Mathematics

Mathematics
Department Chair: Matthew Ando
Department Office: 273 Altgeld Hall, 1409 West Green, Urbana
Phone: 333-3350
www.math.uiuc.edu

MATH 002  **Introductory Algebra**  credit: 3 hours.
Methods of elementary algebra, including simplification of algebraic expressions, solving linear and quadratic equations, equations of lines, systems of linear equations, and radicals. Approved for Letter and S/U grading. Enrollment is restricted. Credit may not be used toward graduation at the University of Illinois. Prerequisite: Score on appropriate placement test, or consent of Mathematics Department.

This course is for students in the LAS Access and Achievement Program only.

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<th>Location</th>
<th>Instructor</th>
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<td>149 - Henry Administration Bldg</td>
<td>Johnson, R</td>
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Restricted to Liberal Arts & Sciences.
Seats are reserved for LAS Access and Achievement Program students, specifically for Undeclared students until August 1, and then seats will open for EOP and PAP students in the college of Liberal Arts and Sciences. If you do not meet this requirement, please contact the Access and Achievement Program Office in 112 English Building to be placed on the waiting list.
Restricted to EOP - Obligatory, Pres Award Program Recip, President's Award Honors, or AAP - Undeclared students.

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<tr>
<td>67636</td>
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<td>Z1</td>
<td>ARRANGED -</td>
<td>-</td>
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Departmental Approval Required
Meets 17-Oct-16 - 07-Dec-16.

MATH 103  **Theory of Arithmetic**  credit: 4 hours.
Analyses of the mathematical issues and methodology underlying elementary mathematics in grades K-5. Topics include sets, arithmetic algorithms, elementary number theory, rational and irrational numbers, measurement, and probability. There is an emphasis on problem solving. Priority registration will be given to students enrolled in teacher education programs leading to certification in elementary or childhood education. Prerequisite: MATH 112 (formerly MATH 012) or equivalent.

Students must register for one lab and one lecture section.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning I

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Quant Reasoning I course.

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Quant Reasoning I course.
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MATH 112  **Algebra**  credit: 3 hours.

Rapid review of basic techniques of factoring, rational expressions, equations and inequalities; functions and graphs; exponential and logarithm functions; systems of equations; matrices and determinants; polynomials; and the binomial theorem. Prerequisite: 1.5 units of high school algebra; 1 unit of high school geometry.

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Seats are reserved for LAS Access and Achievement Program students, specifically Undeclared students until August 1, and then seats will open for LAS EOP and PAP students. If you do not meet this requirement, please contact the Access and Achievement Program Office.
Program Office in 112 English Building to be placed on the waiting list. We will continue to do as we have in the past—maintain a paper waiting list in our office at 112 English Building.

Restricted to EOP - Obligatory, Pres Award Program Recip, or AAP - Undeclared students.

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</table>
MATH 115  **Preparation for Calculus**  credit: 3 hours.
Reviews trigonometric, rational, exponential, and logarithmic functions; provides a full treatment of limits, definition of derivative, and an introduction to finding area under a curve. Intended for students who need preparation for MATH 220, either because they lack the content background or because they are not prepared for the rigor of a university calculus course. Credit is not given for both MATH 115 and either MATH 014 or MATH 114. Credit is not given for MATH 115 if credit for either MATH 220 or MATH 221 has been earned. Prerequisite: An adequate ALEKS placement score as described at [http://math.illinois.edu/ALEKS/](http://math.illinois.edu/ALEKS/), demonstrating knowledge of the topics of MATH 112.

This course satisfies the General Education Criteria for a: Quantitative Reasoning I

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<td>Johnson, R</td>
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Quant Reasoning I course.
Restricted to Liberal Arts & Sciences.
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| 58801 | Lecture-Discussion | B1      | 09:00 AM - 09:50 AM | MWF  | 116 - Roger Adams Laboratory | McNeilly, J  |

Quant Reasoning I course.
Placement in this course requires a recent U of I Math Placement Exam score of at least 65%. Failure to achieve the minimum score will result in removal from the course. For details see [http://www.math.uiuc.edu/ALEKS/](http://www.math.uiuc.edu/ALEKS/).

| 49213 | Lecture-Discussion | E1      | 01:00 PM - 01:50 PM | MWF  | 100 - Gregory Hall        | McNeilly, J  |

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**MATH 119  Ideas in Geometry**  credit: 3 hours.
General education course in mathematics, for students who do not have mathematics as a central part of their studies. The goal is to convey the spirit of mathematical thinking through topics chosen mainly from plane geometry. Prerequisite: Two units of high school algebra; one unit of high school geometry; or equivalent.
This course satisfies the General Education Criteria for a:
Quantitative Reasoning I

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Quant Reasoning I course.
Restricted to Undergrad - Urbana-Champaign.
This course is designed for students preparing to teach geometry at the elementary and middle grade levels. Assignments include math journals, papers, and presentations. This course is restricted to teaching students through April 18. Email mathadvising@illinois.edu with enrollment questions.

**MATH 124  Finite Mathematics**  credit: 3 hours.
Introduction to finite mathematics for students in the social sciences; introduces the student to the basic ideas of logic, set theory, probability, vectors and matrices, and Markov chains. Problems are selected from social sciences and business. Prerequisite: MATH 112 (formerly MATH 012) or an adequate ALEKS score.
This course satisfies the General Education Criteria for a:
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<td>2 - Illini Hall</td>
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Quant Reasoning I course.
This section has combined evening exams. See http://www.math.uiuc.edu/timetable for the schedule. This section has a blended format in which part of the content is delivered in lecture and discussion, and part is delivered online. This course is restricted to the College of ACES until the morning of June 29, 2015. Current Agri-Communication majors should e-mail mathadvising@illinois.edu with name, major, and UIN for a College override.

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<td>Lecture-Discussion</td>
<td>F1</td>
<td>02:00 PM - 02:50 PM</td>
<td>MWF</td>
<td>114 - David Kinley Hall</td>
<td>Folwaczny, L</td>
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</tbody>
</table>

Restricted to College of Business through May 26. From May 27 - August 23 the restriction will change to all new first-time freshmen. Others may register starting August 24. Business students who need to add the class after May 26, 2016 should email mathadvising@illinois.edu with their name, UIN, and college.

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<td>Folwaczny, L</td>
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MATH 181  A Mathematical World  credit: 3 hours.
Introduction to selected areas of mathematical sciences through application to modeling and solution of problems involving networks, circuits, trees, linear programming, random samples, regression, probability, inference, voting systems, game theory, symmetry and tilings, geometric growth, comparison of algorithms, codes and data management. Prerequisite: Three years of high school mathematics, including two years of algebra and one year of geometry.
This course satisfies the General Education Criteria for a:
Quantitative Reasoning I

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<td>MWF</td>
<td>343 - Altgeld Hall</td>
<td>Delcourt, M</td>
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Quant Reasoning I course.
Not intended for Engineering or Graduate College. Not intended for Mathematics or Actuarial Science major(s).
Math majors may register only with the permission of the department. Please email mathadvising@illinois.edu with name, UIN, and reason if a math major has a legitimate reason for wishing to take this course aimed at non-mathematical students.

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<td>149 - Henry Administration Bldg</td>
<td>Malik, A</td>
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Quant Reasoning I course.
Not intended for Engineering or Graduate College. Not intended for Mathematics or Actuarial Science major(s).
Meets 17-Oct-16 - 07-Dec-16.
Math majors may register only with the permission of the department. Please email mathadvising@illinois.edu with name, UIN, and reason if a math major has a legitimate reason for wishing to take this course aimed at non-mathematical students.

MATH 198  Freshman Seminar  credit: 3 hours.
Guides the student in the study of selected topics not considered in standard courses. Prerequisite: Enrollment in the mathematics honors program; consent of department.

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<td>G1H</td>
<td>03:00 PM - 03:50 PM</td>
<td>MWF</td>
<td>212 - 1205 W Oregon</td>
<td>Francis, G</td>
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</table>

Hypergraphics
Camp Honors/Chanc Schol course.
Restricted to Chancellor's Scholar-CHPHonors students.
Special Topic: Hypergraphics, 3 hours. This section for Chancellor's Scholars only (not restricted by major or year); other students may only enroll with consent of instructor and the Campus Honors Program.

MATH 199  Undergraduate Open Seminar  credit: 1 TO 5 hours.
Approved for both letter and S/U grading. May be repeated.

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Instructor Approval Required

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Credit Hours: 1 hours
Prep Future Teachers of Math
Preparing Future Teachers of Mathematics. Restricted to pre-Teaching Students. Contact las-teach@illinois.edu with your name and 9-digit UIN in order to be added to the teaching mailing list and receive the pre-Teaching attribute if you are interested in becoming a high school teacher. Restricted to Pre Teacher Ed Student students.

<table>
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Credit Hours: 1 hours
Restricted to DGS Enrichment Experience students.

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Credit Hours: 1 hours
Departmental Approval Required
For Math 285 Merit Workshop students only. Students must also register for either Math 285 Lecture C1 (CRN 51206) or Math 285 Lecture D1 (CRN 51207). For further information see http://www.math.uiuc.edu/timetable/

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Credit Hours: 1 hours
Departmental Approval Required
For Math 115 Merit Workshop students only. For further information see http://www.math.uiuc.edu/timetable/

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Credit Hours: 1 hours
Departmental Approval Required
For Math 115 Merit Workshop students only. For further information see http://www.math.uiuc.edu/timetable/

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Credit Hours: 1 hours
Departmental Approval Required
For Math 115 Merit Workshop students only. For further information see http://www.math.uiuc.edu/timetable/

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<td>TR</td>
<td>212 - 1205 W Oregon</td>
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Credit Hours: 3 hours
Spaceflight
This section is for Chancellor’s Scholars only; other students may enroll only with special permission from the Campus Honors Program and the instructor
Restricted to Chancellor’s Scholar-CHPHonors students.

