LSC Use Only
Number: 237
Submission Date:
Action-Date:

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LIBERAL STUDIES

UWUCC USE Only
Number: 01-62d
Submission Date:
Action-Date: UWUCC App 4/9/02
Senate App 5/7/02

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

I. CONTACT

Contact Person Gerald Buriok Phone 7 2608

Department Mathematics

II. PROPOSAL TYPE (Check All Appropriate Lines)

X COURSE MATH 122 Calculus II / NatSci SocSci
Suggested 20 character title

___ New Course* _____
Course Number and Full Title

X Course Revision MATH 122 Calculus II for Business, Natural and Social Sciences
Course Number and Full Title

RECEIVED
APR - 4 2002
LIBERAL STUDIES

___ 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

X Course or Catalog Description Change MATH 122 Calculus II for Business, Natural and Social Sciences
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)

Gary L Stuval 10/1/01
Department Curriculum Committee

Gerald Buriok 10/1/01
Department Chair

[signature] 02/26/02
College Curriculum Committee

[signature] 2-27-02
College Dean

Mary Sadler 4-1-02
+Director of Liberal Studies (where applicable)

*Provost (where applicable)

I. Catalog Description

MATH 122 Calculus II for Natural and Social Sciences

4 credits
4 lecture hours
0 lab hours
(4c-0l-4sh)

Prerequisites: MATH 121.

Applications of integrals to natural and social sciences, functions of several variables, trigonometric functions, sequences and series, numerical methods, differential equations.

II. Course Objectives

1. Students will understand and take advantage of pattern recognition in the study of mathematics.
2. Students will make a careful study of trigonometric functions, functions of several variables, and their application to the natural and social sciences.
3. Students will understand how to interpret these functions expressed analytically and graphically.
4. Students will understand the limit of sequences and series and how they pertain to the natural and social sciences.
5. Students will be able to calculate the partial derivative of a function and interpret its meaning.
6. Students will be able to calculate the multiple integral of a function and interpret its meaning.
7. Students will leave the course with a solid set of skills and a conceptual framework to equip the students for future study.

III. Course Outline

It is expected that six (6) hours will be spent reviewing differentiation and integration techniques before proceeding.

A. Calculus of Several Variables (12 hours)
   1. Functions of Several Variables
   2. Partial Derivatives
   3. Optimizing Functions of Several Variables
   4. Least Squares
   5. Lagrange Multipliers and Constrained Optimization
   6. Total Differentials and Approximate Changes
   7. Multiple Integrals

B. Trigonometric Functions (10 hours)
   1. Triangles, Angles, and Radian Measure
   2. Sine and Cosine Functions
   3. Derivatives of Sine and Cosine Functions
   4. Integrals of Sine and Cosine Functions
   5. Other Trigonometric Functions

C. Differential Equations (8 hours)
   1. Separation of Variables
   2. Further Applications of Differential Equations
   3. First-Order Linear Differential Equations
   4. Approximate Solutions of Differential Equations

D. Sequences and Series (6 hours)
   1. Geometric Series
   2. Taylor Polynomials
   3. Taylor Series
   4. Newton's Method

E. Probability (6 hours)
   1. Discrete Probability
   2. Continuous Probability
   3. Uniform and Exponential Random Variables
   4. Normal Random Variables

The remaining eight hours are for four review classes and four tests.

IV. Method of Instruction

This course is taught in a traditional classroom setting involving lecture, student participation in class, homework assignments, and written in class evaluations. Instructors are free to assign optional projects that may or may not involve graphing technology.

V. Evaluation Methods

The final grade for the course will be determined as follows:

50% Tests. Tests will include problems on basic competency and critical thinking.
20% Final Examination. The final examination will be comprehensive and cover both basic competency and critical thinking.
30% Homework, Quizzes, and Projects. These will cover textbook assignments and applications.

