7
*Total* ..... 120

## Bachelor of Science Degree in Mathematics, College of Education and Human Services

*University Core Curriculum Requirements to include*
ENGL 101 & 102, PSYC 102, MATH 300I, EDUC 311, 314.....39
*Requirements for major in Mathematics*.....46
Content Courses .....40
MATH 150, 221, 250, and 251 or 305
(Three hours included in UCC mathematics hours) ... 11
CS 202 or approved substitute .....4
MATH 302, 319, 335, 349, 352 483.....19
At least two additional approved 400-level mathematics courses excluding 411, 412.....6
Methods Course, MATH 311A,B .....6
Professional Education and Licensure Requirements ..... 24
EDUC 301, 302, 303, 308, 313, 319, 401A
Other requirements for licensure
CI 360.....3
Electives to make 120 hours..... 8
*Total* ..... 120

Admission into the Teacher Education Program requires a 2.5 average in MATH 150, 221, 250; and 251 or 305 in addition to College of Education and Human Services requirements for admission to the TEP.

Retention in the Teacher Education Program and approval for student teaching requires a 2.75 average in the major and departmental approval.

Mathematics majors are required to meet with a departmental advisor for approval of their courses prior to registering each semester.

**Concentration in Mathematics for Elementary Education**

Consult with College of Education and Human Services and with Mathematics advisors about the latest requirements.

## Mathematics Minor

A non-teaching minor consists of MATH 150 and 12 hours of mathematics courses at the 200 level or above, including at least three hours at the 400 level (excluding 220, 257, 282, 300I, 311A, 311B, 321, 322, 388, 389, 411, 412). All courses used for the minor must be completed with a grade of C or better. The 400-level mathematics courses must be taken at SIU Carbondale.

The departmental advisor must approve the student's minor program.

**Additional Educator Endorsements in Mathematics**

Students pursuing a teaching license in another discipline and interested in adding an endorsement in mathematics should see a mathematics department advisor to obtain a list of specific requirements.

## Honors

MATH 395 and 495 are used for individual honors work for upper level undergraduates in mathematics. Concurrent participation in the University Honors Program is encouraged.

## Placement

In addition to having taken the prerequisite mathematics courses, students are required to present a satisfactory placement score as a condition for registration in mathematics courses. Contact the Department of Mathematics for current information regarding placement.

## Courses (MATH)

A hand-held calculator with function keys appropriate to the course is required of each student in 108, 109, 111, 139, 140, 141, 150, 250, 251, and 282. NO calculators are allowed for the final exam in MATH 107 and 108. ONLY an approved scientific calculator will be permitted for the final examination in MATH 109, 111, 139, 140, 150, and 250. The student should consult the course instructor about which calculators are permitted.

**MATH 101-3 Introduction to Contemporary Mathematics.** (University Core Curriculum Course) [IAI Course: M1 904] Elementary mathematical principles as they relate to a variety of applications in contemporary society. Exponential growth, probability, geometric ideas and other topics. This course does not count towards the major in mathematics. Prerequisite: MATH 107 with a grade of C or better or high school Geometry and Algebra 2 with a grade of C or better, and satisfactory placement score. $96 fee will cover student access to mylabsplus. Platform is used for assessment and online access to learning aids and e-textbook.

**MATH 105-3 College Algebra and Mathematical Modeling for Teachers.** A course in college algebra designed for the pedagogical and content needs of K-8 teachers. Equations and inequalities involving linear, polynomial, rational, absolute value, exponential and logarithmic functions, and systems of linear equations; the algebra of functions (polynomials, rational, exponential, logarithmic), graphing functions; domain

and range. Conic sections. Modeling and solving real-world problems and situations. Use of technology as appropriate to interpret data and create mathematical models. Core Standards Mathematical Practices will be infused throughout. No credit may be earned for MATH 105 if there is prior credit in MATH 106, 108 or 111. Prerequisite: Satisfactory placement score OR MATH 220 with a grade of C or better. Digital Course Materials Fee: $93.

**MATH 106-3 College Algebra Enhanced.** (University Core Curriculum) The course leads students through an intensive review of foundational algebra concepts followed by a careful study of functions (polynomial, rational, exponential, logarithmic), graphing, solving equations including systems. Two lecture and three lab hours per week. Credit is given for only one of MATH 106, 108, 111. Prerequisite: Three years of college preparatory mathematics including Algebra I, Geometry and Algebra II AND satisfactory placement score. Digital Course Materials and CAI (Computer Aided Instruction) Fee: $183.

**MATH 107-3 Intermediate Algebra.** Properties & operations of real numbers. Polynomials, factoring, algebraic fractions, exponents, roots, and radicals. First and second-degree equations and inequalities. Functions, graphing, systems of equations and inequalities. Exponential and logarithmic functions. Does not satisfy the University Core Curriculum mathematics requirement and does not count toward the hours required for graduation. Prerequisite: satisfactory placement score. $96 fee will cover student access to mylabsplus. Platform is used for assessment and online access to learning aids and e-textbook.

**MATH 108-3 College Algebra.** (Advanced University Core Curriculum Course) The algebra of functions (polynomials, rational, exponential, logarithmic), graphing, conic sections, solving equations including systems. Not open to students with prior credit in MATH 106 or MATH 111. Prerequisite: Three years of college preparatory mathematics including Algebra I, Geometry and Algebra II AND satisfactory placement score. $156 course fee will cover student access to Mylabsplus. Platform is used for assessment and online access to learning aids and e-textbook.

