Math 100.2 – Applications in Mathematics
Fall 2014

Instructor – Dr. Michael Fraboni
Office: PPHAC 221
Phone: 610-861-1605
Email: frabonim@moravian.edu
Office hours: Tuesday and Thursday 9:30-11

Course Materials – The text for this course is the custom printed book from McGraw-Hill containing chapter 10 from *Discrete Mathematics and Its Applications*, Seventh Edition by Rosen and chapter 13 from *Mathematics in Our World*, Second Edition by Sobecki, Bluman, Schirck-Matthews.

Course Goals – After successfully completing this course students will:

- understand how mathematical models can help us answer questions, draw conclusions, and make decisions.

- understand a variety of applications of mathematics using concepts of graph theory.

- be able to convert real-world situations into graphs that can be analyzed quantitatively.

- understand the complexities of voting systems.

Homework and Quizzes – Each day there will be reading and homework assigned. Some assignments will be turned in and graded, some will be discussed in class, but not graded. The problems assigned to hand in will be collected at the beginning of the class meeting. In addition, we will have a quiz at the beginning of most classes.

It is vital that you do all the homework problems assigned; you should keep all your work in a binder or notebook for reference. For every hour in class you should expect to spend at least 2 hours doing work outside of class. You cannot learn mathematics without lots of practice!

Exams – There will be two exams. The first will be on October 9 and the second will be on December 4. There is no final exam.

Attendance – Mandatory. Regular attendance is vital. A late assignment will be graded with a reduction of 10% for each day it is late. There will be no make-up quizzes given, and make-up exams are given only in extreme, pre-approved cases. If you must miss an exam it is

your responsibility to contact me *in advance.* Students who are unable to attend class are responsible for all assignments and material covered in that class.

Grading – Grades will be the result of quizzes, homework, and two tests. The breakdown is as follows:

Culture Points – 5%
Quizzes/Homework – 30% total
Projects – 25% total
First Exam – 20%
Second Exam – 20%

Disclaimers – This syllabus is subject to change through the semester. Any updates to the syllabus will be announced in class. The instructor reserves the right to apply qualitative judgment in determining final grades for the course.

Learning Disability Accommodations – Students who wish to request accommodations in this class for a disability must contact Ms. Elaine Mara, assistant director of academic support services for academic and disability support, at the lower level of Monocacy Hall, or by calling 610-861-1401. Accommodations cannot be provided until authorization is received from the Academic Support Center.

Culture Points

> The mathematician's patterns, like the painter's or the poet's must be beautiful; the ideas, like the colours or the words must fit together in a harmonious way. Beauty is the first test: there is no permanent place in this world for ugly mathematics.
>
> *G. H. Hardy*

> To those who do not know mathematics it is difficult to get across a real feeling as to the beauty, the deepest beauty, of nature ... If you want to learn about nature, to appreciate nature, it is necessary to understand the language that she speaks in.
>
> *Richard Feynman*

One goal for this class is to provide some perspective of mathematics, and the role it plays in our modern world. Whether you plan to be a mathematician, a scientist, or simply a well-rounded liberal arts graduate, it is important to be aware of the role and nature of mathematics today. To help meet this goal, I am asking you to participate in "mathematical cultural awareness." There are no specific assignments for this portion of the course. Rather, there are many opportunities for you to explore mathematics in our culture. Activities that foster cultural awareness include (but are not limited to): attending talks, discussing a mathematical topic with a fellow student or professor, giving a talk, reading a paper, or solving a problem.

Basic overview of culture points

To get full credit for the Culture Points portion of your grade, you must accrue 10 points by the end of the semester. You gain points by attending seminars, colloquia or other talks; discussing mathematics outside class; reading articles; giving presentations; solving problems.

To get credit for an event, you will need to submit a short write-up for the event. This write-up will have two portions: (1) a short description of the event and (2) a reflection on the impact of that event on your own understanding of mathematics.

Points will be given based both on the quality of the event and the quality of the submission. The following sections provide details on this activity.

Rules for submission

Your culture point write-up must be neat and well-written (complete sentences, paragraph structure, etc.). I prefer your submissions to be typed, but I will accept hand-written submissions – particularly if there is a great deal of mathematical notation. For each submission, keep in mind that there are two portions:

1. **Summary of the event:** This section of the write-up should constitute no more than 50% of your submission. Summarize the talk, conversation, article, or event. If you were working on a problem, discuss *how* you approached the problem and whether you were able to arrive at a satisfactory answer (provide the actual solution or work on the problem on an attached page).

