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Action-Date: App. 12/16/97

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

Senate app. 2/3/98

I. CONTACT

Contact Person Gerald Buriok Phone 2608

Department Mathematics

II. PROPOSAL TYPE (Check All Appropriate Lines)

X .COURSE MA 123 Calc I Phys/Chem
Suggested 20 character title

____ New Course* _____
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

X Number and/or Title Change MA 123 Calculus I for Physics and Chemistry
Old Number and/or Full Old Title

~~MA 123 Calculus I for Physics, Chemistry, and~~ Mathematics
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 — 9/14/97

Department Chair — 9/14/97

College Curriculum Committee — 10/15/97

College Dean — 10/15/97

÷Director of Liberal Studies (where app

Provost (where applicable)

Part II. Description of Curriculum Change

1. New syllabus of record - attached.

2. A summary of the proposed revisions.

The Mathematics Department currently offers three calculus sequences:

MA 121/122 Calculus for Natural, Social Science, and Business (4 sh. each)
MA 123/124 Calculus for Physics and Chemistry (4 sh. each)
MA 127/128/227 Calculus (4 sh. each).

Majors in Mathematics and Applied Mathematics have been required to take the three semester sequence MA 127/128/227, while majors in Secondary Mathematics Education have had the option of taking this three semester sequence or taking the two semester sequence MA 123/124. The faculty of the Mathematics Department have chosen to eliminate the MA 127/128/227 sequence and require majors in all three programs to complete MA 123/124 instead. We are proposing that the course titles be changed to:

MA 123 Calculus I for Physics, Chemistry, and Mathematics
MA 124 Calculus II for Physics, Chemistry, and Mathematics

3. The current course titles will no longer be appropriate. In addition to Physics and Chemistry majors, students in the three mathematics programs will be required to take MA 123/124. Proposed name change would reflect the change in clientel for the courses.

4. The old syllabus of record

5. Liberal Studies course approval form and checklist (if appropriate).
This is a name change only. Course content will not be affected.

Part III. Letters of Support

I Catalog Description

MA 123 Calculus I for Physics, Chemistry and Mathematics — 4 credits, 4 lecture hours (4c-0l-4sh)

Prerequisites: Algebra, geometry and trigonometry. (MA 110 or the equivalent)

Intended for math and science majors, coverage includes: functions, limits, continuity, derivatives, applications of derivative, integrals and applications of the integral. (Trigonometric, exponential and logarithmic functions are included throughout the course.)

II Course Objectives

1. Students will learn the intuitive concept of a limit and be able to calculate limits both from a graph and from algebraic manipulation.
2. Students will learn the concept of derivative as both a slope of a tangent line and a rate of change.
3. Students will be able to calculate derivatives of algebraic and transcendental functions using sum, product, quotient and chain rules.
4. Students will learn the concept of integral as an area under a curve and as a limit of sums.
5. Students will be able to calculate integrals using the fundamental theorem of calculus and methods of substitution.
6. Students will develop skills in converting written applied problems into mathematical models and solving them using methods of differential calculus.
7. Students will develop skills in using technology appropriately as an aid to problem solving.

III Course Outline

Coverage: Chapters 2 through 8 with the exception of 4.2 and 8.5, with chapter 7 assimilated into earlier chapters.

CHAPTER 1 Functions and Graphs (1 hour)
The instructor should prepare a brief review of concepts related to functions and their graphs as well as an introduction to calculus. (Use your own discretion here.)
Possible problems to assign may include some of the following:

1.1 Functions and Real Numbers
Problems pp. 11-13 (1, 4, 6, 10, 13, 14, 16, 17, 25, 27, 29, 39, 42, 47, 54, 57, 61, 69)

1.2 The Coordinate Plane and Straight Lines
Problems pp. 22-23 (3, 6, 8, 10, 14, 19, 22, 25, 29, 35, 36, 43)

1.3 Graphs of Equations and Functions
Problems pp. 30-31 (3, 4, 9, 10, 13, 23, 27, 35, 41, 43, 49, 53, 55)

1.4 A Brief Catalog of Functions
Problems pp. 40-41 (5, 9, 13, 16, 22, 23, 28, 31, 34)

1.5 A Preview What Is Calculus?

NOTE STUDENTS SHOULD BE ADVISED TO LOOK OVER AND WORK SOME OF THE MISCELLANEOUS PROBLEMS ON PAGES 47-48.