Grades will be assigned as follows:

A: 90%-100%
B: 80%-89%
C: 70%-79%
D: 60-69%
F: 0%-59%

VI. Required Textbook

Berresford, Geoffrey C. and Andrew M. Rockett. Applied Calculus (2nd edition). Boston: Houghton Mifflin Publishing Company, 2000.

VII. Special Resource Requirements

Some instructors may require students to purchase a graphing calculator.

VIII. Bibliography

Committee on the Mathematical Sciences in the Year 2000. Everybody Counts: A Report to the Nation on the Future of Mathematics Education. Washington, DC : National Academy Press, 1989.

Hughes-Hallet, Deborah, et al. Applied Calculus. New York: John Wiley & Sons, Inc., 1999.

Ostebee, Arnold, and Paul Zorn. Calculus from Graphical, Numerical, and Symbolic Points of View. Stamford, CT: Harcourt, 1997.

IX. Student Enrollment

This course is offered every semester and the average enrollment is 20 students.

Part II. Description of Curriculum Change.

1. New syllabus of record. (Attached.)

2. Summary of proposed revisions.

The proposed changes are in the prerequisite, where "MATH 121 or equivalent" is being added, and in the title, where the word "Business" is being deleted.

a. Proposed new catalog description:

MATH 122 Calculus II for Natural and Social Sciences **4c-0l-4sh**

Prerequisite: MATH 121.

Applications of integrals to natural and social sciences, functions of several variables, trigonometric functions, sequences and series, numerical methods, differential equations.

b. Old catalog description:

MATH 122 Calculus II for Business, Natural and Social Sciences **4c-0l-4sh**

Applications of integrals to natural and social sciences, functions of several variables, trigonometric functions, sequences and series, numerical methods, differential equations.

3.Justification/rationale for the Change.

MATH 121/122 is a two-semester sequence where the first half of the textbook is covered in MATH 121 and the second half in MATH 122. Understanding course material from MATH 121 is necessary in order to understand course material in MATH 122. The fact that MATH 121 or equivalent is not currently listed as a prerequisite for MATH 122 is an error we wish to correct.

The Mathematics Department developed a new course for students in the College of Business, namely MATH 115 Applied Mathematics for Business. This new course will be required instead of MATH 121 for business students. Thus "Business" is being removed from the title of both courses in the MATH 121/122 sequence, and business applications will be de-emphasized in the course.

4. Old syllabus of record. (Attached.)

5. Liberal Studies course approval form and checklist. (Attached.)

Part III. Letters of Support. (Attached.)

MA 122 Syllabus

Mathematics Department
Indiana University of Pennsylvania
Indiana, PA 15705

Course Number: MA 122

Course Title: Calculus II for Business, Natural, and Social Sciences

Credits: 4 semester hours

Prerequisites: MA 121

Textbook: **Applied Calculus**, 3rd ed.
by Dennis Berkey
Saunders College Publishing

Revised: 4/96

Catalog Description:

Applications of integrals to business, natural, and social sciences, functions of several variables, trigonometric functions, sequences and series, numerical methods, differential equations.

Course Outline/Sample Time Schedule:

6. Trigonometric Functions
Please note that with the changes in the precalculus/college algebra courses, this will not be a review once the new courses go into effect.

6.1	Radian Measure	(1 hour)
6.2	The Sine and Cosine Functions	(2 hours)
6.3	Derivatives of sin x and cos x	(2 hours)
6.4	Integrals of Sine and Cosine	(1 hours)
6.5	Other Trigonometric Functions	(2 hours)

7. Techniques of Integration

7.1	Review of Method of Substitutions	(1 hour)
7.2	Integration by Parts	(1 hour)
7.3	The Use of Integral Tables	(1 hour)
7.4	Improper Integrals	(2 hours)
7.5	Rules for Approximating Integrals	(1 hour)

8. Functions of Several Variables

8.1	Functions of Several Variables	(1 hour)
8.2	Partial Derivatives	(2 hours)
8.3	Relative Maxima and Minima	(2 hours)
8.4	Optimization Problems with Constraints	(2 hours)
8.6	The Method of Least Squares	(2 hour)
8.8	Double Integrals	(2 hour)

