approved by Undergraduate Council

Sharon Gill

Digitally signed by Sharon Gill
DN: cn=Sharon Gill, o=Undergraduate Education, ou=Undergraduate Council, email=sgill@uky.edu, c=US
Date: 2011.01.13 13:56:14 -05'00'

General Education Course Approval Form **Date of Submission:** April 22, 2010

1. Check which area(s) this course applies to.

Inquiry – Arts & Creativity	☐	Composition & Communications - II	☐
Inquiry – Humanities	☐	Quant Reasoning – Math	X
Inquiry – Nat/Math/Phys Sci	☐	Quant Reasoning – Stat	☐
Inquiry – Social Sciences	☐	Citizenship – USA	☐
Composition & Communications - I	☐	Citizenship - Global	☐

2. Provide Course and Department Information.

Department: Mathematics

Course Prefix and Number: MA 111 Credit hours: 3

Course Title: Introduction to Contemporary Mathematics

Expected Number of Students per Section: 30 Course Required for Majors in your Program? No

Prerequisite(s) for Course? Two years of high school algebra and a Math ACTE score of 19 or above, or MA 108R, or math placement test.

Departmental Contact Information Date: ☒ existing course

Name: Zhongwei Shen Email: zshen@email.uky.edu

Office Address: POT 721 Phone: 257-3470

3. In addition to this form, the following must be submitted for consideration:

- A major course change form for revision of existing courses or a new course form for new courses.
- A syllabus that conforms to the Senate Syllabi Guidelines, including listing of the Course Template Student Learning Outcomes.
- A narrative that explains: 1) how the course will address the General Education and Course Template Learning outcomes; 2) active learning activities for students; and 3) the course assignment(s) that can be used for Gen Ed course assessment.

4. Signatures

Department Chair: _____ Date: May 3, 2010

Dean: Anna R. K. Bosch _____ Date: 4/5/10

Submit all proposals electronically to:
Sharon Gill
Office of Undergraduate Education
Sharon.Gill@uky.edu

Revised March 2010

Hanson, Roxie

From: R. Brown [rmb.uky.math@gmail.com]
Sent: Friday, May 14, 2010 5:19 PM
To: Hanson, Roxie
Cc: Shen, Zhongwei (shenz@ms.uky.edu)
Subject: Re: MA 111/113 need narrative for gen ed

Oops, sorry. I misread your message. I thought you were asking about
123 and 113.

MA 111 is already approved.
MA 113 was presented to the committee before the new procedures was invented.

All four of our gened packets are at the website, http://www.math.uky.edu/~rbrown/dus/

Russell Brown

2010/5/14 R. Brown <rmb.uky.math@gmail.com>:
> I think these were sent directly to the committee before the new
> procedure for GenEd course approval was invented.
>
> But if you would like another copy, visit
> http://www.math.uky.edu/~rbrown/dus/
> and scroll down.
>
> Russell Brown
>
>
> 2010/5/14 Hanson, Roxie <rhanson@email.uky.edu>:
>> Professor Shen, I have hard copies of the syllabus and the Gen Ed
>> course approval forms. I am missing the following:
>>
>>
>>
>> · A narrative (2-3 pages max) that explains: 1) how the
>> course will address the General Education and Course Template
>> Learning outcomes; and 2) a description of the type(s) of course
>> assignment(s) that could be used for Gen Ed assessment.
>>
>>
>>
>> Best, Roxie
>
>
>
> --
> Russell Brown :-: russell.brown@uky.edu
> ==========
> If I were founding a university I would begin with a smoking room;
> next a dormitory; and then a decent reading room and a library. After
> that, if I still had more money that I couldn't use, I would hire a
> professor and get some text books.
> --Stephen Leacock
>

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Russell Brown :-: russell.brown@uky.edu
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Department of Mathematics
College of Arts and Sciences
University of Kentucky

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Mathematics news
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- 100 level courses
- Graduate
- Undergraduate
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Documents related to the Undergraduate program.

