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INDIANA UNIVERSITY OF PENNSYLVANIA
SENATE CURRICULUM COMMITTEE B-2

NEW COURSE PROPOSAL

Course Prefix and Number: MA 350

Course Title: History of Mathematics

Department: Mathematics

Person to Contact for Further Information: Dr. Marlin E. Hartman

Course Affected: None

Desired Effective Semester for Change: Fall Semester 1987

Approvals:

Department Committee Chairperson

Marlin E. Hartman

Department Chairperson John Broughton

Charles W. Ryan John Burns

School Committee Chairperson

Charles W. Ryan

School Dean

A. DESCRIPTION AND ACADEMIC NEED

A1. See attached catalog description of course.

A2. See attached course syllabus.

A3. This history of mathematics course is intended primarily for mathematics education majors. However, any student who meets the prerequisites, especially mathematics and applied mathematics majors, may enroll in the course. It is not intended for inclusion on the regular General Education course list. It responds to some of the concerns expressed by our external evaluators during our recent departmental self-evaluation and helps our teacher preparation curriculum to be in line with recommendations made in the 1983 report of the CUPM Panel on Teacher Training of the Mathematical Association of America and guidelines developed by the Commission on the Education of Teachers of Mathematics of The National Council of Teachers of Mathematics.

A4. This proposed course is part of a package proposal for revision of the secondary mathematics education program. It does not require changes in content of other existing courses.

A5. This course follows the traditional type of offering by the department.

A6. This course has never been offered at IUP on a trial basis.

A7. This course is not to be a dual-level course.

A8. There are no known institutions of higher education in our general area which currently offer an undergraduate level course in the history of mathematics specifically designed for mathematics education majors.

A9. As stated above, the course was designed following recommendations made by the Committee on the Undergraduate Program of the Mathematical Association of America in its 1983 report entitled "Recommendations on the Mathematical Preparation of Teachers" and according to guidelines developed by the Commission on the Education of Teachers of Mathematics of The National Council of Teachers of Mathematics in their report entitled "Guidelines for the Preparation of Teachers of Mathematics".

B. INTERDISCIPLINARY IMPLICATIONS

B1. This course will be taught by one instructor.

B2. No additional or corollary courses are needed with this course, now or later.

B3. There is no direct relationship of the content of this course to the content of courses offered by other departments.

B4. This course is not applicable in a program of the School of Continuing Education directed to a clientele other than our full-time students.

C. EVALUATION

C1. Written examinations, quizzes, and classroom participation are expected to be used to evaluate student progress. In addition, individual and/or group projects and reports may be used at the discretion of the instructor.

C2. This course may not be taken for variable credit.

D. IMPLEMENTATION

D1. Resources, including faculty, space and library materials, are adequate to teach this course.

D2. At the present time, on the basis of the current number of mathematics education, mathematics and applied mathematics majors, we expect to offer this course once each academic year. If demand necessitates, we would offer the course more frequently.

D3. We presently anticipate one section each time the course is offered.

D4. We plan to accomodate a maximum of 30 students in a section of this course.

E. MISCELLANEOUS

All pertinent information has been included in the above.

COURSE SYLLABUS

Date Submitted: February 28, 1986

Submitted By: Marlin E. Hartman

Department: Mathematics

I. MA 350 History of Mathematics

II. Catalog Description

The history of mathematics is concerned with the origins, philosophy, and development of the mathematical sciences. The prerequisite is completion of a calculus sequence or permission of the instructor. Two lecture hours per week.

III. Course Objectives

The objectives of the history of mathematics course are to provide:

A. An understanding of mathematics both as a science and as an art.

B. The ability to develop a broad concept of the mathematical sciences as approachable from several points of view including

a. problem solving as a basis for the initial development of many concepts;
b. mathematics as a human endeavor, the role of individuals of both sexes with their insights and idiosyncrasies;
c. mathematics as a cultural heritage, the evolving role of mathematics in cultures throughout the world;
d. the impact of social, economic, and cultural forces on mathematical study and creativity;
e. interrelations among the various branches of mathematics, especially their role in the solution of significant problems and in extending the horizons of mathematics; and
f. the dynamic nature of mathematics, including the relatively recent development of probability and statistics and the increasing roles of calculators and computers.