CHAPTER 2 PRELUDE TO CALCULUS (4 hours)
Possible problems to assign may include some of the following

2.1 Tangent Lines and the Derivative - A First Look
Problems pp. 57-59 (3, 5, 8, 11, 15, 18, 21, 24, 28, 31, 35, 36, 37, 38, 42, 46, 49)

2.2 The Limit Concept
Problems p. 69 (1-29 odd, 32, 35, 38, 40, 41, 43, 46, 49, 51)

2.3 More about Limits
Problems pp. 80-81 (1-27 odd, 30, 34, 35, 41, 48, 49, 55, 61, 64, 66)

2.4 The Concept of Continuity
Problems pp. 90-91 (2, 6, 8, 11, 18, 21, 27, 33, 39, 44, 47, 52, 54, 57, 59, 62, 67)

NOTE: POSSIBLE REVIEW PROBLEMS MAY BE FOUND IN THE MISCELLANEOUS PROBLEMS SECTION ON PAGES 92-93.

CHAPTER 3 THE DERIVATIVE (10 hours)

3.1 The Derivative and Rates of Change
Problems pp. 105-106 (2, 3, 5, 9, 14, 17, 20, 23, 24, 29, 31, 35, 37, 39, 43, 45)

3.2 Basic Differentiation Rules
Problems pp. 115-117 (1-71 every other odd)

3.3 The Chain Rule
Problems pp. 124-125 (1-63 odd - OR every other odd)

3.4 Derivatives of Algebraic Functions
Problems pp. 129-131 (1-59 odd -OR every other odd)

3.5 Maxima and Minima of Functions on Closed Intervals
Problems pp. 138-139 (1-51 odd)

3.6 Applied Maximum-Minimum Problems
Problems pp. 149-154 (1-7odd,11,12,14, 16, 19, 21, 25-27, 30, 33, 335, 38, 42, 46-48)

3.7 Derivatives of Trigonometric Functions
Problems pp. 161-164 (1-71 e.o.o.)

3.8 Exponential and Logarithmic Functions (NOTE: Add problems from 7.2 & 7.3)
Problems pp. 173-174 (1-57 e.o.o.)
and pp. 418-419 (1-31 e.o.o, 51, 55); pp. 425-426 (1-35 e.o.o, 55, 59,63)

3.9 Differentiation and Related Rates
Problems pp. 180-183 (1-27 odd, 35, 37, 45, 49, 55, 59, 63)

3.10 Successive Approximations and Newton's Method
Problems pp. 192-194 (3, 7, 11, 17, 18, 21, 25, 29, 31, 34, 37, 38)

CHAPTER 4 ADDITIONAL APPLICATIONS OF THE DERIVATIVE (4 hours)
Possible problems to assign may include some of the following:

4.3 Increasing and Decreasing Functions and the Mean Value Theorem
Probs pp. 218-20 (3,4,8,9,12, 15, 18, 21, 22, 25, 26, 30, 33, 36, 38, 43, 44, 49, 55, 57)

4.4 The First Derivative Test & 4.5 Simple Curve Sketching
Problems pp. 228-230 (1, 7, 11, 15, 18, 21, 23, 27, 30, 33, 36, 44, 46)
AND pp. 237-238 (2, 3, 7, 11, 15, 19, 20, 29, 39, 43)

4.6 Higher Derivatives and Concavity
Probs pp. 250-253 (2,3,8,9,13, 17, 21, 23, 27, 30, 35, 38, 41, 47, 51, 65, 73,77,80, 81)

4.7 Curve Sketching and Asymptotes
Problems pp. 261-262 (1-29 odd, 34, 41, 47, 55)

CHAPTER 5 THE INTEGRAL (7 hours)
Possible problems to assign may include some of the following:

5.1 Introduction

5.2 Antiderivatives and Initial Value Problems
Problems pp. 278-280 (1-29odd, 35-45 odd, 47,49,57, 65)

5.3 Elementary Area Computations (light coverage)
Problems pp. 290-291 (1,5,9,13,17,19,23,25,35,37)

5.4 Riemann Sums and the Integral (light coverage)
Problems pp. 298-299 (1,5,9,11,15,43,45,47)

5.5 Evaluation of Integrals (light coverage, emphasize Fund. Thm of Calc in 5.6)
Problems pp. 307-308 (1-35 odd)

5.6 Average Values and the Fundamental Theorem of Calculus
Problems pp. 316-318 (1, 5, 9, 11, 13-27 odd, 29, 31, 35, 41, 43, 45, 51-59 odd)