GenEdification of MA 137, 12 April 2010

- Packet regarding MA 137 to be submitted to the quantitative foundations vetting committee

Course in game theory, 5 April 2010

- Syllabus
- Rationale for offering course
- New course form

The GenEdification of MA 123, 22 March 2010

- Proposal to include MA 123 as a course to satisfy the quantitative foundations requirement of the new GenEd program

The GenEdification of MA 113, 6 February 2010

- Packet for submission to the quantitative foundations vetting committee

MA 109 prerequisite change, 1 February 2010

- MA 109 prerequisite change

The GenEdification of MA 111, 25 January 2010

- Proposal to add MA 111 to the University's general education program

Course prerequisites, 15 January 2010

- Minor changes to course prerequisites

Mathematical sciences major, to be considered on 29 October 2009

- Mathematical sciences option, BS
- Mathematical sciences option, BA
- Cover memo

Problem solving for middle-school teachers, to be considered on 29 October 2009.

- Form
- Syllabus

University Senate Syllabi Guidelines

MA III
Gen Ed

General Course Information

- ☑ Full and accurate title of the course.
- ☑ Departmental and college prefix.
- ☑ Course prefix, number and section number.
- ☑ Scheduled meeting day(s), time and place.

Instructor Contact Information (if specific details are unknown, "TBA" is acceptable for one or more fields)

- ☑ Instructor name.
- N/A ☐ Contact information for teaching/graduate assistant, etc.
- ☑ Preferred method for reaching instructor.
- ☑ Office phone number.
- ☑ Office address.
- ☑ UK email address.
- ☑ Times of regularly scheduled office hours and if prior appointment is required.

Course Description

- ☑ Reasonably detailed overview of the course.
- ☑ Student learning outcomes.
- ☑ Course goals/objectives.
- ☑ Required materials (textbook, lab materials, etc.).
- ☑ Outline of the content, which must conform to the Bulletin description.
- ☑ Summary description of the components that contribute to the determination of course grade.
- ☐ Tentative course schedule that clarifies topics, specifies assignment due dates, examination date(s).
- ☑ Final examination information: date, time, duration and location.
- ☑ For 100-, 200-, 300-, 400-, 400G- and 500-level courses, numerical grading scale and relationship to letter grades for *undergraduate* students.
- N/A ☐ For 400G-, 500-, 600- and 700-level courses, numerical grading scale and relationship to letter grades for *graduate* students. (Graduate students cannot receive a "D" grade.)
- ☑ Relative value given to each activity in the calculation of course grades (Midterm=30%; Term Project=20%, etc.).
- ☑ Note that undergraduate students will be provided with a Midterm Evaluation (by the midterm date) of course performance based on criteria in syllabus.
- ☑ Policy on academic accommodations due to disability. Standard language is below:

  If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, email address jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities.

Course Policies

- ☑ Attendance.
- ☑ Excused absences.
- ☑ Make-up opportunities.
- ☑ Verification of absences.
- ☑ Submission of assignments.
- ☑ Academic integrity, cheating & plagiarism.
- ☑ Classroom behavior, decorum and civility.
- N/A ☐ Professional preparations.
- N/A ☐ Group work & student collaboration.

Syllabus for MA 111
Introduction to Contemporary Mathematics
Spring 2010

Course: MA 111-XXX, TR 9:30–10:45, CB XXX

Instructor: Carl Lee

Office: 967 Patterson Office Tower

Mailbox: 715 Patterson Office Tower

Phone: 257-1405 (or 257-3336 to leave a message)

Email: lee@ms.uky.edu (preferred method for reaching me)

Office Hours: TR 11:00–12:15, and by appointment, since I realize that this time may not be convenient for everyone.

Potential Texts: Peter Tannenbaum, *Excursions in Modern Mathematics*, seventh edition, Prentice Hall, 2010, ISBN 10: 0-321-56508-8, ISBN 13: 978-0-321-56508-2; or Bernard L. Madison, Stuart Boersma, Caren L. Diefenderfer, and Shannon W. Dingman, *Case Studies for Quantitative Reasoning — A Casebook of Media Articles*, second edition, Pearson Custom Publishing, 2009, ISBN 10: 0-558-19880-5, ISBN 13: 978-0-558-19880-0.