**MATH 210  Theory of Interest  credit: 3 hours.**
Study of compound interest and annuities; applications to problems in finance. Prerequisite: MATH 231 or equivalent.
CRN  | Type            | Section | Time            | Days | Location     | Instructor
-----|-----------------|---------|-----------------|------|--------------|-------------
30330 | Lecture-Discussion | M1      | 09:30 AM - 10:50 AM | TR   | 223 - Gregory Hall | Wang, Y

Enrollment restricted to current actuarial science majors April 4 - April 26. Prospective transfers should review [http://www.math.illinois.edu/ActuarialScience/transfer-to-actsci-ui-only.pdf](http://www.math.illinois.edu/ActuarialScience/transfer-to-actsci-ui-only.pdf) Prospective transfers who are not able to register on April 27 should fill out the form here to be added to the request list: [http://go.illinois.edu/Math210FA16](http://go.illinois.edu/Math210FA16)

**MATH 213 Basic Discrete Mathematics**  credit: 3 hours.
Beginning course on discrete mathematics, including sets and relations, functions, basic counting techniques, recurrence relations, graphs and trees, and matrix algebra; emphasis throughout is on algorithms and their efficacy. Credit is not given for both MATH 213 and CS 173. Prerequisite: MATH 220 or MATH 221, or equivalent.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning II

CRN  | Type            | Section | Time            | Days | Location     | Instructor
-----|-----------------|---------|-----------------|------|--------------|-------------
32072 | Lecture-Discussion | D1      | 11:00 AM - 11:50 AM | MWF  | 141 - Altgeld Hall | Ivanov, S

Quant Reasoning II course.

32073 | Lecture-Discussion | E1      | 01:00 PM - 01:50 PM | MWF  | 443 - Altgeld Hall | Xiao, M

Quant Reasoning II course.

32076 | Lecture-Discussion | X1      | 12:00 PM - 12:50 PM | MWF  | 145 - Altgeld Hall | Ivanov, S

Quant Reasoning II course.

**MATH 220 Calculus**  credit: 5 hours.
First course in calculus and analytic geometry; basic techniques of differentiation and integration with applications including curve sketching; antidifferentiation, the Riemann integral, fundamental theorem, exponential and trigonometric functions. Credit is not given for both MATH 220 and either MATH 221 or MATH 234. Prerequisite: An adequate ALEKS placement score as described at [http://math.illinois.edu/ALEKS/](http://math.illinois.edu/ALEKS/), demonstrating knowledge of topics of MATH 115. Students with previous calculus experience should consider MATH 221.

Students must register for one discussion and one lecture section beginning with the same letter in Fall and Spring terms only. Engineering students must obtain a dean's approval to drop this course after the second week of instruction.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning I

CRN  | Type            | Section | Time            | Days | Location     | Instructor
-----|-----------------|---------|-----------------|------|--------------|-------------
34509 | Discussion/Recitation | AD1      | 11:00 AM - 12:50 PM | TR   | 159 - Altgeld Hall | McConvey, A

Quant Reasoning I course.
Departmental Approval Required
For Merit Workshop students only. For further information see [http://www.math.uiuc.edu/timetable/](http://www.math.uiuc.edu/timetable/)

35101 | Discussion/Recitation | AD2      | 09:00 AM - 10:50 AM | TR   | 173 - Altgeld Hall | Wright, B
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<td>443 - Altgeld Hall</td>
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Quant Reasoning I course. 
This section is restricted to Architectural Studies and Architecture majors until June 12.
Quant Reasoning I course.

Placement in this course requires a recent U of I Math Placement Exam score of at least 80%. Failure to achieve the minimum score will result in removal from the course. For details see http://math.illinois.edu/ALEKS

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Quant Reasoning I course.

For Unit One and other LLC students only. Placement in this course requires a recent U of I Math Placement Exam score of at least 80%. Failure to achieve the minimum score will result in removal from the course. For details see http://math.illinois.edu/ALEKS

Restricted to LEADS LLC, Global Crossroads, Honors LLC, Health Professions Lv Lrn Comm, Intersections, Innovations LLC, Sustainability LLC, Unit One, Weston Explorer Program, or Women in Math/Science/Engr Prg students.

MATH 221  Calculus I  credit: 4 hours.
First course in calculus and analytic geometry for students with some calculus background; basic techniques of differentiation and integration with applications including curve sketching; antidifferentiation, the Riemann integral, fundamental theorem, exponential and trigonometric functions. Credit is not given for both MATH 221 and either MATH 220 or MATH 234. Prerequisite: An adequate ALEKS placement score as described at http://math.illinois.edu/ALEKS/ and either one year of high school calculus or a minimum score of 2 on the AB Calculus AP exam.

Students must register for one discussion and one lecture section beginning with the same letter. Engineering students must obtain a dean's approval to drop this course after the second week of instruction.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning I

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Quant Reasoning I course.

Placement in this course requires a recent U of I Math Placement Exam score of at least 80%. Failure to achieve the minimum score will result in removal from the course. For details see [http://www.math.uiuc.edu/ALEKS/](http://www.math.uiuc.edu/ALEKS/).
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Quant Reasoning I course.

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Quant Reasoning I course.
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Quant Reasoning I course.
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MATH 225  **Introductory Matrix Theory**  credit: 2 hours.

Systems of linear equations, matrices and inverses, determinants, and a glimpse at vector spaces, eigenvalues and eigenvectors. Credit is not given for both MATH 225 and any of MATH 125, MATH 410, or MATH 415. Prerequisite: MATH 220 or MATH 221; or equivalent.

Engineering students must obtain a dean's approval to drop this course after the second week of instruction.

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MATH 231  **Calculus II**  credit: 3 hours.

Second course in calculus and analytic geometry: techniques of integration, conic sections, polar coordinates, and infinite series. Prerequisite: MATH 220 or MATH 221.

Students must register for one discussion and one lecture section beginning with the same letter in Fall and Spring terms only. Engineering students must obtain a dean's approval to drop this course after the second week of instruction.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning I

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Quant Reasoning I course.
Not intended for Engineering. Not intended for Engineering Physics or Physics or Chemical Engineering or Statistics & Computer Science or Math & Computer Science or Computer Sci & Anthropology or Computer Sci & Astronomy or Computer Sci & Chemistry or Computer Sci & Linguistics major(s).
New freshmen in Engineering or Engineering-rate majors must enroll in lecture EL1 or EL2. Continuing students in Engineering who register after May 27, 2016, should e-mail mathadvising@illinois.edu with name, UIN, and continuing status to receive an override.
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Quant Reasoning I course. Not intended for Engineering. Not intended for Engineering Physics or Physics or Chemical Engineering or Statistics & Computer Science or Math & Computer Science or Computer Sci & Anthropology or Computer Sci & Astronomy or Computer Sci & Chemistry or Computer Sci & Linguistics major(s). New freshmen in Engineering or Engineering-rate majors must enroll in lecture EL1 or EL2. Continuing students in Engineering who register after May 27, 2016, should e-mail mathadvising@illinois.edu with name, UIN, and continuing status to receive an override.

Quant Reasoning I course. Not intended for Graduate - Urbana-Champaign. Honors section. Grade of A in Math 220 (221) or score of 5 on AP Calculus AB exam required. Requires concurrent enrollment in Math 249 Q1H CRN 32044. Not all qualified students will get seats in honors calculus, so freshmen should register for a regular section as a backup plan. The course will open to students with a 5 on AP Calculus AB at 9:00am on Friday, August 19. Must enroll concurrently in MATH 249 32044.
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Quant Reasoning I course.

Restricted to Civil Engineering or Computer Engineering or Computer Science or Electrical Engineering or Engineering Mechanics or Engineering Physics or General Engineering or Industrial Engineering or Materials Science & Engr or Mechanical Engineering or Physics or Chemical Engineering or Bioengineering or Statistics & Computer Science or Math & Computer Science or Aerospace Engineering or Agricultural & Biological Engr or Nuclear, Plasma, Radiolg Engr or Engineering Undeclared or Computer Sci & Anthropology or Computer Sci & Astronomy or Computer Sci & Chemistry or Computer Sci & Linguistics major(s).

Restricted to new freshmen in the College of Engineering and certain other majors. Students registering for this course must add three CRNs at the same time on the Add/Drop page (not the Class Lookup) to get into the class: 46880 for the lecture, 50014 for the extra credit, and one more for an ED discussion.

Restricted to First Time Freshman students.

Must enroll concurrently in MATH 299 50014.

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Quant Reasoning I course.

Restricted to Civil Engineering or Computer Engineering or Computer Science or Electrical Engineering or Engineering Mechanics or Engineering Physics or General Engineering or Industrial Engineering or Materials Science & Engr or Mechanical Engineering or Physics or Chemical Engineering or Bioengineering or Statistics & Computer Science or Math & Computer Science or Aerospace Engineering or Agricultural & Biological Engr or Nuclear, Plasma, Radiolg Engr or Engineering Undeclared or Computer Sci & Anthropology or Computer Sci & Astronomy or Computer Sci & Chemistry or Computer Sci & Linguistics major(s).

Restricted to new freshmen in the College of Engineering and certain other majors. Students registering for this course must add three CRNs at the same time on the Add/Drop page (not the Class Lookup) to get into the class: 46897 for the lecture, 50015 for the extra credit, and one more for an ED discussion.

