**The Nature of Mathematics – NCLC 333 - Spring 2012**

**A New Century College Learning Community**

**Instructor:** Michael R. Gabel, Ph. D.

**Location and Time of course:** Tuesday 4:30 to 7:10 in Innovation Hall 208

**Location of office:** Enterprise Hall, Room 410

**Phone number:** (703) 993 1484 (contacting via e-mail is preferred)

**Email address:** mgabel@gmu.edu **Website**: <http://mason.gmu.edu/~mgabel/>

**Office Hours:** Tuesday 3:15-4:15, Thursday 6:30-7:00 and by appointment

**Text:** *The Mathematical Universe: An Alphabetical Journey Through the Great Proofs, Problems, and Personalities* by William Dunham, John Wiley and Sons, 1994 and 1997 In addition to other topics that present themselves as the course progresses, it is expected that we will discuss material from chapters A, C, F, G, H, J, K, M, O, Q, X-Y, and W.

**Brief description**

A. Content

*Theoretical Framework* (the nature of Mathematical Truth: logic, axiomatics, theorems and proofs), *Historical Context* (what happened when, and why), *Connections with some other disciplines* ("two culture" issues, relations with Science and Art), and *Current Issues* (modern applications and research areas, primary and secondary school curricula) - all illustrated with selected *Mathematics Topics* (more advanced algebra and geometry plus introductions to set theory, probability, calculus, and number theory). Central to the course will be presentations by students, in groups, on various topics/components of the course.

**B.** Perspective

Too often mathematics is taught as a collection of techniques for solving unimportant problems. In contrast, the goal here is to see mathematics not as an isolated activity or exercise, but as a contributor and measure of human culture.

**C**. Process

In this course, the goal will be complete understanding of all we discuss by everyone in the class. To this end, the course will be run more as a seminar than a standard lecture course. One consequence of this is that students will be presenting to the rest of the class topics/problems they have researched/solved. A further consequence is that students have responsibility for a good deal of the content and most of the “tone” of the class. This course will be what you make it.

**Prerequisites**

If you already have general education credit in Quantitative Reasoning, having earned a grade of B or better, there is no further prerequisite. If you do not yet have general education credit in Quantitative Reasoning or have earned a grade of lower than B in a general education Quantitative Reasoning course, then you should meet one of the following three criteria:

1. Performance on Math Placement Exam equivalent to requirements for entrance to math 110 or math 111

2. Successful completion of algebra program in mathematics learning center

3. Permission of the Instructor (Professor Gabel). Call him: (703) 993 1484 or (better) e-mail him: mgabel@gmu.edu

**Assignments and Grading Policies [These may be adjusted to match better the way this particular version of the course is progressing.]**

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| **Per Cent** | **Description** |
| 5% | Group: Presentation #1: The class will be divided into presentation groups. Presentations will consist of the exposition/teaching of some mathematical results placed in an historical perspective. Presentations will last at least a half hour. Assignment criteria will be posted. |
| 5% | Group: Presentation Paper #1: A (group-written) research/content paper. 1500 words (about 4 pages), 1 inch margins (top, bottom, left, right), double spaced, 11 point font. |
| 10% | Group: Presentation #2 |
| 5% | Group: Presentation Paper #2 |
| 25% | Individual: In-Class quizzes [One week notice will be given.] |
| 20% | Individual: Learning Logs: Assignment criteria will be posted. |
| 10% | Group: Presentation #3 |
| 10% | Group: Presentation Paper #3: 2200 words (about 6 pages), 1 inch margins (top, bottom, left, right), double spaced, 11 point font. |
| 10% | Individual: Take-Home Final Exam: Reflection and Problems Set Assignment criteria will be posted. Date: Monday, May14, 7:15 pm |
| ------------ |  |
| 100% |  |

**The Writing Intensive Requirement**

This course fulfills GMU's Writing-Intensive Requirement. [See <http://wac.gmu.edu/>]

**Policy on participation**

It’s often said (and it’s true) that Mathematics is not a spectator sport. This means that you are expected to ask questions in class, to give your opinion, and to engage the material. If you are confused or puzzled by something, ask me, in class.

**Policy on late assignments**

Except in very special circumstances (and with prior notice to me, in person or by phone), late work will not be accepted.

**Policy on group grades**

Unless I’m presented with evidence to the contrary, I will assume each member of a group has contributed equally, and thus all members of a group will receive the same grade on a group project/presentation.

**Commitment to Diversity**

New Century College is an *intentionally* inclusive community that celebrates diversity and strives to have faculty, staff and students who reflect the diversity of our plural society. We do not discriminate on the basis of race, class, linguistic background, religion, gender identity, sex, sexual orientation, ethnicity, age, or physical ability.

