FINAL FACULTY SENATE APPROVAL ON FEBRUARY 13, 2018

MEMORANDUM

TO: Faculty Senate

FROM: Jack Kirby

DATE: January 17, 2018

SUBJECT: Curriculum Proposal #17-18-09

Calculus

I recommend approval of the attached Curriculum Proposal 17-18-09. This proposal seeks to make updates to the applied calculus sequence; delete MATH 1586 (Applied Calculus 2) and alter MATH 1585 (Applied Calculus).

Dr. Christina Lavorata
Dr. Don Trisel
Dr. Robert Niichel
Mr. Brian Floyd
Ms. Laura Ransom
Ms. Cheri Gonzalez

FAIRMONT STATE UNIVERSITY

MEMORANDUM

TO: Curriculum Committee

FROM: Jack Kirby JRK

DATE: November 3, 2017

SUBJECT: Curriculum Proposal #17-18-09

Calculus

I recommend approval of the attached Curriculum Proposal 17-18-09. This proposal seeks to make updates to the applied calculus sequence; delete MATH 1586 (Applied Calculus 2) and alter MATH 1585 (Applied Calculus).

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CURRICULUM PROPOSAL (Submit one hard copy and an electronic copy to the Associate Provost by the second Tuesday of the month.)

Proposal Number:	17-18-09
School/Department/Program:	Science and Technology—Computer Science and Math—Mathematics
Preparer/Contact Person:	Robert Niichel
Telephone Extension:	4701
Date Originally Submitted:	November 3, 2017
Revision (Indicate date and label it Revision #1, #2, etc.):	
Implementation Date Requested:	

I. **PROPOSAL.** Write a brief abstract, not exceeding 100 words, which describes the overall content of the proposal.

The changes herein concern the applied calculus sequence (MATH 1585 and 1586; formerly 1185 and 1186)

- *One deleted course:*
  - *MATH 1586: Applied Calculus 2*
- *One Altered:*
  - *MATH 1585: Adjustment of description, outcomes, and changes to scheduling*

II. **DESCRIPTION OF THE PROPOSAL.** Provide a response for each letter, A-H, and for each Roman Numeral II–V. If any section does not apply to your proposal, reply N/A.

A. Deletion of course(s) or credit(s) from program(s) **[Note: Applied Calculus is not technically part of the mathematics major]**

MATH 1586 Applied Calculus 2

Total hours deleted. 4

B. Addition of course(s) or credit(s) from program(s)

Total hours added. 0

C. Provision for interchangeable use of course(s) with program(s)
N/A

D. Revision of course content. Include, as an appendix, a revised course description, written in complete sentences, suitable for use in the university catalog.

MATH 1585—Applied Calculus 1

See Appendix A for course descriptions. Course Outlines and outcomes are located in Appendices B and C, respectively.

E. Other changes to existing courses such as changes to title, course number, and elective or required status.

N/A

F. Creation of new course(s). For each new course

1. Designate the course number, title, units of credit, prerequisites (if any), ownership (FSU or shared) and specify its status as an elective or required course. If you are creating a shared course, attach a memo from the Deans of the affected Schools explaining the rationale for the course being shared.

2. Include, as an appendix, a course description, written in complete sentences, suitable for use in the college catalog.

N/A

3. Include, as an appendix, a detailed course outline consisting of at least two levels.

N/A

4. In order to meet the requirements as outlined in Goal One of the Strategic Plan, please include Outcome Competencies and Methods of Assessment as an appendix. Examples are available upon request from the Chair of the Curriculum Committee.

N/A

G. Attach an itemized summary of the present program(s) affected, if any, and of the proposed change(s).

Describe how this proposal affects the hours needed to complete this program. Specifically, what is the net gain or loss in hours? Use the format for Current and Proposed Programs in Appendix A.

MATH 1585/6 are not part of the math major, and so changes to these courses do not affect the math program. We have spoken with faculty from other programs who have agreed move their students into the regular calculus sequence.

III. **RATIONALE FOR THE PROPOSAL.**

A. **Quantitative Assessment**: Indicate the types of assessment data, i.e., surveys, interviews, capstone courses, projects, licensure exams, nationally-normed tests, locally developed measurements, accreditation reports, etc., that were collected and analyzed to determine that curricular changes were warranted. Quantitative data is preferred.

As far as M1586, the elimination of this course stems from the fact that some of its material must be moved into M1585. Also, due to changes in the Calculus sequence (MATH 2501,2502, and 3503), MATH 1586 is no longer an appropriate prerequisite for Calculus 3. Thus, there seems to be little use for the course. We have met multiple times with faculty members from affected programs, and they agreed that 1586 should be dropped.