Restricted to First Time Freshman students.

Must enroll concurrently in MATH 299 50015.
MATH 241  Calculus III  credit: 4 hours.
Third course in calculus and analytic geometry including vector analysis: Euclidean space, partial differentiation, multiple integrals, line integrals and surface integrals, the integral theorems of vector calculus. Credit is not given for both MATH 241 and MATH 292. Prerequisite: MATH 231.

Students must register for one discussion and one lecture section beginning with the same letter in Fall and Spring terms only. Engineering students must obtain a dean's approval to drop this course after the second week of instruction.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning II

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Quant Reasoning II course.
Departmental Approval Required
For Merit Workshop students only. Departmental approval required. For further information see http://www.math.uiuc.edu/timetable/
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Quant Reasoning II course.

| 47057 | Discussion/Recitation | ADG        | TR   | 02:00 PM - 02:50 PM | 343 - Altgeld Hall | Obeidin, M |

Quant Reasoning II course.

| 47041 | Discussion/Recitation | ADH        | TR   | 03:00 PM - 03:50 PM | 141 - Altgeld Hall | Obeidin, M |

Quant Reasoning II course.

| 47056 | Discussion/Recitation |ADI        | TR   | 04:00 PM - 04:50 PM | 147 - Altgeld Hall | Kim, H |

Quant Reasoning II course.

| 47045 | Discussion/Recitation |ADK        | TR   | 09:00 AM - 09:50 AM | 169 - Davenport Hall | Butler, S |

Quant Reasoning II course.

| 56590 | Discussion/Recitation | ADL        | TR   | 10:00 AM - 10:50 AM | G30 - Foreign Languages Building | Butler, S |

Quant Reasoning II course.

| 49246 | Discussion/Recitation |ADM        | TR   | 11:00 AM - 11:50 AM | 143 - Altgeld Hall | Gao, L |

Quant Reasoning II course.

| 59744 | Discussion/Recitation |ADN        | TR   | 12:00 PM - 12:50 PM | 445 - Altgeld Hall | Kim, H |

Quant Reasoning II course.

| 49249 | Discussion/Recitation |ADO        | TR   | 01:00 PM - 01:50 PM | 303 - English Building | Ellis, M |

Quant Reasoning II course.

| 59328 | Lecture           | AL1        | MWF  | 08:00 AM - 08:50 AM | 314 - Altgeld Hall | Dunfield, N |

Quant Reasoning II course.

| 47036 | Lecture           | AL2        | MWF  | 09:00 AM - 09:50 AM | 314 - Altgeld Hall | Dunfield, N |

Quant Reasoning II course.

<p>| 47039 | Discussion/Recitation | BDA        | TR   | 08:00 AM - 08:50 AM | 143 - Altgeld Hall | Koutsaki, K |</p>
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Quant Reasoning II course.
Not intended for Graduate - Urbana-Champaign.
Honors section. Grade of A in Math 231 or score of 5 on AP Calculus BC exam required. Not all qualified students will get seats in honors calculus, so freshmen should register for a regular section as a backup plan. The course will open to students with a 5 on AP Calculus BC at 9:00am on Friday, August 19.

Quant Reasoning II course.
For Unit One and other LLC students only.
Restricted to LEADS LLC, Global Crossroads, Honors LLC, Health Professions Lv Lrn Comm, Intersections, Innovations LLC, Sustainability LLC, Unit One, Weston Explorer Program, or Women in Math/Science/Engr Prg students.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
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<td>50501</td>
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Quant Reasoning II course.

Not intended for Graduate - Urbana-Champaign.
Honors section. Grade of A in Math 231 or score of 5 on AP Calculus BC exam required. Not all qualified students will get seats in honors calculus, so freshmen should register for a regular section as a backup plan. The course will open to students with a 5 on AP Calculus BC at 9:00am on Friday, August 19..

62212    | Discussion/Recitation     | 08:00 AM - 08:50 AM | TR   | 147 - Altgeld Hall | Kaplan, E   |

Quant Reasoning II course.

62213    | Discussion/Recitation     | 09:00 AM - 09:50 AM | TR   | 441 - Altgeld Hall | Kaplan, E   |

Quant Reasoning II course.

62214    | Discussion/Recitation     | 10:00 AM - 10:50 AM | TR   | 441 - Altgeld Hall | Addabbo, D   |

Quant Reasoning II course.

62215    | Discussion/Recitation     | 11:00 AM - 11:50 AM | TR   | 336 - Mechanical Engineering Bldg | Addabbo, D   |
### Quant Reasoning II course.

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<tr>
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### Quant Reasoning II course.

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<td>62211</td>
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### Quant Reasoning II course.

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### Quant Reasoning II course.

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</table>

Not intended for Graduate - Urbana-Champaign.

Honors section. Grade of A in Math 231 or score of 5 on AP Calculus BC exam required. Not all qualified students will get seats in honors calculus, so freshmen should register for a regular section as a backup plan. The course will open to students with a 5 on AP Calculus BC at 9:00am on Friday, August 19.

### MATH 249 Honors Supplement credit: 1 hours.

Supplemental credit hour for honors courses with additional material or special projects. Prerequisite: Concurrent registration in a specially designated honors section and consent of department.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
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<td>32044</td>
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<td>-</td>
<td>-</td>
<td>Nikolaev, I</td>
</tr>
</tbody>
</table>

Not intended for Graduate - Urbana-Champaign.

Requires concurrent registration in MATH 231 D1H CRN 46909.

Must enroll concurrently in MATH 231 46909.

### MATH 285 Intro Differential Equations credit: 3 hours.

Techniques and applications of ordinary differential equations, including Fourier series and boundary value problems, and an introduction to partial differential equations. Intended for engineering majors and others who require a working knowledge of differential equations. Credit is not given for both MATH 285 and any of MATH 284, MATH 286, MATH 441. Prerequisite: MATH 241.

This course satisfies the General Education Criteria for a: Quantitative Reasoning II

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
</table>

page 29 - Mathematics, Fall 2016
MATH 286  **Intro to Differential Eq Plus**  credit: 4 hours.
Techniques and applications of ordinary differential equations, including Fourier series and boundary value problems, linear systems of differential equations, and an introduction to partial differential equations. Covers all the MATH 285 plus linear systems. Intended for engineering majors and other who require a working knowledge of differential equations. Credit is not given for both MATH 286 and any of MATH 284, MATH 285, MATH 441. Prerequisite: MATH 241.

This course satisfies the General Education Criteria for a: Quantitative Reasoning II

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
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<tr>
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</table>

Quant Reasoning II course.
Registration is restricted to students majoring in Electrical and Computer Engineering until the morning of April 25, 2016. Students interested in transfer to ECE should be in contact with ece-advisor@illinois.edu. A few seats are being held for new transfer students and will not be released until the Friday before classes start.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
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<th>Time</th>
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<td>Berwick Evans, D</td>
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</tbody>
</table>

Quant Reasoning II course.
Registration is restricted to students majoring in Electrical and Computer Engineering until the morning of April 25, 2016. Students interested in transfer to ECE should be in contact with ece-advisor@illinois.edu. A few seats are being held for new transfer students and will not be released until the Friday before classes start.

MATH 299  **Topics in Mathematics**  credit: 1 TO 4 hours.
Topics course; see Class Schedule or department office for current topics. May be repeated in the same or subsequent semesters to a maximum of 8 hours. Prerequisite: MATH 220 or MATH 221; consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
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<td>50014</td>
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<td>EL1</td>
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</table>
MATH 347  **Fundamental Mathematics**  credit: 3 hours.
Fundamental ideas used in many areas of mathematics. Topics will include: techniques of proof, mathematical induction, binomial coefficients, rational and irrational numbers, the least upper bound axiom for real numbers, and a rigorous treatment of convergence of sequences and series. This will be supplemented by the instructor from topics available in the various texts. Students will regularly write proofs emphasizing precise reasoning and clear exposition. Credit is not given for both MATH 347 and MATH 348. Prerequisite: MATH 231.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning II

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
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<td>MWF</td>
<td>241 - Altgeld Hall</td>
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<td>65074</td>
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Quant Reasoning II course.
Math 347 is restricted to Mathematics and Math/CS majors until the morning of April 29, 2016. Contact mathadvising@illinois.edu if you have questions. Math minors may attempt to register for this class on April 29, 2016; however admission to the minor does not guarantee a seat in any math course. Students completing Math 241 and hoping to transfer to a mathematics major should make an appointment with a math advisor during early registration. Some seats are reserved for math transfer students and will not be released until late August.
<table>
<thead>
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Quant Reasoning II course. 
Not intended for Graduate - Urbana-Champaign. 
Math 347 is restricted to Mathematics and Math/CS majors until the morning of April 29, 2016. Contact mathadvising@illinois.edu if you have questions. Math minors may attempt to register for this class on April 29, 2016; however admission to the minor does not guarantee a seat in any math course. Students completing Math 241 and hoping to transfer to a mathematics major should make an appointment with a math advisor during early registration. Some seats are reserved for math transfer students and will not be released until late August.

MATH 357  **Numerical Methods I**  credit: 3 hours.
Same as CS 357. See CS 357.

<table>
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Credit Hours: 3 hours  
Restricted to Undergrad - Urbana-Champaign.

Students registered in this section will watch the regular CS 357/Math 357 lecture, online. This is an overflow accommodation for the course. Students in this section will take any exams with the regular section of CS 357/Math 357.

MATH 362  Probability with Engrg Applic  credit: 3 hours. 
Same as ECE 313. See ECE 313.