**Honor Code**

The University Honor Code is here: <http://honorcode.gmu.edu/> Additionally, provided is the following statement:

The integrity of the University community is affected by the individual choices made by each of us. This is especially true in New Century College. GMU has an Honor Code with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to follow at all times are that: (1) all work submitted be your own; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct. If you feel unusual pressure or anxiety about your grade in this or any other course, please talk with us or to a trusted friend or counselor to get your situation in perspective. The University provides a range of service to help with test anxiety, writing skills, study skills, and other related concerns.

Some presentations/projects are designed to be undertaken individually. For these, you may discuss your ideas with others or ask for feedback; however, it is not appropriate to give your work to someone else to develop or revise. You are responsible for making certain that there is no question that the work you hand in is your own. If only your name appears on an assignment, your professor has the right to expect that you have done the work yourself, fully and independently.

With collaborative work, names of all the participants should appear on the work. Over the duration of this course you may find that it is necessary for you to take on various roles in group projects. However, it is expected that all group members will contribute equally and thus understand fully all components of the project/presentation.

Using someone else's words or ideas without giving them credit is plagiarism, a very serious offense. It is very important to understand how to prevent committing plagiarism when using material from a source. If you wish to quote verbatim, you must use the exact words (including punctuation) just as it appears in the original and you must use quotation marks and page number(s) in your citation. If you want to paraphrase ideas from a source, that is, convey the author's ideas in your own words-you must still cite the source.

The re-use of papers, presentations, etc., from one course in another course is not appropriate. In every NCC course, faculty expect that work that is submitted has been done only for that class. [An exception is made for materials included within course and year-end portfolios.]

**Learning Community Principles - How this course is a Learning Community:**

According to <http://ncc.gmu.edu/student-info/learning-communities> in NCC, learning communities are:

Interdisciplinary - they combine subjects generally taught as individual courses into one integrated course

*This course combines the teaching of some standard mathematical ideas (and some less-standard ones) with their historical and cultural context.*

Team-taught - they integrate two or more faculty and their disciplinary perspectives

*Well, the team is the whole class, for each member of the class will be responsible for a portion of the content. As such, the class will see a variety of cultural and academic perspectives.*

Theme-based - they tackle a complex contemporary intellectual inquiry from several different perspectives

*In this course, we examine the Nature of Mathematics from four perspectives: Theoretical Framework, Historical Context, Connections with some other disciplines, and Current Issues.*

Collaborative - they offer both faculty and students the chance to learn from, and teach, each other

*This is exactly the point of the student presentation groups. A substantial component of this course will be taught by the students themselves.*

**NCC Competencies to be emphasized:** Communication, Critical Thinking, Group Collaboration, and Aesthetic Awareness

**Communication**: Communication is the process of creating and sharing meaning through human interaction. A competent communicator will be able to:

* Speak, read, write and listen effectively, with attention to audience, purpose and context.
* Use appropriate language, nonverbal and visual symbols.
* Organize ideas and information strategically.
* Design, revise and produce work tailored to diverse audiences.

**Critical Thinking:** Critical thinking is a habit of mind characterized by the comprehensive exploration of issues, ideas, artifacts, and events before accepting or formulating a judgment or conclusion. Someone who is a good critical thinker will be able to:

* Explore the issues and identify any problems to be solved.
* Identify and evaluate relevant, valid information and evidence.
* Understand the influence of context and assumptions.
* Summarize and synthesize key issues.
* Articulate his or her own position using evidence-based arguments.
* Design and implement problem solving plans.

**Group Collaboration:** Group collaboration is the process of working toward a shared agenda and/or common purpose while capitalizing on the diversity within the group. Effective group collaboration means that students should be able to:

* Create shared expectations and a common purpose.
* Understand and choose roles and tasks.
* Make decisions and track progress collaboratively.
* Facilitate constructive consensus-building, compromise and conflict.
* Integrate individual talents and strengths toward the accomplishment of goals and tasks.
* Be inclusive and value the diversity of the group.

**Aesthetic Awareness:** Aesthetic awareness encourages individual to develop intellectual and emotional responses to nature or human creativity. An aesthetically aware person can:

* Understand the historical, social, political, environmental or gendered contexts of specific created works.
* Appreciate the complex processes of creative expression in multiple forms and media.
* Recognize and explore the transformative potential of creativity in effecting societal change.
* Value creative expression and the natural world to enrich everyday life.

**Writing genres**

In this course you will do several types of writing.

First, there will be assigned a collection of "special problems" that will be generated from the class discussions. Except there is a twist here. Usually, students do math homework with the goal of showing the teacher that they can get the correct answer. In contrast, homework in this course will be viewed as written version of teaching, so, as such, it has as its goal the careful explanation of ideas written to an eager reader.

There will also be a number of "Learning Logs." These are writings designed to help you do understand our text.

Each of the three presentations will be accompanied by a group-written paper.

A component of the final exam will be a reflection.