Calculators: You will need a scientific calculator for this course.

Course Web Page: www.ms.uky.edu/~lee/ma111sp10/ma111sp10.html

Course Description: An introduction to concepts and applications of mathematics, with examples drawn from such areas as voting methods, apportionment, consumer finance, graph theory, tilings, polyhedra, number theory, game theory, and descriptive statistics. This course is not available for credit to persons who have received credit in any mathematics course of a higher number, with the exceptions of MA 112, 123, 162, 201 and 202. This course does not serve as a prerequisite for any calculus course. Credit not available on the basis of special examination. Prerequisites: Two years of high school algebra and a Math ACTE score of 19 or above, or MA 108R, or math placement test.

Course Goals and Objectives: This course introduces and develops concepts and skills associated with quantitative reasoning and literacy that are encountered in everyday life. The course focuses on the process of examining problems drawn from real-life contexts, and modeling and solving them using mathematical tools such as algebra and geometry. As part of this process, students will be required to locate, identify, and utilize information resources from a variety of credible sources.

Student Learning Outcomes: It is expected that by the end of the semester, the students will

- demonstrate proficiency with number sense and with functional relationships between two or more sets of variable values and also relate different representations of such relations.
- apply fundamental elements of mathematical, logical, or statistical knowledge to model and solve problems drawn from real life.

This course will consist of four to six modules. The modules will provide a variety of settings in which students will be asked to model and solve problems using mathematical functions, representations, algebra, geometry, and reasoning.

The following examples of modules are representative, but not exhaustive:

- Voting. What are some different voting methods for selecting one candidate from many? Where are these voting methods used in real life? How can these methods be described and modeled by suitable algorithms? What are some fairness criteria associated with voting methods? Which voting methods satisfy or do not satisfy these criteria?
- Weighted Voting. What is a weighted voting system? Where are these systems used in real life? What are some of the index models for assigning a power value to each of the voters in a weighted voting system? What do these indices reveal about the distribution of power in some real life voting systems?
- Apportionment. What are some different methods for apportioning members of a body like the U.S. House of Representatives among the constituent states? How can these

methods be described and modeled by suitable algorithms? What are some fairness criteria associated with apportionment methods? Which apportionment methods satisfy or do not satisfy these criteria?

- Euler Circuits. What are some real world routing problems that can be modeled and solved by Eulerian graphs? What are necessary and sufficient conditions for a graph to be Eulerian? What is an efficient algorithm to find an Euler circuit in a graph?

- The Traveling Salesman Problem. What are some real world routing problems can can be modeled as traveling salesman problems in graphs? What are some advantages and disadvantages of a brute force solution to a traveling salesman problems? What are some approximation algorithms to solve traveling salesman problems, and what are some advantages and disadvantages of these algorithms?

- Spiral Growth. What are some examples of spiral growth in nature? What are some examples of the Fibonacci sequence in nature? What are some examples of the golden ratio in nature and in man-made image and structures? What are the relationships among spiral growth, Fibonacci numbers, and the golden ratio, and how can recursive and explicit functions be used to model them?

- Symmetry. What are the various kinds of symmetry natural and man-made objects and images may possess? How can the specific types of symmetries be described and modeled by reflections, rotations, translations, and glide reflections? How can these models be used to classify the symmetry types of finite patterns, repeating border patterns, and repeating wallpaper patterns?

- Money. How are various interest rates computed: simple, compound, and continuously compounded? How can they be compared? How can these methods be used to model the relationship between the present and the future values of quantities of money? Which of the functions used in these models are linear, and which are exponential? How can these models help evaluate the differences between credit card offers? How can these models be extended to solve the problems of determining the final payoff for deferred annuities, and the payment schedule for installment loans and mortgages? What are the implications for credit cards accounts?

- Using Numbers and Quantities. What are some ways in which we can make sense of very large or very small numbers? What is the importance of units? What are examples in the media in which very large or very small numbers are presented and discussed?