<table>
<thead>
<tr>
<th>CRN</th>
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Credit Hours: 3 hours

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Credit Hours: 3 hours  
Not intended for Graduate - Urbana-Champaign.
MATH 370  Actuarial Problem Solving  credit: 1 hours.
Methods and techniques of solving problems in actuarial mathematics for advanced students intending to enter the actuarial profession. Approved for S/U grading only. May be repeated in the same or separate terms to a maximum of 4 hours. Prerequisite: Consent of instructor.
Students planning to sit for the "Course 1" Actuarial exam should register for section X. This will carry a 1 hour credit only.

<table>
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<th>CRN</th>
<th>Type</th>
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<td>32097</td>
<td>Conference</td>
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<td>07:00 PM - 08:50 PM</td>
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</table>

This section is for students preparing for Exam 2/FM. Students are expected to be enrolled in or have completed Math 210.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Days</th>
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<td>243 - Altgeld Hall</td>
<td>Feng, R</td>
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</table>

Students who are expecting to take Exam 3F/MFE after the semester. Students are expected to be enrolled in or have completed MATH 241, MATH 210, MATH 408, and MATH 476

<table>
<thead>
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<th>CRN</th>
<th>Type</th>
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<th>Time</th>
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<td>P</td>
<td>07:00 PM - 08:50 PM</td>
<td>M</td>
<td>245 - Altgeld Hall</td>
<td>Feng, R</td>
</tr>
</tbody>
</table>

Credit Hours: 1 hours
This section is for students preparing for Exam 1/P. Students are expected to be enrolled in or have completed Math 408, Stat 400, or Math 461.

MATH 390  Individual Study  credit: 0 TO 3 hours.
Guided individual study of advanced topics not covered in other courses. May be repeated to a maximum of 8 hours. Approved for both letter and S/U grading. Prerequisite: Consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
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<tbody>
<tr>
<td>10553</td>
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</tbody>
</table>

Instructor Approval Required

MATH 399  Math/Actuarial Internship  credit: 0 hours.
Full-time or part-time practice of math or actuarial science in an off-campus government, industrial, or research laboratory environment. Summary report required. Approved for S/U grading only. May be repeated in separate terms. Prerequisite: After obtaining an internship, Mathematics majors must request entry from the Mathematics Director of Undergraduate Studies; Actuarial Science majors must request entry from the Director of the Actuarial Science Program.

<table>
<thead>
<tr>
<th>CRN</th>
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</tr>
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</table>
### MATH 402  Non Euclidean Geometry  credit: 3 OR 4 hours.

Historical development of geometry; includes tacit assumptions made by Euclid; the discovery of non-Euclidean geometries; geometry as a mathematical structure; and an axiomatic development of plane geometry. 3 or 4 undergraduate hours. 3 or 4 graduate hours. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 241; MATH 347 or MATH 348, or equivalent; or consent of instructor.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning II

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
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<th>Time</th>
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<td>Cliff, E Stojanoska, V</td>
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Credit Hours: 3 hours
Quant Reasoning II course.

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Credit Hours: 3 hours
Quant Reasoning II course.

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<td>Cliff, E Stojanoska, V</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Quant Reasoning II course.

MATH 403  Euclidean Geometry  credit: 3 OR 4 hours.
Selected topics from geometry, including the nine-point circle, theorems of Ceva and Menelaus, regular figures, isometries in the plane, ordered and affine geometries, and the inversive plane. 3 or 4 undergraduate hours. 3 or 4 graduate hours. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 241; MATH 347 or 348, or equivalent; or consent of instructor.

<table>
<thead>
<tr>
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Credit Hours: 3 hours

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</tbody>
</table>

Credit Hours: 4 hours
Instructor Approval Required
Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

**MATH 406  History of Calculus  credit: 3 OR 4 hours.**
Examination of the historical origins and genesis of the concepts of the calculus; includes mathematical developments from the ancient Greeks to the eighteenth century. 3 or 4 undergraduate hours. 3 or 4 graduate hours. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 241 or equivalent.

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Credit Hours: 3 hours

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Credit Hours: 4 hours
Instructor Approval Required
Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

**MATH 409  Actuarial Statistics II  credit: 4 hours.**
Same as STAT 409. See STAT 409.

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<th>Type</th>
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</table>

This discussion must be registered with a lecture starting with the same letter.

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<thead>
<tr>
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<th>Type</th>
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<td>AD2</td>
<td>03:00 PM - 03:50 PM</td>
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<td>217 - Gregory Hall</td>
<td>Abdikerimova, S</td>
</tr>
</tbody>
</table>

This discussion must be registered with a lecture starting with the same letter.
**MATH 410  Lin Algebra & Financial Apps  credit: 3 OR 4 hours.**
Emphasizes techniques of linear algebra and introductory and advanced applications to actuarial science, finance and economics. Topics include linear equations, matrix theory, vector spaces, linear transformations, eigenvalues and eigenvectors and inner product spaces. In addition, current research topics such as modeling, data mining, and generalized linear models are explored. 3 or 4 undergraduate hours. 3 or 4 graduate hours. Credit is not given for both MATH 410 and any of MATH 125, MATH 225, MATH 415 or MATH 416. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 241; MATH 210 or FIN 221; or consent of instructor.

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<thead>
<tr>
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<th>Type</th>
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</tbody>
</table>

Credit Hours: 3 hours
This course is restricted to current Actuarial Science majors initially, but the restriction will be removed during business hours on April 28, 2015. Students interested in a transfer to actuarial science should see http://www.math.uiuc.edu/~gorvett/actprob/transfer.html

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Location</th>
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</table>

Credit Hours: 4 hours
Departmental Approval Required
Restricted to Actuarial Science major(s). Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

**MATH 412  Graph Theory  credit: 3 OR 4 hours.**
Examines basic concepts and applications of graph theory, where graph refers to a set of vertices and edges that join some pairs of vertices; topics include subgraphs, connectivity, trees, cycles, vertex and edge coloring, planar graphs and their colorings. Draws applications from computer science, operations research, chemistry, the social sciences, and other branches of mathematics, but emphasis is placed on theoretical aspects of graphs. 3 or 4 undergraduate hours. 3 or 4 graduate hours. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 347 or MATH 348 or equivalent experience or CS 374.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning II

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Section</th>
<th>Time</th>
<th>Days</th>
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<td>02:00 PM - 02:50 PM</td>
<td>MWF</td>
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</table>

Credit Hours: 3 hours
Quant Reasoning II course.
This course is restricted to Mathematics and Math&CS majors initially, but the restriction will be removed during business hours on April 21, 2016.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<td>MWF</td>
<td>245 - Altgeld Hall</td>
<td>Balog, J</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours
Quant Reasoning II course.
Instructor Approval Required
Restricted to Mathematics or Math & Computer Science major(s). Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

MATH 413  Intro to Combinatorics  credit: 3 OR 4 hours.
Permutations and combinations, generating functions, recurrence relations, inclusion and exclusion, Polya's theory of counting, and block designs. Same as CS 413. 3 undergraduate hours. 3 or 4 graduate hours. 4 hours of credit requires approval of the instructor and completion of additional work of substance. Prerequisite: MATH 347 or MATH 348 or equivalent experience.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
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<th>Instructor</th>
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<td>MWF</td>
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Credit Hours: 3 hours
This course is restricted to Mathematics and Math&CS majors initially, but the restriction will be removed during business hours on April 21, 2016.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
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Credit Hours: 4 hours
Departmental Approval Required
Restricted to Graduate - Urbana-Champaign.

<table>
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<tr>
<th>CRN</th>
<th>Type</th>
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<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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Credit Hours: 3 hours
This course is restricted to Mathematics and Math&CS majors initially, but the restriction will be removed during business hours on April 21, 2016.

<table>
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</table>

Credit Hours: 4 hours
Instructor Approval Required
Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

MATH 415  Applied Linear Algebra  credit: 3 or 4 hours.
Introductory course emphasizing techniques of linear algebra with applications to engineering; topics include matrix operations, determinants, linear equations, vector spaces, linear transformations, eigenvalues, and eigenvectors, inner products and norms, orthogonality, equilibrium, and linear dynamical systems. 3 or 4 undergraduate hours. 3 or 4 graduate hours. Credit is not given for both MATH 415 and any of MATH 125, MATH 225, MATH 410, or MATH 416. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 241 or consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
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</table>

Credit Hours: 3 hours
In the fall semester, enrollment is restricted to majors requiring this course. For questions contact mathadvising@illinois.edu. Remaining seats may be made available after the first day of class. Major restrictions will be removed during the morning of August 24, 2016.

Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Mechanical Engineering -UIUC, MS: Aerospace Engr-Online-UIUC, MCS: Computer Sci Online-UIUC, or MENG:Mech Engineering Onl-UIUC. Restricted to online MSAE, online MCS, online MSME, and online MSCEE students. Center for Innovation in Teaching & Learning (CITL) restrictions and assessments apply, see https://online.illinois.edu. For more details on this course section, please see http://engineering.illinois.edu/online/courses/. Online non-degree students are not eligible to register for this section. OCE Tuition $1034.00 per Bill Hour, and OCE Fees $50.00 per Bill Hour.
MATH 416  **Abstract Linear Algebra**  credit: 3 OR 4 hours.
Rigorous proof-oriented course in linear algebra. Topics include determinants, vector spaces over fields, linear transformations, inner product spaces, eigenvectors and eigenvalues, Hermitian matrices, Jordan Normal Form. 3 or 4 undergraduate hours. 3 or 4 graduate hours. Credit is not given for both MATH 416 and either MATH 410 or MATH 415. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 241 or consent of instructor; MATH 347 is recommended.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
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<td>57836</td>
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<td>09:00 AM - 09:50 AM</td>
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<td>141 - Altgeld Hall</td>
<td>Mortensen, K</td>
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</table>

Credit Hours: 3 hours
This course is restricted to Mathematics majors initially, but the restriction will be removed during the morning of April 21, 2016.

| 57837 | Lecture-Discussion  | B14     | 09:00 AM - 09:50 AM | MWF  | 141 - Altgeld Hall | Mortensen, K |

Credit Hours: 4 hours
Instructor Approval Required
Restricted to Computer Science major(s). Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

| 51392 | Lecture-Discussion  | B3H     | 09:00 AM - 09:50 AM | MWF  | 347 - Altgeld Hall | Erdogan, M   |

Credit Hours: 3 hours
Departmental Approval Required
James Scholars, and Camp Honors/Chanc Schol course.
Not intended for Graduate - Urbana-Champaign.
Honors section. Email mathadvising@illinois.edu with name, UIN, and reason for interest to request approval for this section.

| 51393 | Lecture-Discussion  | B4H     | 09:00 AM - 09:50 AM | MWF  | 347 - Altgeld Hall | Erdogan, M   |

Credit Hours: 4 hours
Instructor Approval Required
James Scholars, and Camp Honors/Chanc Schol course.
Restricted to Statistics major(s). Not intended for Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.
Restricted to Chancellor's Scholar-CHPHonors or James Scholars Program students.

| 54464 | Lecture-Discussion  | E13     | 01:00 PM - 01:50 PM | MWF  | 2 - Illini Hall   | Kerman, E    |

Credit Hours: 3 hours
This course is restricted to Mathematics majors initially, but the restriction will be removed during the morning of April 21, 2016.

| 54465 | Lecture-Discussion  | E14     | 01:00 PM - 01:50 PM | MWF  | 2 - Illini Hall   | Kerman, E    |

Credit Hours: 4 hours
Instructor Approval Required
Restricted to Mechanical Engineering major(s). Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

| 55582 | Lecture-Discussion  | M13     | 09:30 AM - 10:50 AM | TR   | 207 - Gregory Hall | Borman, M    |

Credit Hours: 3 hours
This course is restricted to Mathematics majors initially, but the restriction will be removed during the morning of April 21, 2016.

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Credit Hours: 4 hours
Instructor Approval Required
Restricted to Electrical Engineering major(s). Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

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Credit Hours: 3 hours

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Credit Hours: 4 hours
Instructor Approval Required
Restricted to Mathematics major(s).

**MATH 417 Intro to Abstract Algebra**  credit: 3 OR 4 hours.
Fundamental theorem of arithmetic, congruences. Permutations. Groups and subgroups, homomorphisms. Group actions with applications. Polynomials. Rings, subrings, and ideals. Integral domains and fields. Roots of polynomials. Maximal ideals, construction of fields. 3 or 4 undergraduate hours. 3 or 4 graduate hours. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: Either MATH 416 or one of MATH 410, MATH 415 together with one of MATH 347, MATH 348, CS 373; or consent of instructor.

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<td>MWF</td>
<td>206 - David Kinley Hall</td>
<td>Wyser, B</td>
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Credit Hours: 3 hours
This course is restricted to Mathematics and Math&CS majors initially, but the restriction will be removed during business hours on April 21, 2016.

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<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
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<td>206 - David Kinley Hall</td>
<td>Wyser, B</td>
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Credit Hours: 4 hours
Instructor Approval Required
Restricted to Chemical Engineering major(s). Restricted to Graduate - Urbana-Champaign.

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<td>01:00 PM - 01:50 PM</td>
<td>MWF</td>
<td>145 - Altgeld Hall</td>
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Credit Hours: 3 hours
This course is restricted to Mathematics and Math&CS majors initially, but the restriction will be removed during business hours on April 21, 2016.

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<th>CRN</th>
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<td>145 - Altgeld Hall</td>
<td>Tramel, R</td>
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</table>

Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.
### MATH 423  **Differential Geometry**  credit: 3 OR 4 hours.

Applications of the calculus to the study of the shape and curvature of curves and surfaces; introduction to vector fields, differential forms on Euclidean spaces, and the method of moving frames for low-dimensional differential geometry. 3 or 4 undergraduate hours. 3 or 4 graduate hours. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 241 or equivalent.

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Credit Hours: 3 hours

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<td>MWF</td>
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<td>Tyson, J</td>
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</table>

Credit Hours: 4 hours

Instructor Approval Required
Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

### MATH 424  **Honors Real Analysis**  credit: 3 hours.

A rigorous treatment of basic real analysis via metric spaces recommended for those who intend to pursue programs heavily dependent upon graduate level Mathematics. Metric space topics include continuity, compactness, completeness, connectedness and uniform convergence. Analysis topics include the theory of differentiation, Riemann-Darboux integration, sequences and series of functions, and
interchange of limiting operations. As part of the honors sequence, this course will be rigorous and abstract. 3 undergraduate hours. No graduate credit. Credit is not given for both Math 424 and either Math 444 or Math 447. Approved for honors grading. Prerequisite: An honors section of MATH 347 or an honors section of MATH 416, and consent of the department.

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Departmental Approval Required
Restricted to Undergrad - Urbana-Champaign.
Students interested in joining this Math Honors Sequence course should contact mathadvising@illinois.edu with name, 9-digit UIN, and reason for wishing to join. Excellent prior math grades are expected.

**MATH 427  Honors Abstract Algebra**  credit: 3 hours.
Group theory, counting formulae, factorization, modules with applications to Abelian groups and linear operators. As part of the honors sequence, this course will be rigorous and abstract. 3 undergraduate hours. No graduate credit. Approved for honors grading. Credit is not given for both MATH 427 and MATH 417. Prerequisite: Consent of the department is required. Prerequisite courses are either an honors section of MATH 416, or MATH 415 together with an honors section of MATH 347.

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<td>49850</td>
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<td>10:00 AM - 10:50 AM</td>
<td>MWF</td>
<td>343 - Altgeld Hall</td>
<td>Lerman, E</td>
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</table>

Departmental Approval Required
Restricted to Undergrad - Urbana-Champaign.
Students interested in joining this Math Honors Sequence course should contact mathadvising@illinois.edu with name, 9-digit UIN, and reason for wishing to join. Excellent prior math grades are expected.

**MATH 441  Differential Equations**  credit: 3 OR 4 hours.
Basic course in ordinary differential equations; topics include existence and uniqueness of solutions and the general theory of linear differential equations; treatment is more rigorous than that given in MATH 285. 3 or 4 undergraduate hours. 3 or 4 graduate hours. Credit is not given for both MATH 441 and any of MATH 284, MATH 285, MATH 286. 4 hours of credit requires approval of the instructor and completion of additional work of substance. Prerequisite: MATH 241; MATH 347 or MATH 348 is recommended.

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<td>A13</td>
<td>08:00 AM - 08:50 AM</td>
<td>MWF</td>
<td>245 - Altgeld Hall</td>
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Credit Hours: 3 hours
This course is restricted to Engineering Mechanics, Mathematics, Math&CS, Physics, and Stat&CS majors initially, but the restriction will be removed during business hours on April 21, 2016.

| 32118| Lecture-Discussion | A14     | 08:00 AM - 08:50 AM | MWF  | 245 - Altgeld Hall | La Nave, G |

Credit Hours: 4 hours
Instructor Approval Required
Restricted to Engineering Mechanics or Physics or Mathematics or Statistics & Computer Science or Math & Computer Science major(s). Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

| 57793| Lecture-Discussion | E13     | 01:00 PM - 01:50 PM | MWF  | 245 - Altgeld Hall | Berndt, B  |
MATH 442  Intro Partial Diff Equations  credit: 3 OR 4 hours.
Introduces partial differential equations, emphasizing the wave, diffusion and potential (Laplace) equations. Focuses on understanding the physical meaning and mathematical properties of solutions of partial differential equations. Includes fundamental solutions and transform methods for problems on the line, as well as separation of variables using orthogonal series for problems in regions with boundary. Covers convergence of Fourier series in detail. 3 or 4 undergraduate hours, 3 or 4 graduate hours. 4 hours of credit requires approval of the instructor and completion of additional work of substance. Prerequisite: One of MATH 284, MATH 285, MATH 286, MATH 441.

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<tr>
<th>CRN</th>
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<td>B13</td>
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<td>MWF</td>
<td>147 - Altgeld Hall</td>
<td>Xu, S</td>
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MATH 444  Elementary Real Analysis  credit: 3 OR 4 hours.
Careful treatment of the theoretical aspects of the calculus of functions of a real variable intended for those who do not plan to take graduate courses in Mathematics. Topics include the real number system, limits, continuity, derivatives, and the Riemann integral. 3 or 4 undergraduate hours. 3 or 4 graduate hours. Credit is not given for both MATH 444 and either Math 424 or MATH 447. 4 hours of credit requires approval of the instructor and completion of additional work of substance. Prerequisite: One of MATH 284, MATH 285, MATH 286.
of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 241; MATH 347 or MATH 348, or equivalent.

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<td>Instructor Approval Required</td>
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This course is restricted to Mathematics, Math&CS, and Stat&CS majors initially, but the restriction will be removed during business hours on April 21, 2016. Current Statistics majors may consult with the Statistics advisor to determine whether they are eligible for an override before the restriction-remove date.

Restricted to Graduate - Urbana-Champaign.

Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.
MATH 446  Applied Complex Variables  credit: 3 OR 4 hours.
For students who desire a working knowledge of complex variables; covers the standard topics and gives an introduction to integration by residues, the argument principle, conformal maps, and potential fields. Students desiring a systematic development of the foundations of the subject should take MATH 448. 3 or 4 undergraduate hours. 3 or 4 graduate hours. Credit is not given for both MATH 446 and MATH 448. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 241.

