

**MATH 105 - SPRING 2017 (SEM II 2016/17)**  
**Mathematics Applications, Appreciation & Skills**

<b>Instructor:</b>	Alvin Schuller
<b>Office:</b>	SCI D260
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<b>Office Hours:</b>	M 9:00 – 9:50 am

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	T 9:00- 9:50 am
	R 9:00- 9:50 am
	*or by appointment *

<b>Section 1</b>	~	<b>MTR 8:00 – 8:50 am</b>	<b>SCI D228</b>
		<b>Required Tutoring Session: W 8:00 – 8:50 am</b>	<b>SCI D228</b>
<b>Section 2</b>	~	<b>MTR 12:00 – 12:50 pm</b>	<b>SCI D228</b>
		<b>Required Tutoring Session: W 12:00 – 12:50 pm</b>	<b>SCI D228</b>
<b>Section 3</b>	~	<b>MTR 1:00 – 1:50 pm</b>	<b>SCI A201</b>
		<b>Required Tutoring Session: W 1:00 – 1:50 pm</b>	<b>SCI A201</b>

**Prerequisite:** Math 90 or a suitable placement score.

**Text:** The Heart of Mathematics: An Invitation to Effective Thinking, 3<sup>rd</sup>ed. by Edward Burger & Michael Starbird.

**\*The supplemental tool kit is required for each student! You must purchase this at the book store\***

**Philosophy of the course:**

In this course, we would hope that you will see that mathematics is a network of intriguing ideas—not just a dry, formal list of techniques. It is creative, powerful, and even artistic. Mathematics uses penetrating techniques of thought that we can all use to solve problems, analyze situations, and sharpen the way that we look at our world.

This course emphasizes basic strategies of thought and analysis. These strategies have their greatest value to us in dealing with real-life decisions and situations that are completely outside mathematics. These “life lessons,” inspired by mathematical thinking, empower us to better grapple with and conquer the problems and issues that we all face in our lives from love to business, from art to politics. If you can conquer infinity and the fourth dimension, then what can’t you do?

The road through this course is not free from perils, bumps, and jolts. Sometimes you will confront issues that start beyond your comprehension, but, hopefully, they won’t stay beyond your comprehension. The journey to true understanding can be difficult and frustrating, but learn, stay the course, and be patient. There is light at the end of the tunnel—and throughout the journey, too.

What’s the point of it all? Well, the bottom line is that mathematics involves profound ideas. Making these ideas our own empowers us with the strength, the techniques, and the confidence to accomplish wonders. And, hopefully, you will find the ideas and the process of thinking through them to be an enjoyable, as well as valuable, experience.

## Course Outline:

So, in this course, we will explore some of the greatest ideas within the realm of mathematics - comparable to the works of Shakespeare, Plato and Michelangelo - these mathematical ideas have helped shape history, and they can add texture, beauty, and wonder to our lives. Mathematics is an artistic endeavor, which is shaped by each person's imagination and creativity.

### There are three basic goals for this course:

1. To attain a better understanding of some significant mathematical ideas.
2. To sharpen our analytical skills for life issues that are beyond the realm of mathematics.
3. To develop a fresh perspective and outlook on your view of the world.

### In addition, we will also dig deeper and explore ways

4. To better and more concisely communicate with clarity of exposition, mathematical ideas to others and
5. we hope to learn how to work more effectively in groups

This course satisfies the Quantitative Literacy Requirement. In particular, it addresses the following:

#### Quantitative Literacy Learning Outcomes

- Select, analyze, and interpret appropriate numerical data used in everyday life in numerical and graphical format.
- Identify and apply appropriate strategies of quantitative problem solving in theoretical and practical applications.
- Construct a conclusion using quantitative justification.