9. Infinite Series

9.1	Infinite Sequences	(1 hour)
9.2	Infinite Series	(1 hour)
9.3	Tests for Convergence	(2 hours)
9.4	The Ratio Test and Absolute Convergence	(2 hours)
9.5	Taylor Polynomials	(2 hours)
9.6	Taylor's Theorem	(2 hours)
9.7	Taylor Series	(2 hours)

9.8 Newton's Method (Optional) (1 hour)

10. Differential Equations
- 10.1 Introduction to Differential Equations (1 hour)
- 10.2 Applications to Population Growth (1 hour)
- 10.3 Separation of Variables (1 hour)
- 10.4 Second Order Equations (1 hour)
- 10.5 Qualitative Theory of Differential Equations (1 hour)
- 10.6 Approximating Solutions to Differential Equations (1 hour)

11. Applications to Probability Theory
- 11.1 Discrete Probability Distributions (2 hours)
- 11.2 Continuous Probability Distributions (1 hour)
- 11.3 The Normal Probability Distribution (1 hour)
- 11.4 The Exponential Probability Distribution (1 hour)

This syllabus covers 49 hours of class time This leaves 7 hours for tests and to devote extra time to topics that may give students difficulty, or to extra topics.

Note: If you wish to use a graphing calculator in this course, you must notify the chairperson of the Service Courses Committee one semester in advance so that a note to this effect can be included in the Course Schedule for students.

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Read this disclaimer.

Maintained by H. Edward Donley <hedonley@grove.iup.edu>
Last Modified on Friday, 06-Sep-96 18:20:16 EDT

LIBERAL STUDIES COURSE APPROVAL, PARTS 1-3: GENERAL INFORMATION CHECK-LIST

I. Please indicate the LS category(ies) for which you are applying:

LEARNING SKILLS:

____ First Composition Course	____ Second Composition Course
____ Mathematics	

KNOWLEDGE AREAS:

____ Humanities: History	____ Fine Arts
____ Humanities: Philos/Rel Studies	____ Social Sciences
____ Humanities: Literature	____ Non-Western Cultures
____ Natural Sci: Laboratory	____ Health & Wellness
____ Natural Sci: Non-laboratory	✓ Liberal Studies Elective

II. Please use check marks to indicate which LS goals are primary, secondary, incidental, or not applicable. When you meet with the LSC to discuss the course, you may be asked to explain how these will be achieved.

Prim	Sec	Incid	N/A	
				A. Intellectual Skills and Modes of Thinking:
✓				1. Inquiry, abstract logical thinking, critical analysis, synthesis, decision making, and other aspects of the critical process.
	✓			2. Literacy--writing, reading, speaking, listening.
✓				3. Understanding numerical data.
		✓		4. Historical consciousness.
✓				5. Scientific Inquiry.
			✓	6. Values (Ethical mode of thinking or application of ethical perception).
		✓		7. Aesthetic mode of thinking.
			✓	**B. Acquiring a Body of Knowledge or Understanding Essential to an Educated Person**
			✓	**C. Understanding the Physical Nature of Human Beings**
				D. Collateral Skills:
			✓	1. Use of the library.
	✓			2. Use of computing technology.

III. The LS criteria indicate six ways that courses should contribute to students' abilities. Please check all that apply. When you meet with the LSC, you may be asked to explain your check marks.

____ 1. Confront the major ethical issues which pertain to the subject matter; realize that although "suspended judgment" is a necessity of intellectual inquiry, one cannot live forever in suspension; and make ethical choices and take responsibility for them.

✓ 2. Define and analyze problems, frame questions, evaluate available solutions and make choices.

✓ 3. Communicate knowledge and exchange ideas by various forms of expression, in most cases writing and speaking.

✓ 4. Recognize creativity and engage in creative thinking.

✓ 5. Continue learning even after the completion of their formal education.

✓ 6. Recognize relationships between what is being studied and current issues, thoughts, institutions, and/or events.