The situation with M1585 is a bit more complicated. A member of the mathematics faculty, Dennine Larue, is on the HEPC's Statewide Transfer Initiative of College Course Work committee. She has informed us that the HEPC will release a master syllabus for all programs that offer Applied Calculus. To meet the requirements of the transfer agreement, more mathematics content needs to be added to M1585. The best way to accomplish this is to remove the computer applications component. Thus, if and when the course is offered, it needs to reflect the HEPC's guidelines.

Regarding the change to scheduling M1585 only on demand, there are a number of reasons for this. First, the faculty of Sci/Tech do not consider Applied Calculus an essential or important course. In our first meeting with colleagues from the chemistry, biology, and engineering programs, the consensus of the group was that Applied Calculus 1 (M1585) should be eliminated along with Applied Calculus 2 (M1586). Second, since Applied Calculus 2 will not be offered any more (if this proposal passes), then Applied Calculus 1 becomes a dead-end first-year course, which is generally undesirable, since it makes it harder for students to switch majors to Math, Computer Science, Chemistry, etc. However, a few schools around West Virginia still offer the course, and so it seemed best to leave the class in the catalog so that transfer students can get credit for calculus of some kind.

B. **Qualitative Assessment**: Based upon the assessment data above, indicate why a curricular change is justified. Indicate the expected results of the change. Be sure to include an estimate of the increased cost, or reduction in cost of implementation. FOR EXAMPLE: Will new faculty, facilities, equipment, or library materials be required?

The elimination of M1586 will obviously reduce the costs incurred by the program. Since M1585 is remaining a 4-credit course, no additional costs will be added.

Since M1585 was designed primarily for science majors, it was imperative that members of the science faculty be on board with the effective elimination of the course. It was agreed that a few minor topics and some additional applications would be added to the regular calculus sequence (MATH 2501 and 2502), in order to better serve non-math majors. A few topics would also be covered at different times within the courses (i.e. 2501 and 2502). With these adjustments to the regular calculus sequence, members of the College of Science and Technology felt comfortable with the changes to the Applied Calculus sequence we are proposing.

IV. Should this proposal affect any course or program in another school, a memo must be sent to the Dean of each school impacted and a copy of the memo(s) must be included with this proposal. In addition, the Deans of the affected schools must sign below to indicate their notification of this proposal.

By signing here, you are indicating your college's/school's notification of this proposal.

Dean, Sci Tech

V. Should this proposal affect any course to be added or deleted from the general studies requirements, a memo from the chair of the General Studies Committee indicating approval of the change must be included with this proposal.

N/A

VI. ADDITIONAL COMMENTS.

APPENDIX A
Course Descriptions for Created and Revised Courses

REVISED COURSES:

MATH 1585 Applied Calculus I (4cr)

An elementary study of calculus with an emphasis on its applications to life science, business, and social science. Primary topics include limits, derivatives and integrals. **Offered on demand.**

PR: Math ACT score of 24, or Math SAT of 560 (old) or 580 (new), or MATH 1540, or MATH 1520 with "B" or better

Old Description:

~~A study of calculus with an emphasis on its applications to science, business, technology and social science. Topics covered using the derivative: functions and their graphs, max/min problems, related rates, approximation of change, and curvilinear motion. Topics covered using the integral: area, volume, and accumulation functions. Graphing calculators and mathematical software will be introduced and used throughout the course.~~

~~PR: MATH ACT score of 24, or MATH SAT 560 or COMPASS score of 67 or MATH 1115 or MATH 1102 with "B" or better.~~

APPENDIX B
Course Outlines

ALTERED COURSES:

MATH 1585: APPLIED CALCULUS

1. Precalculus review
2. Limits, Continuity, and the Derivative
    a. The idea of the limit
    b. Continuity
    c. Definition of the derivative
    d. Derivatives of elementary functions
    e. Techniques of differentiation
    f. Derivative of a composite function
3. Applications of derivatives
    a. Higher order derivatives and concavity
    b. Curve sketching
    c. Implicit differentiation and related rates
    d. Marginals and differentials
4. Integration
    a. Antiderivatives and elementary integration formulas
    b. Area and Riemann integrals
    c. Definition of the definite integral
    d. The Fundamental Theorem of Calculus
    e. Integration by substitution
5. Applications of Integration
    a. Applications of antiderivatives
    b. Total Change
    c. Average value
    d. Improper integrals
    e. Differential equations
    f. Applications of definite integration

Old Outline:

1. Precalculus review
2. Limits, Continuity, and the Derivative
    a. The idea of the limit
    b. Continuity
    c. Definition of the derivative
    d. Derivatives of elementary functions
    e. Techniques of differentiation
    f. Derivative of a composite function
3. Applications of derivatives
    a. Higher order derivatives and concavity
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4. Integration
   a. Antiderivatives and elementary integration formulas
   b. Area and Riemann integrals
   c. Definition of the definite integral
   d. The Fundamental Theorem of Calculus
   e. Integration by substitution