**MATH 109-3 Trigonometry and Analytic Geometry.** (Advanced University Core Curriculum Course) Trigonometric and inverse trigonometric functions, complex numbers, conic sections, polar coordinates. Credit is not given for both MATH 109 and 111. Prerequisites: MATH 108 or MATH 106 or equivalent, with C or better. New students must present satisfactory placement scores.

**MATH 110-3 Non-Technical Calculus.** (University Core Curriculum) The elements of differentiation and integration. The emphasis is on the concepts and the power of the calculus rather than on technique. It is intended to provide an introduction to calculus for non-technical students. Does not count towards the major in mathematics. No credit hours may be applied to fulfillment of any degree requirements if there is prior credit in Mathematics 140, 141 or 150. Prerequisite: 3 years of college preparatory mathematics including algebra I, algebra II and geometry with C or better. Students must present satisfactory placement scores or obtain the permission of the Department of Mathematics.

**MATH 111-4 Precalculus.** (Advanced University Core Curriculum Course) Intensive review of college algebra and trigonometry necessary for Calculus I. Algebra of rational and transcendental functions, graphing, trigonometic identities, laws of sines and cosines, conics, complex numbers, polar coordinates. Not open to students with credit in 106, 108 or 109. Prerequisites: High school advanced algebra and trigonometry with at least C and satisfactory placement score. Course Materials includED Fee: $96.

**MATH 120-3 Mathematics Content and Methods for Elementary School I.** (Same as CI 120) Modern approaches to mathematics instruction for the elementary grades. Mathematics content includes problem solving, intuitive set theory, development of whole numbers, integers and rational numbers and the fundamental arithmetic operations. Place value. Prime numbers and divisibility properties. Computation includes students` informal mathematics, mental computation and estimation, algorithms and the appropriate use of calculators. Emphasis is placed throughout on reasoning, multiple representations of mathematical concepts, making connections and communication. Three hours lecture/laboratory per week. Prerequisite: Three years of college preparatory mathematics including Algebra I, Algebra II and Geometry and satisfactory placement score.

**MATH 125-4 Technical Mathematics with Applications.** (Advanced University Core Curriculum course) Emphasizes the applications of algebra and trigonometry in technical fields. Topics in algebra include functions and graphs, systems of linear equations, quadratic equations, higher degree equations and variation. Topics in trigonometry include the trigonometric functions, laws of sines and cosines, complex numbers, exponential and logarithmic functions. Meets University Core Curriculum requirement in mathematics for Applied Sciences and Arts students. Prerequisite: Mathematics 107 or two years of high school algebra or equivalent, with a grade of C or better. Enrollment restricted to students in the College of Applied Sciences and Arts or permission of department. Course Materials includED Fee: $96.

**MATH 139-3 Finite Mathematics.** (Advanced University Core Curriculum Course) Set concepts and operations, combinations, permutations, elementary probability theory including Bayes Formula, linear systems of equations, matrix algebra, row reduction, introduction to linear programming and simplex method. This course does not count toward the major in mathematics. Prerequisite: MATH 108 with grade of C or better AND satisfactory placement score. Satisfies UCC Mathematics in lieu of 110 or 101.

**MATH 140-4 Short Course in Calculus.** (Advanced University Core Curriculum Course) Techniques of differentiation, increasing and decreasing functions, curve sketching, max-min problems in business and social science; partial derivatives; LaGrange multipliers; elementary integration techniques. Not open to students with prior credit in 141 or 150. Does not count toward the major in mathematics. Prerequisite: MATH 108 with grade of C or better AND satisfactory placement score. Satisfies University Core Curriculum Mathematics requirement in lieu of 110 or 101. $92 fee will cover student access to mylabsplus. Platform is used for assessment and online access to learning aids and e-textbook.

**MATH 141-4 Short Course in Calculus for Biological Sciences.** (Advanced University Core Curriculum Course) [IAI Course: M1 900] Techniques of differentiation and integration. Applications to population and organism growth and other biological science problems. Not open to students with prior credit in 150 or 140. Does not count toward the major in mathematics. Prerequisite: High school advanced algebra and trig or MATH 111 or 108 plus 109 with C or better, AND satisfactory placement score. Satisfies University Core Curriculum Mathematics requirement in lieu of 110 or 101.

**MATH 150-4 Calculus I.** (Advanced University Core Curriculum course) [IAI Course: MTH 901] [IAI Course: M1 900-1] Major concepts and techniques of single variable calculus with careful statements but few proofs. Differential and integral calculus of the elementary functions; analytic geometry. Only 2 hours credit toward graduation if there is prior credit in 140 or 141. Prerequisite: High school advanced algebra and trig or MATH 111 or 108 plus 109 with C or better, AND satisfactory placement score. Satisfies University Core Curriculum Mathematics requirements in lieu of 110 or 101.

**MATH 151-4 Calculus I Enhanced.** (Advanced University Core Curriculum course) [IAI Course: MTH 901] This course leads students through an intensive review of foundational algebra and trigonometry concepts followed by a careful study of major concepts and techniques of single variable calculus with careful statements but few proofs. Differential and integral calculus of the elementary functions; analytic geometry. Only 2 hours credit toward graduation if there is prior credit in 140 or 141. Credit is given for only one of MATH 150, 151. Prerequisite: High school advanced algebra and trig or MATH 111 or 108 plus 109 with C or better, AND satisfactory placement score. Course fee: $90.

