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CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

I. CONTACT

Contact Person Gerald Buriok Phone 2608

Department Mathematics

II. PROPOSAL TYPE (Check All Appropriate Lines)

X COURSE — MA 480 Senior Seminar
Suggested 20 character title

X New Course* — MA 480 Senior Seminar
Course Number and Full Title

____ Course Revision — _____
Course Number and Full Title

____ Liberal Studies Approval+ for new or existing course — _____
Course Number and Full Title

____ Course Deletion — _____
Course Number and Full Title

____ Number and/or Title Change — _____
Old Number and/or Full Old Title

_____
New Number and/or Full New Title

____ Course or Catalog Description Change — _____
Course Number and Full Title

_____ PROGRAM: ____ Major ____ Minor ____ Track

____ New Program* — _____
Program Name

____ Program Revision* — _____
Program Name

____ Program Deletion* — _____
Program Name

____ Title Change — _____
Old Program Name

_____
New Program Name

III. Approvals (signatures and date)

Department Curriculum Committee — Department Chair

College Curriculum Committee — College Dean

+Director of Liberal Studies (where applicable) — *Provost (where applicable)

Course Analysis Questionnaire

Section A: Details of the Course

A1 How does this course fit into the programs of the department? For what students is the course designed? (majors, students in other majors, liberal studies).

This course is designed to be taken in the senior year by students whose major is Mathematics or Applied Mathematics. It is meant to broaden students' views of mathematics by analyzing problem solving skills and considering the general nature of mathematics. It is also meant to extend their understanding of these topics. Further, this course will be used by the faculty of the Mathematics Department as an outcomes assessment tool for the Mathematics and Applied Mathematics programs. This will be accomplished by assessing the student's ability to read, understand, and write mathematics, as well as through the use of the Educational Testing Service (ETS) Major Field Test in Mathematics.

A2 Does this course require changes in the content of existing courses or requirements for a program? If catalog descriptions of other courses of department programs must be changed as a result of the adoption of this course, please submit as separate proposals all other changes in courses and/or program requirements.

This course does not require changes in the content of existing courses. Separate proposals are being submitted to change requirements for the Mathematics and Applied Mathematics programs to include this course.

A3 Has this course ever been offered at IUP on a trial basis (e.g. as a special topic)? If so, explain the details of the offering.

This course was offered as a special topics course during the spring semester of the 1996/97 academic year. We asked all prospective May '97 graduates of the Mathematics and Applied Mathematics programs to voluntarily take the course, and ended up with an enrollment of five students. The instructor followed the general outline of the course syllabus attached to this document, including the administration or the ETS Major Fields Test.

A4 Is this course to be a dual-level course? If so, what is the approval status at the graduate level?

This course is not to be a dual-level course.

A5 If this course may be taken for variable credit, what criteria will be used to relate credits to

the learning experience of each student? Who will make this determination and by what procedures.

This course may not be taken for variable credit.

A6 Do other higher education institutions currently offer this course? If so, please list examples.

The Mathematics Department of the University of Pittsburgh requires a two credit senior seminar called the Putnam Seminar. Clarion U. of PA and Edinboro U. of PA both require a one credit senior seminar of mathematics majors, and Allegheny College requires a three credit senior project.

A7 Is the content, or are the skills, of the proposed course recommended or required by a professional society, accrediting authority, law or other external agency? If so, please provide documentation. Explain why this content or these skills cannot be incorporated into an existing course.

The content of the proposed course is not required by a professional society, accrediting authority, law, or external agency. However, the Mathematical Association of America circulated a document in 1993 entitled ASSESSMENT OF STUDENT LEARNING FOR IMPROVING THE UNDERGRADUATE MAJOR IN MATHEMATICS. In this document, they list eight types of assessment techniques, one of which is a summary course, described as follows: "Such courses are designed to cover and connect ideas from across the mathematics major. These may be specifically designed as summary courses and as such are usually called capstone courses, or they may be less specific, such as senior seminars or research seminars. Assessment of students' preformances in these courses provide good summary information about learning in the major."