Liberal Studies Course Approval , Parts 4 - 6:

IV.

A. MATH 122 is not a multiple-section course. Currently one section of MATH 122 is offered each semester.

B. Whenever appropriate, information will be introduced which will reflect the contributions made to mathematics by women and racial minorities.

C. The Mathematics Department wishes to exercise the exception and claim that the primary purpose of this course is the development of higher level quantitative skills. The syllabus for MATH 122 was developed to provide students with basic knowledge of calculus in order that they may apply it in upper division courses in their majors. Success in these courses requires an understanding of descriptive and analytical approaches to problem solving.

D. MATH 122 is the second half of an introductory calculus sequence, and is a continuation of MATH 121. Basic concepts of calculus are introduced in this course for the purpose of developing analytical and quantitative skills which can be applied in upper level courses, particularly those related to natural sciences.

CHECK LIST -- LIBERAL STUDIES ELECTIVES

Knowledge Area Criteria which the course must meet:

✓ Treat concepts, themes and events in sufficient depth to enable students to appreciate the complexity, history and current implications of what is being studied; and not be merely cursory coverage of lists of topics.

✓ Suggest the major intellectual questions/problems which interest practitioners of a discipline and explore critically the important theories and principles presented by the discipline.

✓ Allow students to understand and apply the methods of inquiry and vocabulary commonly used in the discipline.

✓ Encourage students to use and enhance, wherever possible, the composition and mathematics skills built in the Skill Areas of Liberal Studies.

Liberal Studies Elective Criteria which the course must meet:

✓ Meet the "General Criteria Which Apply to All Liberal Studies Courses."

✓ Not be a technical, professional or pre-professional course.

Explanation: Appropriate courses are to be characterized by learning in its broad, liberal sense rather than in the sense of technique or preprofessional proficiency. For instance, assuming it met all the other criteria for Liberal Studies, a course in "Theater History" might be appropriate, while one in "The Craft of Set Construction" probably would not; or, a course in "Modern American Poetry" might be appropriate, while one in "New Techniques for Teaching Writing in Secondary Schools" probably would not; or, a course on "Mass Media and American Society" might be appropriate, while one in "Television Production Skills" probably would not; or, a course in "Human Anatomy" might be appropriate, while one in "Strategies for Biological Field Work" probably would not; or, a course in "Intermediate French" might be appropriate, while one in "Practical Methods for Professional Translators" probably would not.

01-62d

Mathematics Department Curriculum Changes

Response Form

✓ The Mathematics Department has informed me of the proposed changes listed below, and I support these changes.

___ The Mathematics Department has informed me of the proposed changes listed below, and I do not support these changes.

Comments:

MANAGEMENT
Department

Prof. B.W 5/31/2001
Chairperson / Date

1. MATH 105 College Algebra: Change in prerequisite.

2. MATH 121 Calculus I for Business, Natural and Social Sciences: Change in prerequisite, catalog description, and title.

3. MATH 122 Calculus II for Business Natural and Social Sciences: Change in prerequisite and title.

Mathematics Department Curriculum Changes

Response Form

✓ The Mathematics Department has informed me of the proposed changes listed below, and I support these changes.

___ The Mathematics Department has informed me of the proposed changes listed below, and I do not support these changes.

Comments:

Accounting
Department

Chairperson / Date 6/1/01

1. MATH 105 College Algebra: Change in prerequisite.

2. MATH 121 Calculus I for Business, Natural and Social Sciences: Change in prerequisite, catalog description, and title.

3. MATH 122 Calculus II for Business Natural and Social Sciences: Change in prerequisite and title.

Mathematics Department Curriculum Changes

Response Form

✓ The Mathematics Department has informed me of the proposed changes listed below, and I support these changes.

___ The Mathematics Department has informed me of the proposed changes listed below, and I do not support these changes.

Comments:

Finance & Legal Studies
Department

Ibrahim Affaneh 6/1/01
Chairperson / Date

1. MATH 105 College Algebra: Change in prerequisite.

2. MATH 121 Calculus I for Business, Natural and Social Sciences: Change in prerequisite, catalog description, and title.