**MATH 220-3 Mathematics Content and Methods for the Elementary School II.** (Advanced University Core Curriculum Course) (Same as CI 220) Modern approaches to mathematics instruction for the elementary grades. Mathematics content focuses on rational and irrational numbers. Ordering of numbers. Decimal representations. Percents. Ratio and Proportion. Perimeter and area concepts. Pythagorean Theorem. Concept of square root and nth root. Exponent notation. Elementary geometry. Triangles, quadrilaterals, polygons, angles associated with a polygon. Reflectional and rotational symmetry. Congruence and Similarity. Tessellations. Transformations: translations, rotations, reflections. Measurement of perimeter, area, surface area, volume, mass, temperature. Conversion of measurements. Emphasis is placed throughout on reasoning, multiple representations of mathematical concepts, making connections and communication. Prerequisite: MATH 120 or Curriculum and Instruction 120 or equivalent with a grade of C or better.

**MATH 221-3 Introduction to Linear Algebra.** Vector spaces, linear functions, systems of equations, dimensions, determinants, eigenvalues, quadratic forms. Prerequisite: MATH 150 with a grade of C or better.

**MATH 250-4 Calculus II.** (Advanced University Core Curriculum Course) [IAI Course: MTH 902] [IAI Course: M1 900-2] Develops the techniques of single-variable calculus begun in Calculus I and extends the concepts of function, limit, derivative and integral to functions of more than one variable. The treatment is intuitive, as in Calculus I. Techniques of integration, introduction to multivariate calculus, elements of infinite series. Prerequisite: MATH 150 with C or better AND satisfactory placement score. Satisfies University Core Curriculum Mathematics requirement in lieu of 110 or 101.

**MATH 251-3 Calculus III.** (Advanced University Core Curriculum Course) [IAI Course: M1 900-3] [IAI Course: MTH 903] Further topics in calculus. Definite integrals over solid regions, applications of partial derivatives, vectors and vector operations, derivatives of vector functions, line integrals, Green`s Theorem. Prerequisite: MATH 250 with C or better. Satisfies University Core Curriculum Mathematics requirements in lieu of 110 or 101.

**MATH 257-1 to 12 Concurrent Work Experience.** As an instructional aide, the student will do tutoring under the direction of an established teacher and under the supervision of a representative of the Department of Mathematics. Special approval needed from the department. Mandatory Pass/Fail.

**MATH 282-3 Introduction to Statistics.** (Advanced University Core Curriculum Course) Designed to introduce beginning students to basic concepts, techniques, and applications of statistics. Topics include the following: organization and display of data, measures of location and dispersion, elementary probability, statistical estimation, and parametric and nonparametric tests of hypotheses. Prerequisite: MATH 108 with C or better. Satisfies University Core Curriculum Mathematics requirement in lieu of 110 or 101.

**MATH 300I-3 History of Mathematics.** (University Core Curriculum) This course examines how diverse cultures and history from the ancient past to the present have shaped the development of mathematical thought and how developing mathematical ideas have influenced history and society. Particular attention will be given to the evolution of the concepts of number and space; the emergence and applications of calculus, probability theory, non-Euclidean geometries and technology; and to the changes in the concept of mathematical rigor. Does not count towards the mathematics requirements of the mathematics major. Open to all students. Prerequisite: MATH 150.

**MATH 302-3 Mathematical Communication and the Transition to Higher Mathematics.** A course in communicating mathematical ideas with a special emphasis on reading, writing, and critiquing mathematical proofs. Topics covered include logic, proofs, set theory, relations, functions. Additional illustratory topics will be drawn from linear algebra, number theory, complex variables, and geometry. Prerequisite: MATH 221 and MATH 250 with a grade of C or better.

**MATH 305-3 Introduction to Ordinary Differential Equations I.** [IAI Course: MTH 912] Solution techniques for differential equations with emphasis on second order equations, applications to physical sciences, series solutions. Prerequisite: MATH 250 with a grade of C or better.

**MATH 311A-3 Teaching of Secondary Mathematics I.** The nature and objectives of the standards-based secondary mathematics curriculum, particularly the means of introducing new ideas into the high school program. An important focus will be state and national teaching and learning standards and the use of technology. Heavy emphasis will be placed on

development of formative and summative assessment measures and the use of such assessments in planning future instruction and remediation. For students preparing to be secondary mathematics teachers. Does not count toward a mathematics major in the Colleges of Liberal Arts or Science. Prerequisites: EDUC 313, EDUC 301 and MATH 349 with grades of C or better. Concurrent enrollment in MATH 335 and MATH 352 required.

**MATH 311B-3 Teaching of Secondary Mathematics II.** The nature and objectives of the standards-based secondary mathematics curriculum, particularly the means of introducing new ideas into the high school program. An important focus will be state and national teaching and learning standards and the use of technology. Emphasis in part II will be on the development of a complete curriculum, understanding the secondary curriculum as a dynamic system and the use of standardized testing to adjust curriculum and remediate students. Must be taken in A-B sequence. For students preparing to be secondary mathematics teachers. Does not count toward a mathematics major in the Colleges of Liberal Arts or Science. Prerequisite: MATH 311A with a grade of C or better. Concurrent enrollment in MATH 319 required.