<table>
<thead>
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<th>Type</th>
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<th>Time</th>
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<th>Location</th>
<th>Instructor</th>
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<td>59648</td>
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<td>C13</td>
<td>10:00 AM - 10:50 AM</td>
<td>MWF</td>
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Credit Hours: 3 hours

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Credit Hours: 4 hours
Instructor Approval Required
Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

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Restricted to MS: Civil Engr - Online - UIUC, MCS:Computer Sci Online -UIUC, MS:Mechanical Engineering -UIUC, MS: Aerospace Engr-Online-UIUC, NDEG:Grad Nondegree-CE-UIUC, MCS: Computer Sci Online-UIUC, or MENG:Mech Engineering Onl-UIUC. Restricted to online grad non-degree, online MSAE, online MCS, online MSME and online MSCEE students. Center for Innovation in Teaching & Learning (CITL) restrictions and assessments apply, see https://online.illinois.edu. For more details on this course section, please see http://engineering.illinois.edu/online/courses/.
OCE Tuition $1034.00 per Bill Hour, and OCE Fees $50.00 per Bill Hour.

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Credit Hours: 3 hours

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<th>Days</th>
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<td>Ahlgren, S</td>
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Credit Hours: 4 hours
Instructor Approval Required
Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

MATH 447  Real Variables  credit: 3 OR 4 hours.
Careful development of elementary real analysis for those who intend to take graduate courses in Mathematics. Topics include completeness property of the real number system; basic topological properties of n-dimensional space; convergence of numerical sequences and series of functions; properties of continuous functions; and basic theorems concerning differentiation and Riemann integration. 3 undergraduate hours. 3 or 4 graduate hours. Credit is not given for both MATH 447 and either Math 424 or MATH 444. 4 hours of credit requires approval of the instructor and completion of additional work of substance. Prerequisite: MATH 241 or equivalent; junior standing; MATH 347 or MATH 348, or equivalent experience; or consent of instructor.

<table>
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Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.
<table>
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<td>MWF</td>
<td>445 - Altgeld Hall</td>
<td>Lerman, E</td>
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</tbody>
</table>

**MATH 448 Complex Variables** credit: 3 OR 4 hours.
For students who desire a rigorous introduction to the theory of functions of a complex variable; topics include Cauchy's theorem, the residue theorem, the maximum modulus theorem, Laurent series, the fundamental theorem of algebra, and the argument principle. 3 or 4 undergraduate hours. 3 or 4 graduate hours. Credit is not given for both MATH 448 and MATH 446. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 447.

<table>
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<td>145 - Altgeld Hall</td>
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</table>

**MATH 450 Numerical Analysis** credit: 0 to 4 hours.
Same as CS 450, CSE 401 and ECE 491. See CS 450.

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<tr>
<td>36039</td>
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<td>BL1</td>
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<td>MW</td>
<td>1320 - Digital Computer Laboratory</td>
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</table>
MATH 453  **Elementary Theory of Numbers**  credit: 3 OR 4 hours.

Basic introduction to the theory of numbers. Core topics include divisibility, primes and factorization, congruences, arithmetic functions, quadratic residues and quadratic reciprocity, primitive roots and orders. Additional topics covered at the discretion of the instructor include sums of squares, Diophantine equations, continued fractions, Farey fractions, recurrences, and applications to primality testing and cryptography. 3 or 4 undergraduate hours. 3 or 4 graduate hours. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 241 or equivalent.

This course satisfies the General Education Criteria for a:
Quantitative Reasoning II

<table>
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<tr>
<th>CRN</th>
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<td>443 - Altgeld Hall</td>
<td>Samart, D</td>
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</tbody>
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Credit Hours: 3 hours
Quant Reasoning II course.

| 32144 | Lecture-Discussion | C14     | 10:00 AM - 10:50 AM | MWF  | 443 - Altgeld Hall | Samart, D    |

Credit Hours: 4 hours
Quant Reasoning II course.
Instructor Approval Required
Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

| 32147 | Lecture-Discussion | M13     | 09:30 AM - 10:50 AM | TR   | 447 - Altgeld Hall | Zaharescu, A |

Credit Hours: 3 hours
Quant Reasoning II course.

| 32150 | Lecture-Discussion | M14     | 09:30 AM - 10:50 AM | TR   | 447 - Altgeld Hall | Zaharescu, A |

Credit Hours: 4 hours
Quant Reasoning II course.
Instructor Approval Required
Restricted to Graduate - Urbana-Champaign.
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

MATH 461  **Probability Theory**  credit: 3 OR 4 hours.

Introduction to mathematical probability; includes the calculus of probability, combinatorial analysis, random variables, expectation, distribution functions, moment-generating functions, and central limit theorem. 3 or 4 undergraduate hours. 3 or 4 graduate hours. Credit is not given for both MATH 461 and either MATH 408 or ECE 313. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 241 or equivalent.
<table>
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<td>Restricted to online MSAE, online MCS, online MSME, and online MSCEE students. Center for Innovation in Teaching &amp; Learning (CITL) restrictions and assessments apply, see <a href="https://online.illinois.edu">https://online.illinois.edu</a>. For more details on this course section, please see <a href="http://engineering.illinois.edu/online/courses/">http://engineering.illinois.edu/online/courses/</a>. Online non-degree students are not eligible to register for this section.</td>
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MATH 463  Statistics and Probability I  credit: 4 hours.
Same as STAT 400. See STAT 400.
Students must register for one discussion and one lecture section.
<table>
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<th>Type</th>
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This discussion must be registered with a lecture starting with the same letter.
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<th>Type</th>
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<th>Location</th>
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<td>160 - English Building</td>
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Credit Hours: 4 hours
Restricted to Graduate - Urbana-Champaign.
<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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**MATH 469 Methods of Applied Statistics**  credit: 3 OR 4 hours.
Same as STAT 420. See STAT 420.

<table>
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<th>Time</th>
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</table>

page 54 - Mathematics, Fall 2016
MATH 471  Actuarial Theory I  credit: 4 hours.
Distribution of the time-to-death random variable for a single life, and its implications for evaluations of insurance and annuity functions, net premiums, and reserves. 4 undergraduate hours. 4 graduate hours. Prerequisite: MATH 408 and MATH 210.
Students must register for one discussion and one lecture section.

<table>
<thead>
<tr>
<th>CRN</th>
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Restricted to Applied Mathematics or Actuarial Science major(s).

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MATH 476  Actuarial Risk Theory  credit: 3 OR 4 hours.
Mathematical analysis of the risk to an insurer due to variations in expected claim numbers and amounts; optimal insurance systems; the probability of ruin in the long run; reinsurance; dividend formulas. 3 undergraduate hours. 3 or 4 graduate hours. 4 hours of credit requires approval of the instructor and completion of additional work of substance. Prerequisite: Credit or concurrent registration in STAT 409 or STAT 410.

<table>
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<tr>
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Credit Hours: 3 hours
Restricted to Actuarial Science major(s). Restricted to Undergrad - Urbana-Champaign.

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Credit Hours: 3 hours
Restricted to Actuarial Science major(s). Restricted to Undergrad - Urbana-Champaign.

MATH 482  Linear Programming  credit: 3 OR 4 hours.
Rigorous introduction to a wide range of topics in optimization, including a thorough treatment of basic ideas of linear programming, with additional topics drawn from numerical considerations, linear complementarity, integer programming and networks, polyhedral methods. 3 or 4 undergraduate hours. 3 or 4 graduate hours. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 410, MATH 415, or MATH 416.

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Credit Hours: 3 hours
This course is restricted to Mathematics majors initially, but the restriction will be removed during business hours on April 21, 2016.

<table>
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<th>CRN</th>
<th>Type</th>
<th>Section</th>
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Credit Hours: 4 hours
Instructor Approval Required
Restricted to Graduate - Urbana-Champaign.

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Credit Hours: 3 hours
This course is restricted to Mathematics majors initially, but the restriction will be removed during business hours on April 21, 2016.

<table>
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</table>

Credit Hours: 4 hours
Instructor Approval Required
Restricted to Graduate - Urbana-Champaign.

MATH 484  Nonlinear Programming  credit: 3 OR 4 hours.
Iterative and analytical solutions of constrained and unconstrained problems of optimization; gradient and conjugate gradient solution methods; Newton's method, Lagrange multipliers, duality and the Kuhn-Tucker theorem; and quadratic, convex, and geometric programming. 3 or 4 undergraduate hours. 3 or 4 graduate hours. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 241; MATH 347 or MATH 348; or equivalent; MATH 415 or equivalent; or consent of instructor.

<table>
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</table>
This course is restricted to Mathematics and Math&CS majors initially, but the restriction will be removed during business hours on April 21, 2016.

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Credit Hours: 4 hours  
Instructor Approval Required  
Restricted to Graduate - Urbana-Champaign.  
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

**MATH 488  Math Methods In Engineering**  credit: 3 OR 4 hours.

Matrices, determinants, bounds and approximations to eigenvalues, introduction to linear operator theory and inner product spaces, orthogonal expansions, and Fourier transforms. 3 or 4 undergraduate hours. 3 or 4 graduate hours. 4 hours of credit requires approval of the instructor and department with completion of additional work of substance. Prerequisite: MATH 241 or equivalent.