5.7 Integration by Substitution
Problems pp. 323-325 (1-43 odd, 45, 46, 49)

5.8 Areas of Plane Regions
Problems pp. 332-334 (1, 4, 5, 10, 11, 13, 15, 18, 20, 21-41 odd, 45)

5.9 Numerical Integration
Problems pp. 345-347 (1, 3, 5, 13, 15, 17, 21, 23)

CHAPTER 6 APPLICATIONS OF THE INTEGRAL (6 hours)
Possible problems to assign may include some of the following:

6.1 Setting up Integral Formulas
Problems pp. 359-360 (1, 5, 9, 11, 13, 15, 19, 21, 25, 27, 29, 31, 33, 34, 37)

6.2 Volumes by the Method of Cross Sections
Problems pp. 368-371 (1-25 odd, 29, 31, 33, 34, 39, 43)

6.3 Volume by the Method of Cylindrical Shells
Problems pp. 377-378 (1-9 odd, 15, 17, 19, 23, 25, 31, 35)

6.4 Arc Length and Surface Area of Revolution (optional)
Problems pp. 386-387 (1-9 odd, 11, 12, 15, 17, 18, 21, 23, 27, 29, 31, 35)

6.5 Separable Differential Equations
Problems pp. 394-395 (1-19 odd, 21, 23, 27, 29, 21, 33)
Problems pp. 441-442 (3, 5, 10, 13, 15, 17, 19)

6.6 Force and Work
Problems pp. 403-405 (1-13 odd, 17, 19, 23, 25, 29, 31)

CHAPTER 7 MORE EXPONENTIAL AND LOGARITHMIC FUNCTIONS (Omitted)
Note: Problems from sections 7.2, 7.3 and 7.5 included in sections on derivatives and integrals.

CHAPTER 8 FURTHER CALCULUS OF TRANSCENDENTAL FUNCTIONS (3 hours)
Possible problems to assign may include some of the following:

8.1 Introduction

8.2 Inverse Trigonometric Functions
Problems pp. 461-462 (1-25 odd, 27, 31-55 odd, 59, 61, 63)

8.3 Indeterminate Forms and L'Hopital's Rule
Problems pp. 466-467 (1-47 odd)

8.4 Additional Indeterminate Forms
Problems pp. 471-472 (1-33 odd, 39)

IV Evaluations Methods

Evaluation for the course will typically consist of following breakdown:

3 or 4 exams	60%
Quizes	10%
Projects/Assingments	10%
Comprehensive Final	20%

Reading Program: The following articles should be required reading.

1. Judith Grabiner: The Changing Concept of Change: The derivative from Fermat to Weierstrass.
2. Lars Garding: The Heroic Century.
3. Eric Temple Bell: On the Seashore.

V Required Text Book

Edwards, C.H. Jr & Penney, David, *Calculus with Analytic Geometry* (Early Transcendental Version), 4th Ed. Pretice Hall, 1994.

VI Special Resource Requirements

None

VII Bibliography

Swokoswki, Earl, et.al., *Calculus*, 6th Edition, PWS Publishing Co., 1994.

Anton, Howard, *Calculus* 5/E., John Wiley & Sons, 1995.

Stewart, James, *Calculus*, 3rd Ed., Brooks/Cole Publishing Co., 1994.

From: GROVE::JBURIOK
To: CCULLUM
CC: JBURIOK
Subj: More on Math LS Questions

Charles: I contacted Darlene Richardson again, and here is a memo regarding MA 123/124 name changes. Please let me know if I have satisfied the request from the Screening Committee or not.

Jerry_Buriok

From: GROVE::DRCHRDSN "Darlene Richardson, Liberal Studies" 14-NOV-1997 16 :23:26.22
To: GROVE::JBURIOK
CC: DRCHRDSN
Subj: RE: LS questions - Screening Committee

i, Gerry. The Liberal Studies Office accepts the change in the titles of MA 123 and MA 124. The content, objectives, and statements regarding liberal studies criteria are not changing. Thanks for the memo. Darlene

To: Gerald Buriok, Chairperson
Mathematics Department
233 Stright Hall

Subject: Change MA123/124 Titles

I understand that the Mathematics Department has decided to require students in the Mathematics, Applied Mathematics, and Secondary Mathematics Education programs to take the calculus sequence MA123/124 instead of MA127/128/227. I have been informed of the proposal to change the course titles for MA123 and MA124 to reflect the inclusion of these students. I support changing the titles for MA123 Calculus I for Physics and Chemistry and MA124 Calculus II for Physics and Chemistry to MA123 Calculus I for Physics, Chemistry, and Mathematics and MA124 Calculus II for Physics, Chemistry, and Mathematics, respectively.