**MATH 318-2 An Introduction to Mathematics Software.** This course is an introduction to the use of Maple, a modern computer algebra system, as a computational and experimental tool in mathematics. The preparation of reports using text, graphics and mathematics is emphasized. Topics will include: solving equations, plotting techniques, special packages, programming with Maple V. Prerequisite: MATH 150 with B or better or MATH 250 with C or better.

**MATH 319-3 Introduction to Abstract Algebra I.** Basic properties of groups and rings: Binary operations, groups, subgroups, permutations, cyclic groups, isomorphisms, Cayley`s theorem, direct products, cosets, normal subgroups, factor groups, homomorphisms, rings, integral domains. Prerequisite: MATH 302 with C or better.

**MATH 321-3 Mathematics Content and Methods for the Elementary School III.** (Same as CI 321) Modern approaches to mathematics instruction for the elementary grades. Mathematics content focuses on: straight-edge and compass constructions. Justification and proof of geometric properties. Three dimensional geometry. Coordinate geometry. Transformations expressed in coordinate notation. Analysis of linear relationships geometrically and algebraically. Modeling various "real-world" situations by linear equations and inequalities. Setting up and solving equations and inequalities. Exploration of statistical data. Representation of data, interpretation of data, misrepresentation of data. Introduction to the fundamental ideas of statistics; measures of spread and central tendency. Introduction to the fundamental concepts of probability. Counting techniques needed for calculating probabilities. Dependent and independent events. Conditional probability. Odds, expected value. Simulation. Emphasis is placed throughout on reasoning, multiple representations of mathematical concepts, making connections and communication. Prerequisite: MATH 220 or Curriculum and Instruction 220 or equivalent with a grade of C or better.

**MATH 322-3 Mathematics Content and Methods for the Elementary School IV.** (Same as CI 322) Modern approaches to mathematics instruction for the elementary grades. Mathematics content focuses on: algebra and algebraic thinking, geometry, relations and functions and their applications to real-life problems. Emphasis is placed throughout on reasoning, multiple representations of mathematical concepts, making connections and communication. Prerequisite: MATH 321 or Curriculum and Instruction 321 with a grade of C or better.

**MATH 335-3 Concepts of Geometry.** Introduction to the foundations of Euclidean and non-Euclidean geometries. Topics include synthetic approach (Euclidean geometry, axiomatic systems, constructions, proofs), symmetries (similarly, congruence and various transformations and their invariants), metric approach (distance), vector space approach (transformations and matrices, inner product), inversive geometry, projective geometry (art and math) and non-Euclidean geometries. Some applications in modern science, such as Relativity Theory, may also be covered. Historical background and connections with other parts of mathematics, science and culture are important components of this course. Prerequisite: MATH 250 with C or better, or MATH 302 with C or better or concurrent enrollment in MATH 302.

**MATH 349-3 Introduction to Discrete Mathematics.** Numbers, sets, relations and functions; elementary enumeration; introduction to graph theory; logic, partially ordered sets and Boolean algebra; mathematical induction; recurrence relations. Prerequisite: MATH 221 and MATH 250 with C or better; Co-requisite: MATH 302 or prior completion of MATH 302.

**MATH 352-3 Theory of Calculus.** An introduction to understanding and writing proofs in mathematical analysis, through a careful study of limits, continuity, the derivative, and the integral. Prerequisite: MATH 302 with C or better.

**MATH 380-3 Elements of Probability.** Probability as a mathematical system. Axioms, permutations and combinations, random variables, generating functions, limit theorems, and Monte Carlo procedure. Prerequisite: MATH 250 and Computer Science 202.

**MATH 388-3 Integrated Math Content and Methods for Teachers (PreK-4th Grade).** (Same as CI 388) This course is designed for early childhood and elementary school teachers, focusing on Pre-K through 4th grade mathematics content and methods. Math content covers the developmental progression of concepts and skills in counting and cardinality, numbers and operations in base-ten system, algebraic thinking, fractional reasoning, measurement and data, and geometry. Methods of math teaching are integrated with the delivery of math content. The course showcases standards-based mathematical practices including problem solving, mathematical modeling, communication and justification, use of tools and technology, assessment and interventions, diverse learner support, supportive math environments, lesson planning, and interdisciplinary connections. Prerequisite: C or better in CI/MATH 220 or equivalent.

**MATH 389-3 Integrated Math Content and Methods for Teachers (4th-8th Grade).** (Same as CI 389) This course is designed for elementary school and middle school teachers, focusing on 4th-8th grade mathematics content and methods. Math content covers the developmental sequence of grade-appropriate mathematical concepts and skills in

number systems, operations and algebraic thinking, ratios and proportional relationships, expressions and equations, functions and applications, measurement and data analysis, statistics and probability, and geometry. Methods of math teaching are integrated with the delivery of math content. The course showcases standards-based mathematical practices including problem solving, mathematical modeling, communication and justification, use of tools and technology, informative assessment, meeting the needs of diverse learners, building supportive math environments, lesson planning, and making interdisciplinary connections. Prerequisite: CI/MATH 388 with a minimum grade of C. Co-requisites: EDUC 319 and EDUC 302.