3. MATH 122 Calculus II for Business Natural and Social Sciences: Change in prerequisite and title.

Mathematics Department Curriculum Changes

Response Form

✓ The Mathematics Department has informed me of the proposed changes listed below, and I support these changes.

___ The Mathematics Department has informed me of the proposed changes listed below, and I do not support these changes.

Comments:

Maorong

Maorong Department

June 13, 2001

Chairperson / Date

1. MATH 105 College Algebra: Change in prerequisite.

2. MATH 121 Calculus I for Business, Natural and Social Sciences: Change in prerequisite, catalog description, and title.

3. MATH 122 Calculus II for Business Natural and Social Sciences: Change in prerequisite and title.

Mathematics Department Curriculum Changes

Response Form

X The Mathematics Department has informed me of the proposed changes listed below, and I support these changes.

___ The Mathematics Department has informed me of the proposed changes listed below, and I do not support these changes.

Comments:

Safety Sciences
Department

Lon H. Ferguson 5/31/01
Chairperson / Date

1. MATH 105 College Algebra: Change in prerequisite.

2. MATH 121 Calculus I for Business, Natural and Social Sciences: Change in prerequisite, catalog description, and title.

3. MATH 122 Calculus II for Business Natural and Social Sciences: Change in prerequisite and title.

Mathematics Department Curriculum Changes

Response Form

✓ The Mathematics Department has informed me of the proposed changes listed below, and I support these changes.

___ The Mathematics Department has informed me of the proposed changes listed below, and I do not support these changes.

Comments:

Spanish & Classical Lang
Department

R. Roger Smith 6-4-01
Chairperson / Date

1. MATH 105 College Algebra: Change in prerequisite.

2. MATH 121 Calculus I for Business, Natural and Social Sciences: Change in prerequisite, catalog description, and title.

3. MATH 122 Calculus II for Business Natural and Social Sciences: Change in prerequisite and title.

Mathematics Department Curriculum Changes

Response Form

✓ The Mathematics Department has informed me of the proposed changes listed below, and I support these changes.

___ The Mathematics Department has informed me of the proposed changes listed below, and I do not support these changes.

Comments:

GEOGRAPHY
Department

8/1/01
Chairperson / Date

1. MATH 105 College Algebra: Change in prerequisite.

2. MATH 121 Calculus I for Business, Natural and Social Sciences: Change in prerequisite, catalog description, and title.

3. MATH 122 Calculus II for Business Natural and Social Sciences: Change in prerequisite and title.

Mathematics Department Curriculum Changes

Response Form

✓ The Mathematics Department has informed me of the proposed changes listed below, and I support these changes.

___ The Mathematics Department has informed me of the proposed changes listed below, and I do not support these changes.

Comments:

Nursing and Allied Health Professions
Department

Chairperson / Date 6-4-01

1. MATH 105 College Algebra: Change in prerequisite.

2. MATH 121 Calculus I for Business, Natural and Social Sciences: Change in prerequisite, catalog description, and title.

3. MATH 122 Calculus II for Business Natural and Social Sciences: Change in prerequisite and title.

Mathematics Department Curriculum Changes

Response Form

✓ The Mathematics Department has informed me of the proposed changes listed below, and I support these changes.

___ The Mathematics Department has informed me of the proposed changes listed below, and I do not support these changes.

Comments:

Biology
Department

W. Bo Bo 8/7/01
Chairperson / Date

1. MATH 105 College Algebra: Change in prerequisite.

2. MATH 121 Calculus I for Business, Natural and Social Sciences: Change in prerequisite, catalog description, and title.

