

**DEREE COLLEGE SYLLABUS FOR:**

**HSE 2205 LE Mathematics and Human Experience**

(previously HEL 2205)

Revised Fall 2015

**US CREDITS: 3/0/3**

**PREREQUISITES:**

WP 1010 Introduction to Academic Writing  
WP 1111 Academic Writing & Ethics

**CATALOG  
DESCRIPTION:**

An interdisciplinary course that aims to expose students to the ways in which mathematical principles and laws underline, inform, and help explain various facets of human experience. Using as starting points natural phenomena, forms of popular culture and elements of social life, the course exposes students to various mathematical concepts and their applications, in order to demonstrate the centrality of mathematical laws and the importance of mathematical consciousness.

**RATIONALE:**

Through the use of motivating examples from nature, art, and culture, the course teaches students key mathematical concepts and helps them understand the connections between mathematics and the real world. Aspects of nature, art, law, music, philosophy are investigated for patterns and equations that govern everyday life.

By guiding students to an appreciation of mathematics, not as an abstract science but rather as a vital tool for understanding the meaning of phenomena (natural, cultural, social), the course helps students develop awareness of the mathematical structures at work on various planes of human experience.

**LEARNING OUTCOMES:**

As a result of taking this course, students should be able to:

1. Demonstrate their knowledge of key mathematical concepts;
2. Explain the operation of mathematical principles and laws in various facets of human experience;
3. Critically evaluate the centrality of mathematical laws in different aspects of nature and culture;
4. Relate mathematical logic to real-life applications;
5. Demonstrate their understanding of mathematics in human experience through an essay and a creative project.

**METHOD OF TEACHING AND  
LEARNING:**

In congruence with the teaching and learning strategy of the college, the following tools are used:

- Active student-centered teaching approach in the presentation of course material to engage learners;

- Student presentations of learning material to encourage involvement in the learning process;
- Co-curricular activities both within and outside the campus to encourage students' creative engagement with the material;
- Extensive instructor feedback on assignments and activities;
- Individualized assistance during office hours for further discussion of lecture material, additional reading, and assignments;
- Additional print and audiovisual educational material posted on the Blackboard course template;
- Other relevant educational material placed on reserve in the library.

**ASSESSMENT:**

Performance will be assessed as follows:

Critical Essay	<b>40%</b>
Creative project	<b>40%</b>
Participation	<b>20%</b>

Specifically, students will be required to produce:

- A 1,500-2,000 word critical essay drawn from one of the major cluster themes of the course. The essay needs to display a firm grasp of the topic at hand, of the issues discussed in the course as a whole, as well as of the relevant critical bibliography.
- A creative project which will combine theoretical investigation with practical application. Students will deploy a creative medium of their choice to present their insights on concepts and ideas explored in the course.
- In addition, each student will be evaluated according to his/her contribution in the class, the preparation of the material and his/her critical ability. Furthermore, each student will be assessed in regards to his/her participation in group activities and discussions that will arise throughout the course.

**REQUIRED READING:**

Selections from the following books:

- Adam J. "A Mathematical Nature Walk" (Princeton, 2009)
- Devlin K., Lorden G. "The Numbers behind NUMB3RS" (Plume, 2007)
- Dunbar S. "Logic and Mathematical Paradoxes" (White Word Publications, 2012)
- Livio M. "The Golden Ratio - The Story of PHI, the World's Most Astonishing Number" (Broadway Books, 2003)
- Olofsson P. "Probabilities: The Little Numbers That Rule Our Lives" (Wiley, 2010)

- Schneps L, Colmez C.(2013) “Math on Trial” (Basic Books, 2013)

**RECOMMENDED READING:**

- Bunch B. “Mathematical Fallacies and Paradoxes” (Dover, 2012)
- Devlin K. “The Maths Gene: Why everyone has it but most people don’t use it?” (Phoenix, 2001)
- Field M., Golubitsky M. “Symmetry and chaos: A search for pattern in mathematics, art and nature” (Oxford, 2009)
- Gleick J. “Chaos: Making a New Science” (Penguin, 2008)
- Herrmann N. “The Beauty of Everyday Mathematics” (Springer, 2012)
- Hofstadter D. “Gödel, Escher, Bach: An Eternal Golden Braid” (Basic Books, 1999)
- Huntley H. “The Divine Proportion: A Study in Mathematical Beauty” (Dover, 1970)
- Sainsbury R.M. “Paradoxes” (Cambridge, 2009)
- Stakhov A. “Mathematics of Harmony: From Euclid to Contemporary Mathematics and Computer Science (World Scientific, 2009)
- Vajda S. “Fibonacci and Lucas Numbers, and the Golden Section: Theory and Applications” (Dover, 2007)
- Fauvel J., Flood R., Wilson R. “Music and Mathematics - From Pythagoras to Fractals” (Oxford, 2006)

**COMMUNICATION REQUIREMENTS:**

Written reports in Word, using proper English. Knowledge of Excel and PowerPoint an advantage, as they may be required in either the report-writing or oral presentation phase. Oral presentation using proper English.

**SOFTWARE REQUIREMENTS:**

Word; Excel & PowerPoint recommended.

**WWW RESOURCES:**

<http://www.mathopenref.com>  
<http://www.stanford.edu/~kdevlin>  
<http://www.mathsisfun.com>  
<http://www.logicalparadoxes.info>  
<http://mathworld.wolfram.com>

**INDICATIVE CONTENT:**

- 1. The mathematics gene: Do we all have it?**
- 2. Mathematics in the Natural World: Sequences and Series**
  - The Fibonacci numbers of pinecones and pineapples

- The fractals of snowflakes
- Population Growth
  - The Logistic Equation and chaos in numbers

### **3. Mathematics in Culture: The Golden Section**

- Music
  - Composers using famous mathematical patterns & numbers
- Art & Architecture
  - Mathematics in buildings and artifacts
  - Mathematics of aesthetic proportions

### **4. Mathematics in Social Life: Probability Theory and Combinatorics**

- Crime, Law and Probability
  - Use and abuse of mathematics in the courtroom
  - Famous court trials and math misapplications
  - DNA profiling
- Gambling and Probability
  - Applied mathematics and blackjack
  - The TV game "Let's make a deal"
- TV
  - The series "*Numb3rs*"
  - Using mathematics to fight crime

### **5. Math in Philosophy: Logic**

- Logical paradoxes
- True and false statements