**MATH 390-3 to 6 Topics in Contemporary Mathematics.** Content will vary according to the instructor. The seminar will introduce students to new and developing areas of mathematics, such as Chaos, Fractals, Algorithms, Fourier Analysis, Difference Equations, etc. Prerequisite: intended for students who have completed Mathematics 150, 221, 250 and either 251 or 305. Other prerequisites may apply. May be repeated as topics vary.

**MATH 395-1 to 6 Readings in Mathematics.** Supervised reading in selected subjects. Prerequisite: 3.00 grade point average in mathematics. Special approval needed from the chair.

**MATH 400-4 Interest Theory and Financial Derivatives.** This course examines financial mathematics and actuarial models for investments including interest, annuities, stocks, bonds, and mutual funds. There is an introduction to financial derivatives, options, and futures. Preparation for Exam FM/2. Prerequisite: MATH 250 (Calculus II) with C or better.

**MATH 401-3 Life Contingencies I.** This course examines actuarial models for life insurance. Life contingency models include life insurance liability calculations, annuities, and credit risk. Basic properties of survival models and Poisson processes are covered. This course and MATH 402 prepare students for Exam MLC/3L. Prerequisite: MATH 483 with C or better.

**MATH 402-3 Life Contingencies II.** This is a second course in actuarial models for life insurance including multiple contingencies, multiple survivals and claim frequency models. Basic properties of Markov Chains are covered. This course and MATH 401 prepare students for Exam MLC/3L. Prerequisites: MATH 221 and MATH 401 with C or better.

**MATH 403-3 Loss Models I.** This course examines loss models including severity models, ruin models, and estimating and fitting the models. This course and MATH 404 prepare students for Exam C/4. Prerequisite: MATH 483 with C or better.

**MATH 404-3 Loss Models II.** This is a second course in loss models including estimation and fitting of severity and ruin models, and credibility theory. This course and MATH 403 prepare students for Exam C/4. Prerequisite: MATH 403 with C or better.

**MATH 405-3 Intermediate Differential Equations.** This course features the study of several sets of differential equations with the aid of computers. The equations are actual applications in biology, chemistry, economics, engineering, finance, medicine and physics. Where possible, problems will be chosen to match student`s interests. Students from these areas are particularly welcome. Basic theory of differential equations is cited as needed. Prerequisite: MATH 305 with C or better.

**MATH 406-3 Linear Analysis.** Introduction to function spaces and operators used in quantum mechanics, partial differential equations, etc. Topics include: discrete and continuous models for the vibrating string, separation of variables, eigenfunction analysis, inner product spaces; operators on inner produce spaces; the spectral theorem for Hermitian operators on finite dimensional spaces, the Courant-Fisher characterization. Prerequisite: MATH 221 and MATH 305 with C or better.

**MATH 407-3 Partial Differential Equations.** Solution methods for linear partial differential equations arising in engineering and science. Topics include: the heat equation, the wave equation, Laplace`s equation, separation of variables, boundary and initial value problems, uniqueness via the energy methods, the maximum principle and characteristics. Solutions to the vibrating string and dissipation of heat in a bar will be discussed. Prerequisite: MATH 251 and MATH 305 with C or better.

**MATH 409-3 Fourier Analysis.** Introduction to the theory, techniques and applications of Fourier analysis. Topics include: Fourier synthesis and analysis equations for periodic and aperiodic functions; convolution; the calculus of Fourier transforms, Fourier series of DFT`s; operators and Fourier transforms; FFT and related algorithms; generalized functions such as Dirac`s delta and others; selected applications. Prerequisite: MATH 221 and MATH 305 with C or better.

**MATH 411-1 to 6 (1 to 3, 1 to 3) Mathematical Topics for Teachers.** Variety of short courses in mathematical ideas useful in curriculum enrichment in elementary and secondary mathematics. May be repeated as topics vary. Does not count toward a mathematics major.

**MATH 412-3 Problem Solving Approaches to Basic Mathematical Skills.** Content of basic skills at all levels of education and the development of these skills from elementary school through college; emphasis on problem solving and problem solving techniques; determination of student skills and proficiency level. Credit may not be applied toward degree requirements in mathematics. Prerequisite: MATH 321 or CI 321.

**MATH 417-3 Applied Matrix Theory.** Selected applications of matrices to physics, chemistry and economics. This material is also useful for engineering and computer science. Topics include matrix representation of symmetry groups, non-negative matrices and the subsidy problem, location of eigenvalues. Prerequisite: MATH 221 with C or better.

**MATH 418-3 Computer Algebra Systems.** This course presents modern computer algebra systems (CAS) as a research tool in mathematics. The use of a CAS in the preparation of reports, theses and dissertations will also be covered. Topics will include: solving differential equations with a CAS; plotting techniques with a CAS; symbolic packages for such areas as abstract algebra, number theory; and combinatorics; programming with a CAS; exporting results to TeX or word processing software; The AMS-LaTeX package. Restricted to graduate standing. Special approval needed from the instructor.

**MATH 419-3 Introduction to Abstract Algebra II.** A detailed study of polynomial equations in one variable. Solvable groups and the Galois theory of field extensions are developed

and applied to extensions of the quadratic formula, proving the impossibility of trisecting an angle with only a straight-edge and compass, and to the basic facts about finite fields as needed in coding theory and computer science. Prerequisite: MATH 319 with C or better.