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Credit Hours: 4 hours  
Online  
OCE Tuition $1034.00 per Bill Hour, and OCE Fees $50.00 per Bill Hour.  
Restricted to online grad non-degree, online MSAE, online MCS, online MSME and online MSCEE students. Center for Innovation in Teaching & Learning (CITL) restrictions and assessments apply, see https://online.illinois.edu. For more details on this course section, please see http://engineering.illinois.edu/online/courses/.

**MATH 489  Dynamics & Differential Eqns**  credit: 3 OR 4 hours.

Studies mathematical theory of dynamical systems, emphasizing both discrete-time dynamics and nonlinear systems of differential equations. Topics include: chaos, fractals, attractors, bifurcations, with application to areas such as population biology, fluid dynamics and classical physics. Basic knowledge of matrix theory will be assumed. 3 or 4 undergraduate hours. 3 or 4 graduate hours. 4 hours of credit requires approval of the instructor and completion of additional work of substance. Prerequisite: One of MATH 284, MATH 285, MATH 286, MATH 441.

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Credit Hours: 3 hours  

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Credit Hours: 4 hours  
Instructor Approval Required  
Restricted to Graduate - Urbana-Champaign.  
Instructor approval forms available in 313 Altgeld Hall beginning on the first day of Fall semester.

**MATH 492  Undergraduate Research in Math**  credit: 1 TO 3 hours.

Work closely with department faculty on a well-defined research project. Topics and nature of assistance vary. Capstone paper or computational project required. 1 to 3 undergraduate hours. No graduate credit. Approved for Letter and S/U grading. May be repeated.
in separate terms up to 8 hours. Prerequisite: Evidence of adequate preparation for such study; consent of faculty member supervising the work; and approval of the department head.

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Credit Hours: 1 hours
Departmental Approval Required

**MATH 499  Introduction Graduate Research**  credit: 1 hours.

Seminar is required of all first-year graduate students in Mathematics. It provides a general introduction to the courses and research work in all of the areas of mathematics that are represented at the University of Illinois at Urbana-Champaign. 1 undergraduate hour. 1 graduate hour. Approved for S/U grading only. May be repeated to a maximum of 2 hours. Prerequisite: Graduate standing or consent of instructor.

This course must be taken by all first year graduate students in the department of mathematics.

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**MATH 500  Abstract Algebra I**  credit: 4 hours.


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</table>


Students from the following programs must contact the Director of Graduate Studies in Mathematics Laugesen@illinois.edu to request permission to register for the course: MS:Economics:Policy Econ -UIUC or MS: Financial Engineering. Undergraduates seeking approval to enroll should go to 313 Altgeld Hall for information. Undergraduates who receive approval may enroll starting August 22 if seats remain. Restricted to Graduate - Urbana-Champaign. Not intended for MS:Economics:Policy Econ -UIUC, MS:Economics:Policy Econ -UIUC, MS: Financial Engineering, MENG:Mechanical Engineerng-UIUC, MENG:Elec & Computer Eng-UIUC, or MENG:Engineering:Comp Eng-UIUC.

**MATH 502  Commutative Algebra**  credit: 4 hours.

Commutative rings and modules, prime ideals, localization, noetherian rings, primary decomposition, integral extensions and Noether normalization, the Nullstellensatz, dimension, flatness, Hensel's lemma, graded rings, Hilbert polynomial, valuations, regular rings, singularities, unique factorization, homological dimension, depth, completion. Possible further topics: smooth and etale extensions, ramification, Cohen-Macaulay modules, complete intersections. Prerequisite: MATH 501 or consent of instructor.

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</table>
MATH 506  **Group Representation Theory**  credit: 4 hours.

Representation of groups by linear transformations, group algebras, character theory, and modular representations. Prerequisite: MATH 501 or equivalent.

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<td>141 - Altgeld Hall</td>
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MATH 512  **Modern Algebraic Geometry**  credit: 4 hours.

An introduction to the tools and ideas of contemporary algebraic geometry, with particular focus on the language of schemes. 4 graduate hours. No professional credit. Prerequisite: MATH 500, and one of MATH 510, MATH 511, or consent of instructor.

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MATH 518  **Differentiable Manifolds I**  credit: 4 hours.

Definitions and properties of differentiable manifolds and maps, (co)tangent bundles, vector fields and flows, Frobenius theorem, differential forms, exterior derivatives, integration and Stokes' theorem, DeRham cohomology, inverse function theorem, Sard's theorem, transversality and intersection theory. Prerequisite: MATH 423 or MATH 481, or consent of instructor.

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<td>MWF</td>
<td>345 - Altgeld Hall</td>
<td>Albin, P</td>
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</table>
MATH 522  Lie Groups and Lie Algebras I  credit: 4 hours.
A general introduction to Lie groups and algebras and their representation theory. Theory of finite group representations, Lie groups as matrix groups, and as differentiable manifolds, Lie algebras as tangent spaces and as abstract objects, and their representations. Examples of the classical groups. May be repeated up to 8 hours. Prerequisite: Undergraduate linear algebra, abstract algebra, point set topology, differentiation on manifolds.

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<thead>
<tr>
<th>CRN</th>
<th>Type</th>
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<th>Days</th>
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</tbody>
</table>


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MATH 526  Algebraic Topology II  credit: 4 hours.
CW-complexes, relative homeomorphism theorem, cellular homology, cohomology, Kunneth theorem, Eilenberg-Zilber theorem, cup products, Poincare duality, examples. Prerequisite: MATH 525, MATH 500; or consent of instructor. MATH 501 is recommended but not required.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tr>
<td>59521</td>
<td>Lecture-Discussion</td>
<td>M1</td>
<td>02:00 PM - 02:50 PM</td>
<td>MWF</td>
<td>147 - Altgeld Hall</td>
<td>Rezk, C</td>
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</table>


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MATH 531  Analytic Theory of Numbers I  credit: 4 hours.
Problems in number theory treated by methods of analysis; arithmetic functions, Dirichlet series, Riemann zeta function, L-functions, Dirichlet's theorem on primes in progressions, the prime number theorem. Prerequisite: MATH 448 and either MATH 417 or MATH 453.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tr>
<td>30823</td>
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<td>E1</td>
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<td>MWF</td>
<td>241 - Altgeld Hall</td>
<td>Ford, K</td>
</tr>
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</table>


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MATH 535  **General Topology**  credit: 4 hours.
Study of topological spaces and maps, including Cartesian products, identifications, connectedness, compactness, uniform spaces, and function spaces. Prerequisite: Consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
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MATH 540  **Real Analysis**  credit: 4 hours.
Lebesgue measure on the real line; integration and differentiation of real valued functions of a real variable; and additional topics at discretion of instructor. Prerequisite: MATH 447 or equivalent.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
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<td>153 - Mechanical Engineering Bldg</td>
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</tr>
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</table>

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MATH 542  **Complex Variables I**  credit: 4 hours.
Topics include the Cauchy theory, harmonic functions, entire and meromorphic functions, and the Riemann mapping theorem. Prerequisite: MATH 446 and MATH 447, or MATH 448.

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<thead>
<tr>
<th>CRN</th>
<th>Type</th>
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<th>Instructor</th>
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</table>

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MATH 543  **Complex Variables II**  credit: 4 hours.
Continuation of MATH 542. Topics include Riemann Surfaces, Hyperbolic Metric, Potential Theory and Quasiconformal Mappings. Prerequisite: MATH 542.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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</table>


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MATH 546  **Hilbert Spaces**  credit: 4 hours.
Geometrical properties of Hilbert spaces, spectral theorems for compact, bounded and unbounded operators, basic theory of operator algebras, and additional material depending on the instructor. Prerequisite: MATH 541.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Section</th>
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MATH 550  **Dynamical Systems I**  credit: 4 hours.
An introduction to the study of dynamical systems. Considers continuous and discrete dynamical systems at a sophisticated level: differential equations, flows and maps on Euclidean space and other manifolds. Emphasis will be placed on the fundamental theoretical concepts and the interaction between the geometry and topology of manifolds and global flows. Discrete dynamics includes Bernoulli shifts, elementary Anosov diffeomorphisms and surfaces of sections of flows. Bifurcation phenomena in both continuous and discrete dynamics will be studied. Prerequisite: MATH 489 or consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
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</table>


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MATH 553  Partial Differential Equations  credit: 4 hours.
Basic introduction to the study of partial differential equations; topics include: the Cauchy problem, power-series methods, characteristics, classification, canonical forms, well-posed problems, Riemann's method for hyperbolic equations, the Goursat problem, the wave equation, Sturm-Liouville problems and separation of variables, Fourier series, the heat equation, integral transforms, Laplace's equation, harmonic functions, potential theory, the Dirichlet and Neumann problems, and Green's functions. Prerequisite: Consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
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<th>Instructor</th>
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<tr>
<td>30827</td>
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</table>

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MATH 554  Linear Anal & Part Diff Eq  credit: 4 hours.
Course will provide students with the basic background in linear analysis associated with partial differential equations. The specific topics chosen will be largely up to the instructor, but will cover such areas as linear partial differential operators, distribution theory and test functions, Fourier transforms, Sobolev spaces, pseudodifferential operators, microlocal analysis, and applications of the above topics. Prerequisite: MATH 447, MATH 489 or consent of instructor.

