Instructor: Prof. Anne Krause  (415) 338-2252    TH 943
krause@math.sfsu.edu

Pre-requisites: C- or better in Math 227 and in English 214; sophomore-junior level status

Texts:  
- Foundations and Fundamental Concepts of Mathematics by Howard Eves; Dover Publications
- A History of Mathematics by Carl B. Boyer and Uta C. Merzbach; Wiley, 2nd edition
- From Five Fingers to Infinity: A Journey through the History of Mathematics edited by Frank J Swetz; Dover Publications
- Classics of Mathematics edited by Ronald Calinger; Prentice Hall

Overview: This course, although of interest to all mathematics majors, is designed to be of special interest to those considering teaching careers at the secondary school or junior college levels. It presents an overview of the history of mathematics, and the historical context within which “elementary” mathematics developed. It will help you field questions you will likely get from your students and from the general public, such as “who invented zero?”, “what does it mean to square a circle?”, and “what good is math, anyway?” . It is hoped that you will leave a course with a heightened appreciation of the mathematics you have already learned, a framework within which to place your further mathematical studies, and an appreciation not only of the “history of mathematics” but also of “the mathematics of history”: that is, the impact mathematics has had on society over the past two millennia.

The assigned texts include an excellent chronological survey (Boyer & Merzbach), a collection of original sources (Calinger), a collection of articles on the history of mathematics (Swetz), and the Eves book, which follows two threads: the development of non-Euclidean geometry, and the development of axiomatic mathematics.

In addition to the historical and mathematical content of the course, an equally important focus is the development of writing skills. This is a GWAR course (Graduate Writing Assessment Requirement), and as such replaces the JEPET exam.

Goals of the Course: At the end of the course, it is desired that the student will have met the following student-learning outcomes:
• Acquired an overview of the history of mathematics;
• Be able to discuss
  • the development of the number system;
  • the contribution of Greek mathematics;
  • the quest for non-Euclidean geometry;
  • the birth of the calculus in the 17th century;
  • the rise of the axiomatic method.
• Be able to solve mathematical problems representative of the mathematics covered;
  • Be able to research and write an expository paper on a topic in the history of mathematics which effectively communicates to the general reader both the mathematical content and its societal and historical context.

Grading:

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<th>Assignment</th>
<th>Percentage</th>
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<tr>
<td>Mathematics problem sets</td>
<td>30%</td>
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<td>Writing exercises</td>
<td>20%</td>
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<td>Term Paper</td>
<td>40%</td>
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<td>Final Exam</td>
<td>10%</td>
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Assignments: The course grade is based on the following:

• Mathematics problem sets: these are problems representative of the mathematics of the era being studied. It will include such topics as Egyptian unit-fractions, Greek construction of numbers with straightedge and compass, historical word problems, Chinese surveying problems, and techniques in early calculus. You will have a selection of problems to choose from, and will be responsible for doing around 75 problems over the semester.
• Writing exercises: these are intended to help you develop skills needed for writing the term paper.
• Short biography: this is a 3 page paper giving a short biography of a mathematician, focusing on a single contribution to mathematics. This uses skills such as researching, outlining, drafting, refining, and documenting a paper. Your revised paper will be shared with your classmates, as a source of possible term paper topics. [4%]
• Synopses of three papers in the history of mathematics: in searching for a term paper topic, find, read, and report on three papers, on three distinct topics. On each paper write a short synopsis, two pages in length, giving an abstract of the paper, and a short critical response as to its interest level. These also will be shared with your classmates, as a source of possible term paper topics. [6%]
• Critiques of three papers: For three of the approximately thirty articles assigned, complete a two-page critique of the article. A template for the critique will be provided. In short you will outline the paper, stating the thesis, the development of the thesis, and evidence given to support the thesis, followed by your critical response: was the paper clear? was it convincing? how could the paper have been improved? [6%]
• Peer review: Each student will present orally his/her revised term paper. The term paper will be peer-reviewed by a team of two classmates, who will present their review to the class after the oral presentation. These friendly criticisms will
Written assignments will be graded based on the following rubric:

NOTE: All papers are to be single-spaced, using 12-point font. Plagiarism—using material without citation and/or without using appropriate quotation marks—may result in zero credit for the assignment. Perhaps even failure of the course depended upon the extent of the offense. Ask me if you have questions about what constitutes plagiarism.

Written assignments will be graded based on the following rubric:

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<th>Area</th>
<th>Characteristics - Type of Writer (GRADE)</th>
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<td>Exceptional (A)</td>
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- Term Paper: The term paper, at least 12-15 pages long, will describe a mathematical technique, equation, theory, etc. and how it has impacted society. The paper will be in two parts: one will present the social context of the application of the mathematics, and the other will present the mathematics itself. The term paper project is divided into five stages. Each part is graded separately; points will be docked for late submittals.