Section B: Interdisciplinary Implications

B1 Will this course be taught by one instructor or will there be team teaching? If the latter, explain the teaching plan and its rationale.

This course will be taught by one instructor.

B2 What is the relationship between the content of this course and the content of courses offered by other departments? Summarize your discussions (with other departments)concerning the proposed changes and indicate how any conflicts have been resolved. Please attach relevant memoranda from these departments which clarify their attitudes toward the proposed change(s)?

There is no relationship between this course and the content of courses offered by

other departments.

B3 Will seats in this course be made available to students in the School of Continuing Education?

No.

Section C: Implementation

C1 Are faculty resources adequate? If you are not requesting or have not been authorized to hire additional faculty, demonstrate how course will fit into the schedules of current faculty. What will be taught less frequently or in fewer sections to make this possible?

Inclusion of this course in the Mathematics and Applied Mathematics programs is part of an overall revision of these programs. This revision involves replacing the three semester, twelve credit, calculus sequence MA127, MA128, and MA227 with the two semester, eight credit, calculus sequence MA123 and MA 124. It also involves replacing the one semester course MA271 Algebraic Structures with a two semester sequence MA271 and MA272, three credits each. Thus we decreases students' requirements by four credits in calculus and increase requirements by three credits in algebraic structures. The senior seminar will increase the requirements by an additional credit, for a net change of zero credits in students' requirements.

Since there is no change in the number of credits required by students, there is no need for additional faculty. The senior seminar will result in an additional preparation, but this is easily handled by assigning a faculty member to teach two sections of a four credit calculus courses, one three credit course, and the senior seminar.

C2 What other resources will be needed to teach this course and how adequate are the current resources? If not adequate, what plans exist for achieving adequacy? Reply in terms of the following: Space; Equipment; Laboratory supplies and other consumable goods; travel funds.

The Mathematics Department will pay for the ETS Major Fields Tests for each student. This cost is approximately thirty dollars per student.

C3 Are any of the resources for this course funded by a grant? If so, what provisions have been made to continue support for this course once the grant has expired? (Attach letters of support from Dean, Provost, etc.)

None of the resources for this course will be funded by a grant.

C4 How frequently do you expect this course to be offered? Is this course particularly designed for or restricted to certain seasonal semesters?

This course will be offered during the spring semester of every academic year.

C5 How many sections of this course do you anticipate offering in any single semester?

One section will be offered each spring. The Mathematics and Applied Mathematics programs together typically have fewer than a dozen graduates each year.

C6 How many students do you plan to accommodate in a section of this course? Is this planned number limited by the availability of any resources? Explain.

In order to serve the purposes of the course, enrollment will be limited to twenty students. It is unlikely we will approach this number in the near future.

C7 Does any professional society recommend enrollment limits or parameters for a course of this nature? If they do, please quote from appropriate documents.

There is no evidence of any professional society recommending enrollment limits for a course of this nature.

Section D: Miscellaneous

No additional information.

I. Catalog Description

MA 480 Senior Seminar — 1 credit, 1 lecture hours (1c-0l-1sh)

Catalog Description:

To assess the effectiveness of the mathematics curriculum and to provide mathematics majors with a culminating mathematical experience.

Prerequisites: Senior standing in a mathematics major

II. Course Objectives

The goals and objective of this course are:

1. to assess student understanding of the nature of mathematics and to extend student understanding of the mathematical experience.
   a. Students will write an essay on the nature of mathematics.
   b. Students will read and report, orally or in writing, on a monograph or article concerning the nature of mathematics.
   c. Students will read and report, orally or in writing, on a short article on a currently active mathematician.
2. to assess student learning - how much and how well do our students know mathematics.
   a. Students will take the ETS Major Field Test in mathematics
3. to assess student mathematical problem solving skills and their knowledge of mathematical problem solving and to clarify and extend their understanding of mathematical problem solving.
   a. Students will be asked to solve a problem involving Mathematical Induction.
   b. Students will be asked to solve a series of mathematical problems which involve the use of various problem solving strategies.
   c. Students will read and report, orally or in writing, on the book *How to Solve it* by Polya.
4. to assess student ability to read, understand, and write mathematics on their own.
   a. Students will read and prepare a written report on a mathematical article.
5. to assess student thinking concerning the mathematics curriculum.
   a. Students will complete a survey instrument concerning various aspects of the mathematics curriculum.