3. MATH 122 Calculus II for Business Natural and Social Sciences: Change in prerequisite and title.

Mathematics Department Curriculum Changes

Response Form

___ The Mathematics Department has informed me of the proposed changes listed below, and I support these changes.

___ The Mathematics Department has informed me of the proposed changes listed below, and I do not support these changes.

Comments:

Computer Science
Department

Gary L Britenbaugh Jan 18, 2001
Chairperson Date

1. MATH 105 College Algebra: Change in prerequisite.

2. MATH 121 Calculus I for Business, Natural and Social Sciences: Change in prerequisite, catalog description, and title.

3. MATH 122 Calculus II for Business Natural and Social Sciences: Change in prerequisite and title.

Mathematics Department Curriculum Changes

Response Form

✓ The Mathematics Department has informed me of the proposed changes listed below, and I support these changes.

___ The Mathematics Department has informed me of the proposed changes listed below, and I do not support these changes.

Comments:

Geoscience
Department

Darlene Richardson 6/13/01
Chairperson / Date

1. MATH 105 College Algebra: Change in prerequisite.

2. MATH 121 Calculus I for Business, Natural and Social Sciences: Change in prerequisite, catalog description, and title.

3. MATH 122 Calculus II for Business Natural and Social Sciences: Change in prerequisite and title.

Mathematics Department Curriculum Changes

Response Form

✓ The Mathematics Department has informed me of the proposed changes listed below, and I support these changes.

___ The Mathematics Department has informed me of the proposed changes listed below, and I do not support these changes.

Comments:

Physics
Department

Richard O. Roberts 6/8/01
Chairperson / Date

1. MATH 105 College Algebra: Change in prerequisite.

2. MATH 121 Calculus I for Business, Natural and Social Sciences: Change in prerequisite, catalog description, and title.

3. MATH 122 Calculus II for Business Natural and Social Sciences: Change in prerequisite and title.

Mathematics Department Curriculum Changes

Response Form

✓ The Mathematics Department has informed me of the proposed changes listed below, and I support these changes.

___ The Mathematics Department has informed me of the proposed changes listed below, and I do not support these changes.

Comments:

Chemistry
Department

Russ VanJoosen Ramsey
Chairperson / Date

August 29, 2001

1. MATH 105 College Algebra: Change in prerequisite.

2. MATH 121 Calculus I for Business, Natural and Social Sciences: Change in prerequisite, catalog description, and title.

3. MATH 122 Calculus II for Business Natural and Social Sciences: Change in prerequisite and title.

Mathematics Department Curriculum Changes

Response Form

✓ The Mathematics Department has informed me of the proposed changes listed below, and I support these changes.

___ The Mathematics Department has informed me of the proposed changes listed below, and I do not support these changes.

Comments:

MIS/DS
Department

Laurie B Beeby 9/25/01
Chairperson Date

1. MATH 105 College Algebra: Change in prerequisite.

2. MATH 121 Calculus I for Business, Natural and Social Sciences: Change in prerequisite, catalog description, and title.

3. MATH 122 Calculus II for Business Natural and Social Sciences: Change in prerequisite and title.

To: Dr. Charles McCreary, Chairperson
French/German Department

From: Gerald Buriok, Chairperson
Mathematics Department

Date: September 13, 2001

Subject: Proposed Mathematics Curricula Revisions

Attached to this memo is a copy of proposed mathematics curricula revisions that may affect your department. This is the same material that was originally sent to your department on June 1, 2001. Professor Op De Beeck returned the original with a note saying I should send them to Dr. Liscinsky later in the summer. Considering the unfortunate events that occurred, I have held off until now.

Please consider these proposed revisions and return the response form to me at your earliest convenience.

Jerry Buriok

From: Jerry Buriok <jburiok@grove.iup.edu>
To: <karatjas@iup.edu>
Cc: Jerry Buriok <jburiok@grove.iup.edu>
Sent: Friday, July 06, 2001 8:37 AM
Subject: Math Curriculum Proposals

Hi Nick,

I haven't heard back from you about the curriculum proposals for MATH 105, 110, 121, 122, 123, 124 that I sent out around the first of June. Any chance you could dig those out and fill out the response form I provided? If you can't find them, let me know and I will send another copy.

Jerry Buriok