**MATH 421-3 Linear Algebra.** The extension of basic linear algebra to arbitrary scalars. The theory and computation of Jordan forms of matrices (as needed e.g., for certain diffusion equations). Inner products, quadratic forms and Sylvester`s Law of Inertia. Prerequisite: MATH 221 with C or better.

**MATH 425-3 Introduction to Number Theory.** Properties of integers, primes, divisibility, congruences, quadratic forms, diophantine equations, and other topics in number theory. Prerequisite: MATH 319 with C or better.

**MATH 430-3 Introduction to Topology.** Study of the real line and the plane, metric spaces, topological spaces, compactness, connectedness, continuity, products, quotients and fixed point theorems. This course will be particularly useful to students who intend to study analysis or applied mathematics. Prerequisite: MATH 352 with C or better.

**MATH 435-3 Elementary Differential Geometry.** Introduction to modern differential geometry through the study of curves in R3. Local curve theory with emphasis on the Serret-Frenet formulas; global curve theory including Fenchel`s theorem; local surface theory motivated by curve theory; global surface theory including the Gauss-Bonnet theorem. Prerequisite: MATH 221 and MATH 251 with C or better.

**MATH 447-3 Introduction to Graph Theory.** (Same as CS 447) Graph theory is an area of mathematics which is fundamental to future problems such as computer security, parallel processing, the structure of the World Wide Web, traffic flow and scheduling problems. It also plays an increasingly important role within computer science. Topics include: trees, coverings, planarity, colorability, digraphs, depth-first and breadth-first searches. Prerequisite: MATH 349 with C or better.

**MATH 449-3 Introduction to Combinatorics.** (Same as CS 449) This course will introduce the student to various basic topics in combinatorics that are widely used throughout applicable mathematics. Possible topics include: elementary counting techniques, pigeonhole principle, multinomial principle, inclusion and exclusion, recurrence relations, generating functions, partitions, designs, graphs, finite geometry, codes and cryptography. Prerequisite: MATH 349 with C or better.

**MATH 450-3 Methods of Advanced Calculus.** Multivariable calculus fundamental to continuum mechanics, differential geometry, electromagnetism, relativity, thermodynamics, etc. Includes: parametric curves and surfaces, inverse and implicit function theorems, contraction mapping and fixed point theorems, differentials, convergence of multivariate integrals, coordinate systems in space, Jacobians, surfaces, volumes and Green`s, Gauss`, and Stokes` theorems. Prerequisite: MATH 251 with C or better.

**MATH 452-3 Introduction to Analysis.** A rigorous development of one-variable calculus providing the tools necessary for understanding all other advanced courses in analysis. Topics include: sets, axioms for the real numbers, continuity, limits, differentiation, the Riemann integral, infinite sequences and series of functions. Additional topics may include areas such as Riemann-Stieltjes integration or the analysis of multivariable functions. Prerequisite: MATH 352 with C or better.

**MATH 455-3 Complex Analysis with Applications.** Analysis of differentiable functions of a single complex variable. Introduces mathematical techniques used to analyze problems in the sciences and engineering that are inherently two dimensional. Topics include: the complex plane, analytic functions, the Cauchy-Riemann equations, line integrals, the Cauchy integral formula, Taylor and Laurent series, the residue theorem, conformal mappings, applications. Prerequisite: MATH 251 with C or better.

**MATH 460-3 Transformation Geometry.** Geometry viewed as the study of properties invariant under the action of a group. Topics include collineations, isometries, Frieze groups, Leonardo`s Theorem, the classification of isometries of Euclidean and hyperbolic geometries. Recommended elective for secondary education majors in mathematics. Prerequisite: MATH 319 with C or better.

**MATH 471-3 Optimization Techniques.** (Same as CS 471) Introduction to algorithms for finding extreme values of nonlinear multivariable functions with or without constraints. Topics include: convex sets and functions; the arithmetic-geometric mean inequality; Taylor`s theorem for multivariable functions; positive definite, negative definite, and indefinite matrices; iterative methods for unconstrained optimization. Prerequisite: MATH 221 and MATH 250 with C or better.

**MATH 472-3 Linear Programming.** (Same as CS 472) Introduction to finding extreme values of linear functionals subject to linear constraints. Topics include: recognition, formulation, and solution of real problems via the simplex algorithm; development of the simplex algorithm; artificial variables; the dual problem and duality theorem; complementary slackness; sensitivity analysis; and selected applications of linear programming. Prerequisite: MATH 221 with C or better.

**MATH 473-3 Reliability and Survival Models.** Introduction to statistical analysis of data on lifetime, including hazard functions and failure distributions; estimation and hypothesis testing in life testing experiments with complete as well as censored data. Prerequisite: MATH 480 or MATH 483 with C or better.

**MATH 474-3 Time Series.** An introduction to time series: AR, MA and ARIMA models; estimation, time series models. Prerequisite: MATH 480 or MATH 483 with C or better.

**MATH 475-3 Numerical Analysis I.** (Same as CS 475) Introduction to theory & techniques for computation with digital computers. Topics include: solution of nonlinear equations; interpolation & approximation; solution of systems of linear equations; numerical integration. Students will use MATLAB to study the numerical performance of the algorithms introduced in the course. Prerequisites: MATH 221 and MATH 250 with C or better.