- Percent and Percent Change. What are the differences among the change of a quantity, the percent change of a quantity, the change in the percent of a quantity, and the percent change in the percent of a quantity? What are some ways in which these concepts are used or misused in the media?
- Measurement and Indices. What is the difference between a measurement and an index? How do we compare measurements made in different units? How do mean, median, and mode play a role in summaries of data? How are some well-known indices and averages computed (e.g., Consumer Price Index, Cost of Living Index, S&P 500 Composite Average, Dow Jones Industrial Average)?
- Descriptive Statistics. What are various ways in which data can be represented graphically? What are some important measures of location and spread, ways to depict them graphically? What are some ways in which graphical representations of data can be misleading?
- Counting, Probability, Odds, and Risk. How can we use mathematical models and representations to indirectly count the sizes of certain collections or arrangements of objects? What are some models of probability and how can the probabilities of certain events be computed? What is the difference between probability and odds? What is risk in this context, and how does it influence decision-making?

Attendance: Attendance is required. This class is designed for active involvement of the students. You will be actively supporting each other as you gain experience and understanding. Multiple ideas and points of view are important. You will benefit from hearing others' approaches to analysis and problem solving, and they will benefit from you. So attendance and active participation are expected and contribute toward your grade. If you miss a class for any reason, please explain your absence in writing as soon as possible (at least two weeks in advance for scheduled excused absences). Your absence will be excused if it is due to serious reason (such as illness, death in the family, or travel organized by UK — see the official list of excused absences in the "Student Right and Responsibilities," Section 5.2.4.2, www.uky.edu/StudentAffairs/Code/part2.html). Students absent due to an excused absence bear the responsibility of informing the instructor about their excused absence within one week following the period of the excused absence (except where prior notification is required) and of making up the missed work. The instructor shall give the student an opportunity to make up the work and/or the exams missed due to an excused absence.

Homework: There will be weekly homework assignments. The homework problems will have varying length and complexity. It is expected that you regularly read in detail the

relevant sections in the textbook and complete all assigned work. It is fine to discuss the homework together, but you must write up your own solutions in your own words.

Quizzes: There will be approximately one quiz per week. The quiz questions will be based on the material discussed in class and the homework.

Exams: There will be three in-class exams.

- Exam 1: February 4
- Exam 2: March 2
- Exam 3: April 1

Final Exam: Thursday, May 6, 8:00–10:00 am, in our regular room, CB XXX.

Grading Policy: Your course score will be based on on the following percentages:

5%	Attendance
25%	Homework
20%	Quizzes
30%	Unit Exams
20%	Final Exam

Your letter grade will be determined according to the standard 10% scale:

90–100%	A
80–89%	B
70–79%	C
60–69%	D
0–59%	E

You will receive information on your current grade after each of the exams. In particular, you will receive your midterm evaluation by the midterm of the semester, Monday, March 8.

Accommodations Due to Disability: If you have a documented disability that requires academic accommodations, please see the instructor as soon as possible during scheduled

office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, email address jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities.

Classroom Behavior: I expect that everyone will maintain a classroom conducive to learning. I like an informal atmosphere, but it must be orderly. Thus, everyone is expected to behave with basic politeness, civility, and respect for others. In particular, talking in class is OK if it's part of a class discussion or directed to me. Private communications are not, especially during quizzes and tests. Neither are reading extraneous materials, using electronic equipment unrelated to the course, or sleeping.

Cheating and Plagiarism: Students are encouraged to discuss the course material together. Part of the work in class will be group work that will provide ample opportunity to exchange ideas and learn from each other. As mentioned above, discussing the homework assignments is permissible, but you must write up your solutions in your own words, and not simply copy someone else's work. Any kind of communication with other students during a quiz or an exam will be considered cheating and prosecuted according to university regulations. Cheating and plagiarism can lead to significant penalties. See Sections 6.3 and 6.4 of *Student Rights and Responsibilities*, www.uky.edu/StudentAffairs/Code/part2.html.

Suggestions and Conflicts: Suggestions for improvement are welcome at any time. Any concern about the course should be brought first to my attention. Further recourse is available through Dr. Jakayla Robbins, (Director of Service Courses, POT 767, 257-4802) and the offices of the Department Ombud and the Department Chair, both accessible from the Main Office in 715 Patterson Office Tower.

