

## Dual Credit Certificate in Mathematics

This certificate program allows an Illinois high school mathematics teacher with a masters degree (in any field) to teach certain courses for college credit to high school students. An undergraduate degree in mathematics, mathematics education or a related field is required for admission. The courses are listed below each with their SIUC catalog number and name followed in brackets by their Illinois Articulation Initiative number and name when available.

MATH 101: Introduction to Contemporary Mathematics. [M1904: General Education Mathematics.]

MATH 108: College Algebra. [none]

MATH 109: Trigonometry and Analytic Geometry. [none]

MATH 111: Precalculus. [none]

MATH 139: Finite Mathematics. [M1906: Finite Mathematics.]

MATH 282: Introduction to Statistics. [M1902: General Education Statistics.]

CS 215: Discrete Mathematics [M1905: Discrete Mathematics]

[M1907: Elementary Mathematical Modeling (Not offered at SIUC.)]

MATH 150: Calculus I. [M1 900-1]

MATH 250: Calculus II. [M1 900-2]

MATH 140: Business Calculus. [M1 900-B]

### Program Requirements

By state law the certificate requires a masters degree (in any field) plus 18 credit hours of graduate level mathematics courses beyond those taken as part of the undergraduate degree. Our program requires the final GPA be at least 3.0 and at least a C- in each course. The following MATH courses are required: 419, 417 or 421, 452 and 483, unless you had an equivalent course or courses as an undergraduate. If you had any of the required courses as an undergraduate, you will need to add more courses from below so that you achieve eighteen credit hours. At least two additional courses should be chosen from among the following. They are organized thematically, but you can mix and match them as you please as long as you satisfy the prerequisites.

Statistics: MATH 473, 474, 484, 485.

Applied Math: MATH 405, 407, 455.

Pure Math: MATH 425, 430, 435, 450, 460.

Combinatorics: MATH 447, 449.

Computational: MATH 472, 475, 476. (These require some computer programming skills.)

If you are ambitious 500 level courses available for graduate credit can be used. Up to nine credit hour for graduate courses from other institutions can be applied toward the 18 credit hours with permission

### **Online Courses**

The following courses are currently available online: MATH 417, 419, 452, 460, and 483. Additional courses will become available online soon. Thus, it will be possible to complete the program entirely online.

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### **Catalog description of required courses:**

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 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.

or

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 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 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