<table>
<thead>
<tr>
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<th>Time</th>
<th>Days</th>
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<th>Instructor</th>
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<tbody>
<tr>
<td>30828</td>
<td>Lecture-Discussion</td>
<td>S1</td>
<td>12:00 PM - 12:50 PM</td>
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<td>143 - Henry Administration Bldg</td>
<td>Tzirakis, N</td>
</tr>
</tbody>
</table>

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MATH 558  Methods of Applied Mathematics  credit: 4 hours.
Introduction to modern methods of applied mathematics, including nondimensionalization and scaling analysis, regular and singular asymptotics, analysis of multiscale systems, and analysis of complex systems. Each technique is illustrated with applications from science and engineering. The mathematical frameworks will include ordinary, partial and stochastic differential equations, point processes, and Markov chains. Prerequisite: Undergraduate background in ODEs, PDEs, and probability theory (MATH 441, MATH 442, and MATH 461, or equivalents), or consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Section</th>
<th>Time</th>
<th>Days</th>
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<th>Instructor</th>
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<tr>
<td>62734</td>
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<td>B1</td>
<td>11:00 AM - 11:50 AM</td>
<td>MWF</td>
<td>2 - Illini Hall</td>
<td>Bronski, J</td>
</tr>
</tbody>
</table>
### MATH 562  Theory of Probability II  credit: 4 hours.
Continuation of MATH 561. Same as STAT 552. Prerequisite: MATH 561.

<table>
<thead>
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<th>CRN</th>
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<th>Time</th>
<th>Days</th>
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<tr>
<td>33567</td>
<td>Lecture-Discussion</td>
<td>F1</td>
<td>11:00 AM - 12:20 PM</td>
<td>TR</td>
<td>143 - Henry Administration Bldg</td>
<td>Dey, P</td>
</tr>
</tbody>
</table>

### MATH 564  Applied Stochastic Processes  credit: 4 hours.
Introduction to topics such as spectral analysis, filtering theory, and prediction theory of stationary processes; Markov chains and Markov processes. Same as STAT 555. Prerequisite: MATH 446 and MATH 447.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Time</th>
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<tr>
<td>33547</td>
<td>Lecture-Discussion</td>
<td>E1</td>
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<td>347 - Altgeld Hall</td>
<td>Kirkpatrick, K</td>
</tr>
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</table>

### MATH 567  Topics in Actuarial Theory I  credit: 4 hours.
Selected topics in advanced actuarial science. May be repeated to a maximum of 16 hours. Prerequisite: Consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Instructor</th>
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<tr>
<td>49163</td>
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<td>TR</td>
<td>161 - Noyes Laboratory</td>
<td>Wang, J</td>
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</table>
MATH 570  **Mathematical Logic**  credit: 4 hours.
Development of first order predicate logic; completeness theorem; formalized number theory and the Godel incompleteness theorem. Prerequisite: MATH 417 or consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Days</th>
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<td>30831</td>
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<td>10:00 AM - 10:50 AM</td>
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<td>141 - Altgeld Hall</td>
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</table>

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MATH 571  **Model Theory**  credit: 4 hours.
Techniques for constructing models, including compactness and Lowenheim-Skolem theorems, unions of elementary chains, and omitting types construction; categorical theories; ultraproducts; saturated models; quantifier elimination; applications to algebraically closed fields, real closed fields, and other fundamental structures of mathematics. Prerequisite: MATH 570 or consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Time</th>
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<td>MWF</td>
<td>1066 - Lincoln Hall</td>
<td>Tserunyan, A</td>
</tr>
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</table>


MATH 580  **Combinatorial Mathematics**  credit: 4 hours.
Fundamental results on core topics of combinatorial mathematics: classical enumeration, basic graph theory, extremal problems on finite sets, probabilistic methods, design theory, discrete optimization. Same as CS 571. Prerequisite: Consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
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<th>Instructor</th>
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<tr>
<td>33562</td>
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MATH 582  **Structure of Graphs**  credit: 4 hours.
Structure of graphs and properties of special classes of graphs. Degree sequences and reconstruction, structure of k-connected graphs, Hamiltonian cycles and circumference, planar graphs and their properties, graph minors, cycle coverings, matroidal and algebraic aspects of graphs. Prerequisite: MATH 580 or consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
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MATH 593  Mathematical Internship  credit: 0 hours.
Full-time or part-time practice of graduate-level mathematics in an off-campus government, industrial, or research laboratory environment. Summary report required. 0 graduate credit. No professional credit. Approved for S/U grading only. May be repeated in separate terms.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Time</th>
<th>Days</th>
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<th>Instructor</th>
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<td>-</td>
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Instructor Approval Required

<table>
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<tr>
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<td>-</td>
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<td>Laugesen, R</td>
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Instructor Approval Required

MATH 595  Advanced Topics in Math  credit: 1 TO 4 hours.
May be repeated in the same or separate semesters. Prerequisite: Consent of instructor.

<table>
<thead>
<tr>
<th>CRN</th>
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<th>Time</th>
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Credit Hours: 4 hours
Correlations & Local Spacing
Restricted to Graduate · Urbana-Champaign.
<table>
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<tbody>
<tr>
<td>64474</td>
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<td>11:00 AM - 12:20 PM</td>
<td>Nevins, T</td>
<td>441 - Altgeld Hall</td>
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<tr>
<td>64464</td>
<td>Lecture-Disc</td>
<td>01:00 PM - 01:50 PM</td>
<td>Solecki, S</td>
<td>447 - Altgeld Hall</td>
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<td>66669</td>
<td>Lecture-Disc</td>
<td>12:00 PM - 12:50 PM</td>
<td>Rezk, C</td>
<td>345 - Altgeld Hall</td>
</tr>
<tr>
<td>64475</td>
<td>Lecture-Disc</td>
<td>10:00 AM - 10:50 AM</td>
<td>Allen, P</td>
<td>445 - Altgeld Hall</td>
</tr>
<tr>
<td>58570</td>
<td>Lecture-Disc</td>
<td>09:30 AM - 10:50 AM</td>
<td>Dey, P</td>
<td>347 - Altgeld Hall</td>
</tr>
</tbody>
</table>

**Credit Hours:** 4 hours

**Geometry & Geometric Theory**


Restricted to Graduate - Urbana-Champaign.

### MATH 597  Reading Course  
credit: 1 TO 8 hours.  
Approved for both letter and S/U grading. May be repeated in the same or separate terms to a maximum of 8 hours. Prerequisite: Consent of instructor.  

<table>
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<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>10556</td>
<td>Independent Study</td>
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</table>

Instructor Approval Required  
Instructor Approval Required. Undergraduate students may register with approval. For more information go to room 313 AH.  

### MATH 598  Literature Seminar in Math  
credit: 0 TO 4 hours.  
Seminar on topics of current interest in mathematics. Students present seminars and discussions on various topics. See Class Schedule for current topics. Recommended for all Mathematics students. Approved for both letter and S/U grading. May be repeated as topics vary. Prerequisite: Consent of instructor.  

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
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<tr>
<td>67519</td>
<td>Lecture-Discussion</td>
<td>IA</td>
<td>12:30 PM - 01:50 PM</td>
<td>TR</td>
<td>131 - English Building</td>
<td>Haboush, W</td>
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<tr>
<td>60303</td>
<td>Lecture-Discussion</td>
<td>OA</td>
<td>05:00 PM - 06:20 PM</td>
<td>M</td>
<td>241 - Altgeld Hall</td>
<td>Junge, M</td>
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<tr>
<td>47921</td>
<td>Lecture-Discussion</td>
<td>REN</td>
<td>02:00 PM - 03:20 PM</td>
<td>TR</td>
<td>7 - Illini Hall</td>
<td>Berndt, B</td>
</tr>
</tbody>
</table>

Credit Hours: 4 hours  
Restricted to Graduate - Urbana-Champaign.  
See [http://www.math.uiuc.edu/timetable/](http://www.math.uiuc.edu/timetable/) for the full course description. Students from the following programs must contact the Director of Graduate Studies in Mathematics <Laugesen@illinois.edu> to request permission to register for the course: Restricted to Graduate - Urbana-Champaign. Not intended for MS:Economics:Policy Econ -UIUC, MS:Economics:Policy Econ -UIUC, MS: Financial Engineering, MENG:Mechanical Engineering-UIUC, MENG:Elec & Computer Eng-UIUC, or MENG:Engineering:Comp Eng-UIUC.

Credit Hours: 1 hours  
Operator Algebras  
Restricted to Graduate - Urbana-Champaign.  
Topic: Operator Algebras. See [http://www.math.uiuc.edu/timetable/](http://www.math.uiuc.edu/timetable/) for the full course description. Students from the following programs must contact the Director of Graduate Studies in Mathematics <Laugesen@illinois.edu> to request permission to register for the course: Restricted to Graduate - Urbana-Champaign. Not intended for MS:Economics:Policy Econ -UIUC, MS:Economics:Policy Econ -UIUC, MS: Financial Engineering, MENG:Mechanical Engineering-UIUC, MENG:Elec & Computer Eng-UIUC, or MENG:Engineering:Comp Eng-UIUC.

Credit Hours: 2 hours  
Research Exp in Number Theory  
Restricted to Graduate - Urbana-Champaign.
Topic: Research Experience in Number Theory. See http://www.math.uiuc.edu/timetable/ for the full course description. Undergraduate students may register with approval. For more information go to room 313 AH. Students from the following programs must contact the Director of Graduate Studies in Mathematics <Laugesen@illinois.edu> to request permission to register for the course: Restricted to Graduate - Urbana-Champaign. Not intended for MS:Economics:Policy Econ -UIUC, MS:Economics:Policy Econ -UIUC, MS: Financial Engineering, MENG:Mechanical Engineerng-UIUC, MENG:Elec & Computer Eng-UIUC, or MENG:Engineering:Comp Eng-UIUC.

MATH 599  **Thesis Research**  credit: 0 TO 16 hours.
Approved for S/U grading only. May be repeated. Prerequisite: Consent of instructor.

<table>
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</tr>
</tbody>
</table>

Departmental Approval Required