**MATH 476-3 Numerical Analysis II.** (Same as CS 476) Continuation of MATH 475. Topics include: solution of ordinary differential equations; computation of eigenvalues and eigenvectors; and solution of partial differential equations. Students will use MATLAB to study the numerical performance of the algorithms introduced in the course. Prerequisites: MATH 305 and MATH 475 with a C or better.

**MATH 480-3 Probability, Stochastic Processes and Applications I.** Introduction to the central topics of modern probability including elementary stochastic processes; random variables and their properties; sum of independent random variables and the Central Limit Theorem; random walks; discrete time finite state Markov chains; applications to random number generators and image and signal processing. Also generating functions, conditional probability, expectation, moments. Prerequisite: MATH 251 with C or better.

**MATH 481-3 Probability, Stochastic Processes and Applications II.** Continuation of MATH 480. Thorough introduction to Markov processes and Martingales, including the laws of large numbers, classification of states, recurrence, convergence to the stationary distribution in Markov chains, birth processes, Poisson processes, stopping times, and the Martingale convergence theorem. Important and current applications will be included. Prerequisite: MATH 480 with C or better.

**MATH 483-4 Mathematical Statistics in Engineering and the Sciences.** Develops the basic statistical techniques used in applied fields like engineering, and the physical and natural sciences. Principal topics include probability; random variables; expectations; moment generating functions; transformations of random variables; point and interval estimation; tests of hypotheses. Applications include one-way classification data and chi-square tests for cross classified data. Prerequisite: MATH 250 with C or better.

**MATH 484-3 Applied Regression Analysis and Experimental Design.** Introduction to linear models and experimental design widely used in applied statistical work. Topics include linear models; analysis of variance; analysis of residuals; regression diagnostics; randomized blocks; Latin squares; factorial designs. Applications include response surface methodology and model building. Computations will require the use of a statistical package such as SAS. Prerequisite: MATH 221 and MATH 483 with C or better.

**MATH 485-3 Applied Statistical Methods.** Introduction to sampling methods and categorical data analysis widely used in applied areas such as a social and biomedical sciences and business. Sampling methods topics include: simple random and stratified sampling; ratio and regression estimators. Categorical data analysis topics include: contingency tables; loglinear models; logistic regression; model selection; use of a computer package. Prerequisite: MATH 483 with C or better.

**MATH 486-3 Statistical Computing.** This course covers Statistical Computing Software packages such as R and SAS, Helps prepare students for SAS certification. Topics include obtaining and analyzing output for regression, experimental design, and generalized linear models. Prerequisites: MATH 484 and CS 202 both with C or better.

**MATH 490-3 Topics in Mathematics.** Selected topics in mathematics chosen from such areas as: (a) Financial Mathematics, Mathematical Biology or Actuarial Mathematics; (b) Probability, Statistics or Stochastic Processes; (c) Mathematical topics not including Statistics, such as Operations Research, Cryptography and High Dimensional computing in Numerical Analysis, etc. May be repeated up to 3 times as topics vary. Special approval needed from the instructor.

**MATH 495-1 to 6 Special Topics in Mathematics.** Individual study or small group discussions in special areas of interest under the direction of a member of the faculty. Special approval needed from the chair and instructor.