For more information see <http://www.uwsp.edu/acadaff/Pages/generalEducation.aspx>

**Calculators:** This course will be more concerned with mathematical ideas than formulas or computations, and so for the most part, calculators will not be necessary. Your smart phone probably has a good enough calculator for most of the work we will do. However, **you will need an actual, approved calculator for the exams.**

We will cover only part of the text, as there is more than a semester's worth of material presented therein. This will include about six different topics. The "bottom line," so to speak, is to gain an appreciation for mathematics and to discover the power of mathematical thinking in your everyday life. It is essential in this course to have an open mind, a piqued curiosity, and a willingness to explore and discover. Minimal mathematical background will be assumed.

\* See details below for a list of sections to be covered.

### SECTIONS TO BE COVERED:

Here are the sections that I intend to cover. **There may be some adjustment(s) based on time available.**

#### **CH 1: Fun and Games- an introduction to rigorous thought**

1.4

Silly Stories All Having a Moral: *Conundrums that evoke techniques of effective thinking*

#### **CH 2: Number Contemplation**

2.1 - 2.3, 2.6, 2.7

Counting: *How the Pigeonhole principle leads to precision through estimation*

Numerical Patterns in Nature: *Discovering nature's beauty and the Fibonacci numbers*

Prime Cuts of Numbers: *How the prime numbers are the building blocks of all natural numbers*

Secret Codes and How to Become a Spy: *How modular arithmetic and primes lead to secret public codes*

The Irrational Side of Numbers: *Are there numbers beyond fractions?*

Get Real: *The point of decimals and pinpointing numbers on the real line*

#### **CH 3: Infinity**

3.1-3.3

Beyond Numbers: *What does infinity mean?*

Comparing the Infinite: *Pairing up collections via a one-to-one correspondence*

The Missing Member: *Are some infinities larger than others?*

#### **CH 4: Geometric Gems**

4.1, 4.3 - 4.5

Pythagoras and His Hypotenuse: *How a puzzle leads to the proof of one of the gems of mathematics*

A View of an Art Gallery: *Using computational geometry to place security cameras in museums*

The Sexiest Rectangle: *Finding aesthetics in life, art, and math through the Golden Rectangle*

Soothing Symmetry and Spinning Pinwheels: *Can a floor be tiled without nay repeating pattern?*

The Platonic Solids Turn Amorous: *Discovering the symmetry and interconnections among the Platonic Solids*

The Shape of Reality?: *How straight lines can bend in non-Euclidean geometries*

The Fourth Dimension: *Can you see it?*

#### **CH 5: Contortions of Space**

5.2

Rubber Sheet Geometry: *Discovering the topological idea of equivalence by distortion*

The Band That Wouldn't Stop Playing: *Experimenting with the Möbius Band and Klein Bottle*

#### **CH 6: Fractals and chaos**

6.1, 6.2, other sections possibly, based on time

Images: *Viewing a gallery of fractals*

The Dynamics of Change: *Can change be modeled by repeated applications of simple processes?*

The Infinitely Detailed Beauty of Fractals: *How to create works of infinite intricacy through repeated processes*

#### **CH 7: Taming uncertainty**

7.1, 7.2

Chance Surprises: *Some scenarios involving chance that confound our intuition*

Predicting the Future in an Uncertain World: *How to measure uncertainty through the idea of probability*

#### **Attendance Policy:**

You are required to **attend each class period and participate** as these elements form a part of your course grade.

You will have to actually pay attention, ask questions, and try stuff. You are expected to **attend the required tutoring sessions** as well. It is your responsibility to obtain notes and information for the class times that you miss. When circumstances arise to prevent you from coming to class, you should let me know prior to the absence, usually BEFORE the day in question (detailed texts and emails are ways to do so).

Permission to miss tests, exams and/or presentation days will only be allowed for extreme circumstances, and you will be required to provide sufficient reason and appropriate documentation for the intended absence. In the case of an intended absence, all arrangements for make-up quizzes and exams must be made before the scheduled exam time.

Absences for serious illness, family emergencies, military duty or University sponsored activities may be excused provided you inform me, timeously. Homework assignment due dates may be adjusted for excused absences.