Name Richard D. Roberts

Department Physics

Date March 17, 1997

The Physics Department does have some concerns about the future direction that MA 123 and MA 124 will take after mathematics majors are in these courses. This is something that we will need to monitor.

To: Gerald Buriok, Chairperson
Mathematics Department
233 Stright Hall

Subject: Change MA123/124 Titles

I understand that the Mathematics Department has decided to require students in the Mathematics, Applied Mathematics, and Secondary Mathematics Education programs to take the calculus sequence MA123/124 instead of MA127/128/227. I have been informed of the proposal to change the course titles for MA123 and MA124 to reflect the inclusion of these students. I support changing the titles for MA123 Calculus I for Physics and Chemistry and MA124 Calculus II for Physics and Chemistry to MA123 Calculus I for Physics, Chemistry, and Mathematics and MA124 Calculus II for Physics, Chemistry, and Mathematics, respectively.

Name Allan T. Andrews

Department Natural Science

Date 3/4/97

To: Gerald Buriok, Chairperson
Mathematics Department
233 Stright Hall

Subject: Change MA123/124 Titles

I understand that the Mathematics Department has decided to require students in the Mathematics, Applied Mathematics, and Secondary Mathematics Education programs to take the calculus sequence MA123/124 instead of MA127/128/227. I have been informed of the proposal to change the course titles for MA123 and MA124 to reflect the inclusion of these students. I support changing the titles for MA123 Calculus I for Physics and Chemistry and MA124 Calculus II for Physics and Chemistry to MA123 Calculus I for Physics, Chemistry, and Mathematics and MA124 Calculus II for Physics, Chemistry, and Mathematics, respectively.

Name [signature]

Department Geoscience

Date 3/14/97

To: Gerald Buriok, Chairperson
Mathematics Department
233 Stright Hall

Subject: Change MA123/124 Titles

I understand that the Mathematics Department has decided to require students in the Mathematics, Applied Mathematics, and Secondary Mathematics Education programs to take the calculus sequence MA123/124 instead of MA127/128/227. I have been informed of the proposal to change the course titles for MA123 and MA124 to reflect the inclusion of these students. I support changing the titles for MA123 Calculus I for Physics and Chemistry and MA124 Calculus II for Physics and Chemistry to MA123 Calculus I for Physics, Chemistry, and Mathematics and MA124 Calculus II for Physics, Chemistry, and Mathematics, respectively.

Name W E Pitchford Jr.

Department Biochemistry Program

Date 3/11/97

To: Gerald Buriok, Chairperson
Mathematics Department
233 Stright Hall

Subject: Change MA123/124 Titles

I understand that the Mathematics Department has decided to require students in the Mathematics, Applied Mathematics, and Secondary Mathematics Education programs to take the calculus sequence MA123/124 instead of MA127/128/227. I have been informed of the proposal to change the course titles for MA123 and MA124 to reflect the inclusion of these students. I support changing the titles for MA123 Calculus I for Physics and Chemistry and MA124 Calculus II for Physics and Chemistry to MA123 Calculus I for Physics, Chemistry, and Mathematics and MA124 Calculus II for Physics, Chemistry, and Mathematics, respectively.

Name Dothen Vaughan

Department Chemistry

Date 3/5/97

17 March 1997

To: Gerald Buriok
Chair Mathematics Department

From: Jim Wolfe JSW
Chair Curriculum Committee of the Computer Science Dept
Bill Oblitey WJO
Chair Computer Science Department

Subject: Change MA123/124 Titles

We understand that the Mathematics Department has decided to require students in the Mathematics, Applied Mathematics, and Secondary Mathematics Education programs to take the calculus sequence MA123/124 instead of MA127/128/227. We have been informed of the proposal to change the course titles for MA123 and MA124 to reflect the inclusion of these students.

We support changing the title for MA123 Calculus I for Physics and Chemistry to MA123 Calculus I for Physics, Chemistry and Mathematics; we also support changing the title for MA124 Calculus II for Physics and Chemistry to MA124 Calculus II for Physics, Chemistry, and Mathematics.