## Mathematics Faculty

**Ban, Dubravka,** Professor, Dr. Sci., University of Zagreb, 1998.

**Beckemeyer, Imogene C.,** Assistant Professor, *Emerita,* M.A., Southern Illinois University, 1952.

**Bhattacharya, Bhaskar,** Professor and *Chair*, Ph.D., University of Iowa, 1993.

**Burton, T. A.,** Professor, *Emeritus,* Ph.D., Washington State University, 1964.

**Calvert, Wesley,** Assistant Professor, Ph.D., University of Notre Dame, 2005.

**Carraminana, Rodrigo,** Associate Professor, Ph.D., University of Iowa,

**Choi, Kwangho,** Assistant Professor, Ph.D., Purdue University, 2012.

**Clark, Lane,** Professor, *Emeritus,* Ph.D., University of New Mexico, 1980.

**Crenshaw, James,** Associate Professor, *Emeritus,* Ph.D., University of Illinois, 1967.

**Danhof, Kenneth,** Professor, *Emeritus,* Ph.D., Purdue University, 1969.

**Dharmadhikari, Sudhakar,** Professor, *Emeritus,* Ph.D., University of California at Berkeley, 1962.

**Earnest, Andrew,** Professor, *Emeritus,* Ph.D., Ohio State University, 1975.

**Elston, George,** Assistant Professor, *Emeritus,* M.S., University of Wisconsin, 1949.

**Feinsilver, Philip,** Professor, *Emeritus,* Ph.D., New York University (Courant), 1975.

**Fitzgerald, Robert W.,** Professor, *Emeritus,* Ph.D., University of California at Los Angeles, 1980.

**Foland, Neal E.,** Professor, *Emeritus,* Ph.D., University of Missouri, 1961.

**Grimmer, Ronald C.,** Professor, *Emeritus,* Ph.D., University of Iowa, 1967.

**Hall, Dilla,** Associate Professor, *Emeritus,* Ph.D., St. Louis University, 1955.

**Hooker, John W.,** Professor, *Emeritus,* Ph.D., University of Oklahoma, 1967.

**Hughes, Harry R.,** Associate Professor, Ph.D., Northwestern University, 1988.

**Hunsaker, Worthen N.,** Professor, *Emeritus,* Ph.D., Washington State University, 1966.

**Jeyaratnam, Sakthivel,** Professor, *Emeritus,* Ph.D., Colorado State University, 1978.

**Kammler, David,** Professor, *Emeritus,* Ph.D., University of Michigan, 1971.

**Kirk, Ronald B.,** Professor, *Emeritus,* Ph.D., California Institute of Technology, 1968.

**Koch, Charles,** Assistant Professor, *Emeritus,* Ph.D., University of Illinois, 1961.

**Kocik, Jerzy,** Associate Professor, Ph.D., Southern Illinois University Carbondale, 1989.

**Langenhop, Carl E.,** Professor, *Emeritus,* Ph.D., Iowa State

University, 1948.
**Mark, Abraham M.,** Professor, *Emeritus,* Ph.D., Cornell University, 1947.
**McSorley, John,** Professor, Ph.D., Oxford University, 1988.
**Mohammed, Salah-Eldin A.,** Professor, *Emeritus,* Ph.D., University of Warwick (England), 1976.
**Moore, Robert A.,** Associate Professor, *Emeritus,* Ph.D., Indiana University, 1961.
**Neuman, Edward G.,** Professor, *Emeritus,* Ph.D., University of Wroclaw (Poland), 1972.
**Olive, David,** Professor, Ph.D., University of Minnesota, 1998.
**Paine, Thomas B.,** Assistant Professor, *Emeritus,* Ph.D., University of Oregon at Eugene, 1966.
**Panchapakesan, S.,** Professor, *Emeritus,* Ph.D., Purdue University, 1969.
**Patula, William T.,** Professor, *Emeritus,* Ph.D., Carnegie-Mellon University, 1971.
**Pedersen, Franklin D.,** Associate Professor, *Emeritus,* Ph.D., Tulane University, 1967.
**Pericak-Spector, Kathleen,** Professor, Ph.D., Carnegie-Mellon University, 1980.
**Redmond, Donald,** Associate Professor, Ph.D., University of Illinois, 1976.
**Samadi, Yaser,** Assistant Professor, Ph.D., University of Georgia, 2014.
**Schurz, Henri,** Professor, Ph.D., Humboldt University, Berlin, 1997.
**Spector, Scott J.,** Professor, *Emeritus,* Ph.D., Carnegie-Mellon University, 1978.
**Sullivan, Michael,** Professor, Ph.D., University of Texas at Austin, 1992.
**Wallis, Walter,** Professor, *Emeritus,* Ph.D., University of Sydney, 1968.
**Wright, Mary H.,** Professor, Ph.D., McGill University (Montreal), 1977.
**Xiao, Mingqing,** Professor, Ph.D., University of Illinois, 1997.
**Xu, Dashun,** Associate Professor, Ph.D., Memorial University of Newfoundland, 2004.
**Xu, Jianhong,** Associate Professor, Ph.D., University of Connecticut 2003.
**Yucas, Joseph,** Professor, *Emeritus,* Ph.D., Pennsylvania State University, 1978.
**Zeman, Marvin,** Professor, *Emeritus,* Ph.D., New York University (Courant Institute), 1974.

# Mechanical Engineering and Energy Processes

**(Department, Major [Mechanical Engineering], Courses, Faculty)**

The mission of the Department of Mechanical Engineering and Energy Processes is to provide high quality engineering education to students and equip them with lifelong learning skills, which allow them to adapt to a changing work environment throughout their careers. Also, the Department of Mechanical Engineering and Energy Processes supports faculty growth and development through research and creative activities because quality teaching and service to humanity and society cannot be achieved without such activities. Finally, the Department of Mechanical Engineering and Energy Processes supports the idea of service to department, college, university, professional societies and community as part of the mission. The undergraduate program in Mechanical Engineering is accredited by the Engineering Accreditation Commission of ABET, www.abet.org. The department also offers graduate programs leading to the Master of Science and Doctor of Philosophy degrees.

## Bachelor of Science Degree in Mechanical Engineering

The fundamental goal of the undergraduate program in Mechanical Engineering is to offer a high-quality education for our students, designed to achieve the following Program Educational Objectives (PEOs), which describe what graduates are expected to attain within a few years of graduation:

1. Practice mechanical engineering in a global and societal context
2. Have skills needed for effective written and oral communication, collaboration, and innovation
3. Pursue advanced education or lifelong learning that support careers in a broad range of fields
4. Act in a professional and ethical manner, in their careers and communities

Also, the undergraduate program is designed to achieve the following Student Outcomes (SOs), which describe what students are expected to know and be able to do by the time of graduation:

1. The ability to apply knowledge of mathematics, science and engineering to problem solving
2. The ability to design and conduct experiments, as well as to analyze and interpret data
3. The ability to design a system, component, or process to meet desired needs within realistic constraints
4. The ability to function on multi-disciplinary teams
5. The ability to identify, formulate and solve engineering problems
6. An understanding of professional and ethical responsibility
7. The ability to communicate effectively
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
9. A recognition of the need for and an ability to engage in lifelong learning
10. Knowledge of contemporary issues
11. The ability to use the techniques, skills and modern engineering tools necessary for engineering practice

Mechanical engineering is one of the broadest fields of engineering. Mechanical engineers learn measurement and