APPENDIX C
Course Outcomes and Assessments

ALTERED COURSES:

MATH 1585: APPLIED CALCULUS

Outcome	Direct Assessment	Rubric/satisfactory performance standard
1. Use the limit definition of the derivative to calculate simple derivatives.	Exam/quiz question(s)	Class average score greater than 2.5 on the Arizona Math Rubric.
2. Apply derivatives to solve a variety of real world problems using appropriate symbolic manipulation skills.	Exam/quiz question(s)	Class average score greater than 2.5 on the Arizona Math Rubric.
3. Use the Fundamental Theorem of Calculus to correctly evaluate a definite integral.	Exam/quiz question(s)	Class average score greater than 2.5 on the Arizona Math Rubric.
4. Apply integrals to solve a variety of real-world problems using appropriate symbolic manipulation skills.	Exam/quiz question(s)	Class average score greater than 2.5 on the Arizona Math Rubric.

Old Outcomes:

Outcome	Direct Assessment	Rubric/satisfactory performance standard
1. Utilize mathematical software to solve problems using calculus concepts. This includes analyzing the derivative as a rate of change in various contexts.	Exam/quiz question(s)	Class average score greater than 2.5 on the Arizona Math Rubric.
2. Apply derivatives to solve a variety of real world problems using appropriate symbolic manipulation skills.	Exam/quiz question(s)	Class average score greater than 2.5 on the Arizona Math Rubric.
3. Use the language of mathematics to define various calculus concepts.	Exam/quiz question(s)	Class average score greater than 2.5 on the Arizona Math Rubric.
4. Synthesize mathematical knowledge to model, interpret and calculate the derivative of a function. This includes analyzing the derivative as a rate of change in various contexts.	Exam/quiz question(s)	Class average score greater than 2.5 on the Arizona Math Rubric.

Applied Calculus Proposal

Niichel, Robert

Thu 11/2/2017 3:34 PM

To Trisel, Donald <Donald.Trisel@fairmontstate.edu>; Roof, Steven <Steven.Roof@fairmontstate.edu>; Freeman, Philip <Philip.Freeman@fairmontstate.edu>; Costello, Hugh <hcostello@fairmontstate.edu>;

Cc Hossain, Mahmood <Mahmood.Hossain@fairmontstate.edu>;

1 attachments (47 KB)

Math 2017-18 Applied Calculus.docx;

Dear Don and Sci/Tech Department Chairs,

I just wanted to let you know that the attached proposal was approved today by the CSM faculty. Basically, the proposed changes are as follows:

- Applied Calculus 2 (MATH 1586) will be deleted, and the pathway from (regular) Calculus 1 to Applied Calculus 2 to Calculus 3 will no longer be available to students. We do plan on offering Applied Calculus 2 at least one more time to accommodate students who have taken Applied Calculus 1 already.
- Applied Calculus 1 (MATH 1585) will be changed to incorporate a greater amount of material. These changes are necessary because of the HEPC's Statewide Transfer Initiative. In order to incorporate the additional material, the technology component of the course (i.e., Mathcad) has been dropped.
- Applied Calculus 1 will only be offered on demand.
- Without M1586, M1585 is a dead-end first-year course. After agreeing to make some changes to MATH 2501 (regular calculus), the sci/tech faculty members we spoke with were supportive of eliminating M1585 altogether. However, the course will remain in the catalog to help transfer students. We also hope to change the prerequisites of MATH 2501 to include "or MATH 1585," again as a way to help transfer students.

Thanks for your time,

Bob

Applied Calculus Curriculum Proposal

Niichel, Robert

Tue 10/31/2017 11:58 AM

To: * FSU Faculty - College of Science & Technology <_FSUFaculty-CollegeofScience&Technology2@fairmontstate.edu>;

2 attachments (137 KB)

Math 2017-18 Proposal 4.docx; CurriculumProposal_Math Hist and prob_DRAFT_10.30.17.docx;

Dear Colleagues,

Attached you will find the Applied Calculus curriculum proposal, as well as another proposal dealing with a new Math History course and some minor changes to Calculus 3 and Probability. They are due Friday, so please let us know as soon as possible if you see any problems.

Thanks,
Bob

From: Niichel, Robert
Sent: Tuesday, October 10, 2017 11:01 AM
To: * FSU Faculty - College of Science & Technology <_FSUFaculty-CollegeofScience&Technology2@fairmontstate.edu>
Subject: RE: Applied Calculus Meeting, round 2

Dear Colleagues,

The last Applied Calculus meeting is scheduled for Thursday, October 12, 12:30-1:30 in ET 311. We received one proposal for changes to regular Calculus 1. If you are interested in the future of either applied calculus or regular calculus, please feel free to attend. After this meeting we will move forward with our curriculum proposal.

Thanks,
Bob