III. Course Outline

Lesson 1:

a. Discussion of administration of the course.
b. Discussion of the nature of mathematics.

Assignment: begin writing an essay on the nature of mathematics.

Lesson 2:

a. Discussion of mathematical articles to read.
b. Discussion of the amount of new mathematics produced each year.
c. Discussion of problems on Mathematical Induction.

Assignment:

i. Work on the Mathematical Induction problem.
ii. Begin reading Hardy, *A Mathematician Apology*.
ii. Look for a mathematics article to read.
iv. Hand in essays next time.

Lesson 3:

a. Collect essays.
b. Initial discussion of Hardy.
c. Discussion of mathematical problem solving.
d. Discussion of survey.

Assignment:

i. begin work on the sequence of mathematical problems.
ii. begin filling out the survey.
iii. Hand in induction problem next class.

Lesson 4:

a. Collect induction problem.
b. Further discussion of Hardy.
c. Further discussion of survey.

Assignment:

i. Hand in survey next class.

Lesson 5.

a. Collect surveys.
b. Return and discuss essays.
c. Return and discuss induction problem.

Assignment:

i. Be prepared to discuss several of the sequence problems.
ii. Have a research article selected and provide instructor with a copy.

Lesson 6.

a. Discussion of research articles.
b. Discussion of several of the sequence problems.

Assignment:

i. Continue to work on the sequence problems.
ii. Begin to read Polya: *How to Solve It.*
iii. Begin reading the research article.

Lessons 7-8.

ETS Major Field Test in Mathematics

Assignment:

i. Hand sequence problems next class.
ii. Continue work on research article.
iii. Continue reading Polya.

Lesson 9.

a. Discussion of selected sequence problems.
b. Initial discussion of Polya.

Assignment:

i. Continue work on research article.
ii. Finish reading Polya.

Lesson 10.

a. Discussion of problem solving strategies used in the sequence problems.
b. Discussion of Polya.

Assignment:

i. Work on research article.

Lesson 11.

a. Discussion of results of the Major Field Test.
b. Discussion of progress on research article.

Assignment:

i. Finish work on research article.

Lessons 12-14.

a. Oral presentations of research articles.
b. Collect written reports on articles.

IV. Evaluation Methods

Written assignments will be evaluated more on the basis of the depth and understanding of the ideas presented than on the manner on which they are written. Because a major goal of the problem assignments is assessment they will be evaluated more on the quality of the problem solving effort put forth than on the correctness of the solution. Classroom discussions will be evaluated on the basis the students understanding of the material assignment and their critical evaluation of that material. The relative weight of each assignment follows:

Essay on the nature of mathematics	20 pts.
Mathematical Induction problem	20 pts.
Discussion on Hardy	20 pts.
Completing the survey	20 pts.
Sequence problems	50 pts.
Discussion of Polya	20 pts.
Research article	
Understanding of material	15 pts.
Oral presentation	15 pts.
Written report	20 pts.
Total points:	200 pts.

The grade in the course will be determined as follows:

A = 180 - 200 pts.
B = 160 - 179 pts.
C = 140 - 159 pts.
D = 120 - 139 pts.
F = less than 120 pts.

V. Required Textbooks

Hardy, G. H., A Mathematician's Apology, New York, NY: Cambridge University Press 1967.

Polya G., How to Solve it, a new aspect of mathematical method, Princeton , New Jersey: Princeton University Press, 1973.

VI. Special Resource Requirements

The library has sufficient up to date journal subscriptions to meet the needs of this course. No other special resources are required.

VII. Bibliography

Cipra, B, What's Happening in the Mathematical Sciences, Vol. I,II,III, Providence, RI: American Mathematical Society, 1993-1995.

Davis, P. J. & Hersh, R., The Mathematical Experience, Boston, MA, Houghton Mifflin Company, 1981.

Gillman, Leonard, Writing Mathematics Well, Washington, D.C.: Mathematical Association of America, 1987.