***More than 4 unexcused absences will affect and lower your grade and could result in a failing grade.***

#### **Academic Misconduct Policy:**

You are expected to complete the coursework for this course. Failure to complete any assignment will result in zero points being awarded for that assignment. Late assignments will lose points as per my discretion. Also read the following link:

<http://www.uwsp.edu/admin/stuaffairs/rights/rightsChap14.pdf>

**Evaluation:** There will be a total of 900 points for the semester.

**Homework:** (450 out of 900 pts.)

Homework will be assigned for each section covered in class and will be due as posted or stated. Your success in learning the material presented requires that you complete each assignment and do not fall behind. We will use class time to go over some of your questions regarding the assignments. We will not, however, have enough class time to answer all questions that arise. The tutoring session will be a good time to get homework questions answered. Your textbook and classmates are also valuable resources. Homework grades will reflect daily participation, accuracy and effort.

**Exams:** There will be 3 exams, each worth 75 points (225 out of the 900 points). Actual dates will be announced as they are confirmed.

Tentative dates (these dates may change):

Thursday, March

Thursday, April

Thursday, May

Again, make-up exams and accommodations will be available only in very special cases and will be handled on an individual basis. Notification and arrangements in such cases must be made prior to the examination.

NOTE: Once an exam has been passed out, you may not leave the classroom until you've turned in your exam.

**Research Projects / Poster Session Presentations:** (225 out of 900 pts.)

This project is an opportunity to explore and discover a mathematical topic on your own.

You will select a mathematical topic outside of those covered in our class, learn any necessary background information and then investigate the topic.

This may be a topic that is related to your discipline, for instance, or you may choose to depict a mathematical idea in a creative way (via a song or poem, for example).

You may work individually or in a group of two (collaboration is encouraged - it's more fun!).

**Each student** will submit an abstract of the intention for their project, write a final paper on their findings, and present a poster display at the end of the semester (during the last few class periods and the final exam period –

1: Sec 3: Monday, May 15, 14:45-16:045 and

2: Sec 1: Thursday, May 18, 10:15- 12:15

Sec 2: Thursday, May 18, 12:30-14:30 (please read the dates and times in this section, carefully)

Some interim reports on the progress of the project will be collected during the semester.

Discussion and further details will be provided during class.

#### **Grading and Grading Scale:**

Homework:	450 pts. = 50%
Exams:	225 pts. = 25%
Research Project:	225 pts. = 25%
Total:	900 pts. = 100%

Course letter grades will be based on the scale below, with + and - marks within each range:

A: 90 - 100

B: 80 - 89

C: 70 - 79

D: 60 - 69

F: below 60

I may use my discretion to raise a student's grade if her/his final grade does not reflect the quality of her/his work in the course (for example, from a low exam score, early in the course). I will not, however, use such discretion to lower a student's final grade.

In accordance with UW system policies, Math 105 is dedicated to a safe, supportive and non-discriminatory environment for all persons regardless of age, race, religion, gender, sexual orientation or disability.

You have certain rights and responsibilities as a UWSP student and you are expected to be fully aware of them.

These are detailed in the UWSP Community Bill of Rights and Responsibilities:

<http://www.uwsp.edu/dos/Documents/Community%20Rights%20and%20Responsibilities.pdf>

In particular, this includes the UWSP Student Academic Disciplinary Procedures:

<http://www.uwsp.edu/stuaffairs/Documents/RightsRespons/SRR-2010/rightsChap17.pdf>

Information concerning accommodations made as per Section 504 of the Rehabilitation Act or the Americans with Disabilities Act can be found at:

<http://www4.uwsp.edu/special/disability/>

In particular, to request any accommodations of this type, relevant to this class, discuss the matter with the Disability Services Office. Information and contact information may be found at:

<http://www4.uwsp.edu/special/disability/ToQualifyforDisabilityServicesProcedure/> .



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