- Agenda: is to be on a topic and using source material approved by the instructor. The first part of the term paper project is writing-up and getting approval of this “agenda”. [5%]

- First Draft: This is a working out of the general argument of the paper, and although an initial draft, should be as cohesive and carefully written as possible. [10%]

- Penultimate Draft: This is the result of (perhaps several) revisions of the first draft. It is this draft which will be given to the peer-review team. [10%]

- Oral Presentation of the Penultimate Draft: The student gives a prepared 5-10 minute oral presentation of his/her term paper to the class, after which the peer-review team gives a friendly critique of the written paper. [5%]

- Final Draft: In the final draft the paper is revised in response to the peer-review, and to a final critique by the instructor. [10%]

- Final Exam: The final exam will test your knowledge of the mathematical content of the course.
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<th>Adherence to the Agenda of the Paper (10%)</th>
<th>Paper fully completes the agenda agreed upon with the instructor as to the topic to be explored, sources to be utilized, and issue to be resolved.</th>
<th>Paper achieves most of the goals set for it in the agenda.</th>
<th>Paper achieves some of the basic goals set for it in the agenda, but requires further development.</th>
<th>Paper does not reflect the background reading agreed upon, or has goals which differ from those in the agenda.</th>
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<td>Content and Development (25%)</td>
<td>Paper consistently, clearly, and effectively conveys a focused thesis. Topic has sufficient depth and development; supported by evidence, examples, and details. References are used carefully and cited correctly. Ideas and/or arguments are insightful and thought-out. Critical and creative thinking is demonstrated in terms of topic complexity and perspective. Exceptional development of paper.</td>
<td>Paper is fairly well defined, focused, and supported. The thesis - stated or implied - is adequate, but could be sharpened. Topic development and depth are sufficient, but stronger references could have been used. Ideas and/or arguments are clear, and reasoning is thorough. Writer demonstrates a thoughtful awareness of topic complexity and other points of view. Strong development of paper.</td>
<td>Paper communicates an inconsistent or general thesis. A lack in focus exists. The supporting evidence, gathered honestly and used responsibly, is, nevertheless, often obvious and easily accessible. Ideas and/or arguments are broad and often predictable. The writer demonstrates little awareness of the topic’s complexity or other points of view.</td>
<td>Paper may have a flawed or missing thesis statement. Obvious evidence may be missing or irrelevant. Focus and support are inconsistent or inadequately interpreted and based on an insufficient understanding of topic. Ideas and/or arguments may rely too heavily on evidence from published sources without adding original analysis. Writer has no sense of complexity or perspective.</td>
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<td>Organization (25%)</td>
<td>Introduction establishes a context and purpose, and captures the reader’s attention. Paragraphs are controlled by topic sentences and are well developed. Sequencing is logical and transitions are smooth. Conclusion moves beyond a mere restatement of the introduction, offering application, implications, and/or significance of the topic.</td>
<td>Paper has effective beginning and ending. The order of information is logical, and the reader can follow it because of well-chosen transitions and topic sentences. The essay develops across paragraphs and has an inferable or explicit principle of organization. Paragraph divisions are logical and use enough specific detail to satisfy the educated reader.</td>
<td>Organization is fairly clear, but does not develop significantly from paragraph to paragraph. They have adequate development and are divided appropriately. Organization may be list-like. Transitions may be mechanical, but foster coherence. Organization is uneven. Introduction and conclusion are present, but have difficulty supporting central idea.</td>
<td>Organization is difficult to see or infer. Introductions or conclusions may not be clearly marked or functional; paragraphs may not be coherently developed nor arranged; topic sentences are consistently missing, murky, or inappropriate; transitions are missing or flawed. Paper is disorganized, incomplete, and difficult to follow.</td>
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<td>Writing style and Conventions (25%)</td>
<td>Writing style is direct, expressive, original, and rhythmic. May contain a few surface errors, but does not undermine effectiveness of paper. Usage, grammar, and conventions enhance readability. Prose and conventions demonstrate fluency and clarity adding interest/imagery to text.</td>
<td>Writing style is clear and readable. Sentence structure is appropriate for educated readers, but could be more expressive, direct, and/or rhythmic. Paper is generally free of sentence-level errors. Conventions and vocabulary are strong, but may experience overuse and context issues.</td>
<td>Writing style is functional, but simplistic. Sentence structure may be choppy and/or repetitive. Paper is generally free of sentence-level errors; word choice is correct though limited and may be used incorrectly. Spelling, usage, and punctuation errors may reveal a lack of familiarity with writing conventions.</td>
<td>Writing style is fraught with errors. Sentence structure is often repetitive, and wording may sound awkward with text being difficult to read aloud. Numerous and consistent errors in spelling, usage, and punctuation reveal unfamiliarity with writing conventions. Lack of proofreading evident.</td>
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<td>Presentation of Mathematics (15%)</td>
<td>The mathematical content of the paper shows clear understanding of the material, which is presented so as to be understood easily by a peer unfamiliar with the mathematical content.</td>
<td>The mathematical content of the paper indicates a good understanding of the material; however, this content is not communicated clearly to the reader.</td>
<td>The mathematical content of the paper is presented without error, but indicates a lack of understanding of the material.</td>
<td>The presentation of mathematical content not only indicates a lack of understanding, but also contains errors.</td>
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