2. **Reflection on the event:** How does the event affect your understanding of mathematics and mathematicians? Do you have a greater appreciation of the role of mathematics in society or the nature of mathematical research? Does the event connect with the mathematics you've learned in this course (or any of your other mathematics courses)? If you worked on a problem, explain how your work on that problem has influenced the way you solve problems or your understanding of the mathematics involved.

Be sure to clearly state what the involved event was. If you watched an episode of a series, be sure to include the name of the episode as well as the name of the series. If you read an article, include a full citation of the article (do NOT include a copy of the article itself). If you attended a talk or seminar, include the name of the talk and of the speaker.

Miscellaneous rules

- You may make at most one culture point submission per week.

- At least one culture point submission needs to based on a talk, colloquium or seminar. At least one culture point submission needs to be based on an article or reading.

- Culture point submissions that do not follow the above rules (particularly regarding neatness and making full citations) will be penalized or rejected.

- Culture points above the required number will be used as extra credit.

Culture point activities

This list below is not comprehensive – it is meant to illustrate some possible activities and to provide a calibration for how many culture points different activities might provide. Note that the actual number of culture points you get will vary depending on the quality of your particular write-up.

- Attend an ϵ-talk (3 points). These short (10 to 15 minute) talks are given weekly as part of the Math Society's regular meetings.

- Attend a Math/CS colloquium (4 points).

- Attend a colloquium or conference off-campus (5 to 10 points). There are many opportunities to attend conferences throughout the valley, such as at Lafayette or Lehigh.

- Review an article on mathematics (2 to 4 points). I have attached a listing of places to look for articles, as well how many points you might get for different articles. Also look to sources such as the *New York Times*, the *Washington Post*, or PBS for mathematics in the news.

- Discuss a mathematical topic with someone outside the class (2 to 4 points) – this could be with roommates, teammates, family members, other professors. You can discuss a mathematical topic from the course or some other mathematical topic.

- Find mathematics in popular culture (2 to 4 points) – movies such as *A Beautiful Mind*, or references in *The Simpsons*. One source is *mathgoespop.com*. Also look for mathematics in the creation of movies by Pixar, LucasFilms or Dreamworks.

- Work on a problem outside the scope of the classroom (2 to 10 points). You might solve an interesting exercise or simply work on an interesting problem without quite reaching a solution.

Places to go for articles and other writings

Books and Journals

- (3 points) – mathematical articles from popular journals such as *Popular Science, Scientific American*, or *National Geographic*

- (3 points) – teaching-oriented journals such as *Mathematics Teacher* or *Mathematics Teaching*

- (3 to 5 points) – many books provide terrific insight to the nature of mathematics. Pick a chapter of almost any of the general mathematics books by Martin Gardner, Ian Stewart, Sherman Stein, or Keith Devlin.

There are many other interesting articles out there – look through some of the search engines available through Reeves to discover articles on your own.

You can also search `http://scholar.google.com` or `http://www.scholarpedia.org` for articles.

Math in the news

Look through the newspapers, especially the *New York Times*, the *Chicago Tribune* and other major newspapers for articles on mathematics in modern culture.

You can also find mathematics on the History Channel, the Discovery Channel, or PBS.

Web Resources

Below are just a few links to mathematical articles (and a rough indication of their point value)

- `http://www.maa.org/news/columns.html` (2 to 4 points)

  There is a host of columns here – all quite readable. Be sure to look through the archives to find articles of particular interest.

- `http://www-groups.dcs.st-and.ac.uk/~history/` (3 to 3 points)

  Look up a mathematician or mathematical topic here for a historical perspective on the mathematics you are learning. Start with those mathematicians that are mentioned in class (so who is that Simpson guy behind Simpson's rule for integration?).

- `http://www.cut-the-knot.org` (3 points)

  Lots of interesting mathematical tid-bits, most of which include an interactive applet for you to experiment with.

- `http://plus.maths.org/` (3 points)

  An on-line magazine devoted almost exclusively to questions in the mathematical sciences.

- `http://learner.org/interactives` (3 points)

  Search this site for College Mathematics activities. It has many interactive web apps for exploring mathematical topics.

- `https://www.youtube.com/user/Vihart` (3 points)

  Vi Hart has made many interesting and funny videos that present some great mathematical topics in very approachable ways.

Below are a few links to blogs hosted by professional mathematicians where interesting mathematical musings can be found (2 to 4 points)

- *What's New* by Terence Tao, `http://terrytao.wordpress.com/`

- *Not Even Wrong* by Peter Woit, `http://www.math.columbia.edu/ woit/wordpress/`