Important Dates:

January 12 — Tuesday — Last day a student may officially drop a course or cancel registration with the University Registrar for a full refund of fees. January 14 — Thursday — First day of class.
January 18 — Monday — Martin Luther King Birthday — Academic Holiday.
January 20 — Wednesday — Last day to add a class for the 2010 Spring Semester.
January 20 — Wednesday — Last day to officially withdraw from the University or reduce course load and receive an 80 percent refund.
February 3 — Wednesday — Last day to drop a course without it appearing on the student's transcript.

February 19 — Friday — Last day for students enrolled in an annualized program to officially withdraw from the University or reduce course load and receive a 50 percent refund.
March 8 — Monday — Midterm of 2010 Spring Semester.
March 15–20 — Monday through Saturday — Spring Vacation — Academic Holidays.
March 26 — Friday — Last day to withdraw from the University or reduce course load. Students can withdraw or reduce course load after this date only for urgent non-academic reasons.
May 6 — Thursday — Final Exam, 8:00–10:00 am.

Extended Homework Problems

Some potential extended homework assignments that require some external research using credible sources. The number, choice, and length of these will depend upon the course format and teaching resources.

Voting. What is the current voting procedure by which the President and the Vice President of the U.S. are selected? How does it compare with the systems we have studied in class?

Apportionment. From Tannenbaum, pp. 150–151: For the first apportionment of 1792, two competing apportionment bills were considered: a bill to apportion 120 seats using Hamilton's method (sponsored by Hamilton), and a bill to apportion 105 seats using Jefferson's method (sponsored by Jefferson). Originally, Congress passed Hamilton's bill, but Washington was persuaded by Jefferson to veto it. Eventually, Congress approved Jefferson's bill, which became the basis for the first mathematical apportionment of the House of Representatives.

1. Summarize the arguments presented by Hamilton and Jefferson on behalf of their respective proposals.
2. Calculate the apportionments for the House of Representatives under both proposals.

The Traveling Salesman Problem. You are planning a driving trip around Lexington to visit some sites, starting and ending at the Old Court House on Main Street. You plan to drive by the Ashland (Henry Clay Estate), the Mary Todd Lincoln House, the Hunt-Morgan House, Waveland, the Lexington Cemetery, the White Hall historic site, Keeneland Race Track, the Isaac Murphy Memorial Art Garden, and the Kentucky Horse Park. Determine an efficient route to do this.

Symmetry. Adapted from Tannenbaum: Border patterns can be found in many objects from the real world—ribbons, wallpaper borders, and architectural friezes. Even ceramic pots and woven baskets exhibit border patterns (when the pattern goes around in a circle it can be unraveled as if it were going on a straight line). Find, photograph, and label examples of each of the seven possible border-pattern symmetry types.

Money. Look up the terms of your own credit card, if you have one, or find a credit card offer. Describe these terms, and calculate how much you would end up paying in total

if you charged $1000 and paid it off monthly by making the minimum payment required each time.

Using Numbers and Quantities. Adapted from Madison, et. al: Read the article "Three Bad Numbers" by Daniel Okrent. Give the three key problems the author lists for the Dow Jones Industrial Average (DJIA). Find out and describe how the DJIA is computed and illustrate with a simple example. Find out and describe how the Standard & Poors 500 stock index is computed.

Percent and Percent Change. Provide two concrete examples from the media that demonstrate the misuse or miscalculation of percent change. In each case, determine what corrections need to be made.

Measurement and Indices. Research how the U.S. government computes the unemployment rate. Is this an index or not?

Descriptive Statistics. Discuss five different ways in which the graphical representation of data can be manipulated to lead one to misleading or erroneous conclusions. Provide concrete examples from the media to illustrate each of these examples.

Counting, Probability, Odds, and Risk. Research the games available in the Kentucky State Lottery. The Lottery provides odds or probabilities for winning these various games—how are these figures computed? Are they reported correctly?