C. Resources for developing the empirical and mathematical origins of several areas of mathematics including the notations, terminology and major topics of algebra, geometry, trigonometry, calculus, number theory, probability, statistics, computer science and non-physical-science applications of mathematics.

IV. Course Outline and Schedule

This history course is to include, but not necessarily be structured according to, the chronological development of the mathematical sciences. The emphasis is to be upon mathematical concepts and their interrelations. The topics suggested below are a sample of the many available and worthwhile possibilities. The number of class hours devoted to each topic is included to suggest approximate emphasis but is expected to vary according to the backgrounds and interests of both students and instructor.

A. INFORMAL ORIGINS (2 hours)

Arithmetic and geometric concepts in early and primitive cultures, mathematical procedures based upon experiences and presented by examples, early numeration systems, the nature and content of the Rhind Mathematical Papyrus and Babylonian cuneiform tablets, extensive uses of tables.

B. THE EARLY DEVELOPMENT OF MATHEMATICS AS A SCIENCE (4 hours)

The work of the early Greek philosophers, the beginning of demonstrative geometry, the Pythagoreans, figurate numbers, commensurable and incommensurable magnitudes, Zeno's paradoxes, Eudoxus' method of exhaustion and theory of proportion, the three famous problems, geometric algebra, postulational thinking, Aristotle's laws and his concern for foundations, Euclid's Elements.

C. MATHEMATICS IN THE GREEK CULTURE AFTER EUCLID (4 HOURS)

Continued efforts to understand the physical universe stimulate many aspects of the progress in mathematics. Note the continued development of geometry, properties of numbers, an early form of algebra, and the work of Archimedes, Eratosthenes, Apollonius, Hipparchus, Claudius Ptolemy, Heron, Diophantus, and Pappus.

D. MATHEMATICS OUTSIDE EUROPE BEFORE 1600 (3 hours)

The mathematics developed in Chinese, Hindu, Arabic and other cultures. Suggested topics include rod numerals, the Chou-pei Suan Ching, the algebraic methods of Chu Shih-chieh, the Sulvasutras, the algebraic methods of Brahmagupta and Bhaskara, the algebra of al-Khowarizmi and Khayyam, and the Arabic contributions through the preservation, compilation, and extension of Greek and Hindu mathematics.

E. MATHEMATICS IN EUROPE BEFORE 1600 (2 hours)

The introduction and transmission of Hindu-Arabic numerals, translations of Euclid's Elements and other manuscripts, development of trigonometry, development of arithmetic and algebraic notations, solutions of cubic and quartic equations, slow acceptance of decimal fractions, and extensions of synthetic geometry.

F. MATHEMATICS IN THE 17TH AND 18TH CENTURIES (5 hours)

Analysis emerges first as algebra and then as calculus. Algebra acquires a significant role. Geometry gives way to analysis as the leading area of activity. Suggested topics are logarithms, theory of equations, theory of numbers, probability, statistics, analytic and synthetic-geometry, the boost from science, calculus, infinite series.

G. MATHEMATICS IN THE 19TH AND 20TH CENTURIES (5 hours)

Non-Euclidean geometry sets the stage for abstract mathematical systems that do not necessarily describe the physical universe. Geometry and algebra evolve into abstract mathematical systems. Set theory and logical foundations are developed. Gradually there is an increased recognition of the importance of each area of mathematics as a useful approach to the study of the mathematical sciences. Statistical methods, the use of computers, and a continued emphasis upon applications are important aspects of the ongoing development of the mathematical sciences.

V. Methodology and Procedure

Classroom lectures and discussions. Individual and/or group reports will also be used at the discretion of the instructor.

VI. Probable Texts

Eves, Howard, Great Moments in Mathematics (Before 1650). Dolciani Mathematical Expositions, Number Five, Mathematical Association of America, Washington, DC, 1980.

Eves, Howard, Great Moments in Mathematics (Since 1650). Dolciani Mathematical Expositions, Number Seven, Mathematical Association of America, Washington, DC, 1982.

VII. Other Readings

Selected readings at the discretion of the instructor (see bibliography).

VIII. Evaluation

Examinations, quizzes, and classroom participation, including individual and/or group reports.

IX. Scholarly Papers/Research Requirements

None.

X. Supplemental/Field Experiences

None.

XI. Other requirements that have not been specified above

None.

BIBLIOGRAPHY

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