

SCC# 76-77-4

FACULTY SENATE
CURRICULUM COMMITTEE
Course Approval Form

2 New Courses (R)

Department (M) Mathematics (2)
Title Introduction to Real Analysis I and Intro. to Real Analysis II
Sponsor(s) Prof. Gary S. Fitzkowicz, Ph.D. No. of Credits 3 for each course

Approved by the department Graduate ()
 Not recommended by the department Undergraduate ()

Information copies forwarded: Academic Dean; Chairman; Curriculum Committee

Signature: John Sany Department Chairman
Jaysh Beer, Math Dept. Curric. Comm.

ACADEMIC DEAN

Consultation on proposal has been held

Comments:

Glan Donovan 7/28/76
Signature: Academic Dean

CURRICULUM COMMITTEE

76-77-4

Proposal received

Open Hearing held

Returned to the department for the following reason(s): Chairman's report

Approved by the Curriculum Committee 9/25/76

Presented to Executive Committee of the Faculty Senate as information 10/1/76

Notifications forwarded: Academic Dean; Department Chairman

Signature: [Signature] Chairman, Curriculum Committee

ACADEMIC DEAN

I have reviewed the final documents as approved and concur with same.
Budget, faculty and library resources are adequate for immediate implementation.

I have reviewed the final documents as approved and concur with same.
Budget, faculty and/or library allocations for the current academic year
are inadequate for immediate implementation or implementation in the next
fiscal year. The earliest that the proposal might be implemented would be

HEGIS Taxonomy Number: _____

Signature: Academic Dean

Copies forwarded: Chairman, Curriculum Committee; Department Chairman;
Provost; Registrar

REGISTRAR

Approved course description received

Signature: Registrar

PROVOST

Official copy and approval sheet filed

Signature: Provost (or designee)

- Note:
- 1) Course proposal format is attached
 - 2) A copy of this approval form should accompany each proposal
 - 3) A copy of a proposed catalogue description of the course must accompany the proposal as a separate page.

Introduction to Real Analysis I and Introduction to Real Analysis II

Proposed by

Gary S. Itzkowitz, Ph.D.

(Assistant Professor of Mathematics)

I. Introduction

This 2 semester course sequence is designed to replace the present one semester course, Intermediate Analysis (1701.330).

In this age when Glassboro State College is beginning to send many of its mathematics majors to Graduate School, it is necessary that these students be well trained in all basic areas of mathematics. This includes Analysis, Algebra, and Topology/Geometry. The one area in our Mathematics Department that is still weak is Analysis. Through the introduction of this new one year course sequence we hope to remedy that situation.

II. Outline of the Proposal

A. Essence of Proposal:

1. Course Titles: (i) Introduction to Real Analysis I
(ii) Introduction to Real Analysis II
2. Credit: 3 semester credits per course
3. Level: Upper Division Mathematics Courses
4. Prerequisites: Calculus III for Introduction to Real Analysis I;
and Introduction to Real Analysis I prerequisite for Introduction
to Real Analysis II.

B. Objectives:

Students will demonstrate the ability to use rigorous mathematical thought processes in the following areas: symbolic logic, sets, functions, sequences and series, limits, continuity, derivatives, integrals, and Fourier series.

C. Contents:

Introduction to Real Analysis I

1. Introduction:

- a) Set Theory
 - b) Countable and Uncountable sets
2. Real Number System:
- a) Field and order properties
 - b) Metric Spaces
 - c) Topological Considerations: Completeness, open and closed sets, Bolzano-Weierstrass and Heine-Borel properties
3. Functions:
- a) Relations and 1-1 correspondence
4. Sequences :
- a) Definitions and basic limit Theorems
 - b) Cauchy sequences
5. Continuity:
- a) Further consideration of limits
 - b) Definitions and examples ($\epsilon - \delta$ Definition)
 - c) Special limits
6. Derivatives:
- a) Definition and Basic Theorems
 - b) Mean Value Theorem
 - c) Taylor-McClaurin Expansions

Introduction to Real Analysis II

7. Riemann Integral:
- a) Basic definition and examples
 - b) Proof of the existence of the Integral
 - c) Fundamental Theorem of the Calculus
8. Riemann-Stieltjes Integrals:
- a) Bounded Variation
 - b) Basic Theorems

9. Infinite Series:

- a) Definitions
- b) Tests for convergence
- c) Power series

10. Sequences and Series of functions:

- a) Definitions
- b) Pointwise and uniform convergence
- c) Uniform convergence of power series

11. Fourier Series:

- a) convergence problems
- b) summability of Fourier series
- c) convergence of Fourier series
- d) orthogonal expansions

D. Rationale:

The present one semester course, Intermediate Analysis, has been found to be far too short to cover the essentials in the foundations of Analysis. Most Mathematics departments have found it necessary to have a year long course. Our recent experience has confirmed this fact. The minimum course curriculum for Real Analysis as set forth by the American Mathematical Society is essentially given in section C above and it has been found that it is impossible to cover these topics adequately in one semester.

The change in course title from Intermediate Analysis to Introduction to Real Analysis simply puts us in line with common practice in this country. The overwhelming majority of colleges call their basic Analysis course either by the name of "Real Analysis" or "Advanced Calculus".

Introduction to Real Analysis I (or as it is presently called, Intermediate Analysis) is now required of all Math majors.

E. Teaching Methods:

Lectures, discussions and problem solving (this last, hopefully, by the students).

F. Possible Texts:

1. Gaughan, Edward: Introduction to Analysis (2nd Edition), Brooks/Cole Publishing Co., Monterey, California, 1975.
2. Goldberg, Richard: Methods of Real Analysis, Xerox College Publishing, Lexington, Mass., 1964.
3. Mansfield, Maynard: Intermediate Real Analysis, Prindle, Weber and Schmidt, Boston, Mass., 1969.
4. McCoart, Richard, et al: Elementary Analysis, Holden-Day, Inc., San Francisco, California, 1966.
5. Olmsted, John: Intermediate Analysis, Appleton-Century-Crofts, Inc., New York City, 1956.
6. Youse, Bevan: Introduction to Real Analysis, Allyn and Bacon, Inc., Boston, Mass., 1972.

G. Proposed Catalogue Description:

- a. Course number - 1701.330
- Course title - Introduction to Real Analysis I
- Semester hours - 3 s.h.
- Prerequisites - 1701.230 or the equivalent

1701.330
1701.331
Course Description: *Introduction to Real Analysis I & Introduction to Real Analysis II*

This course will prepare the student for more advanced courses in analysis as well as introduce him to rigorous mathematical thought processes. Topics encountered will include: Symbolic Logic, Sets, Functions, the Real Number System, Sequences, limits and continuity, and Derivatives.

- b. Course number - 1701.331
- Course title - Introduction to Real Analysis II
- Semester hours - 3 s.h.
- Prerequisites - 1701.330

Course Description:

This course is a continuation of Introduction to Real Analysis

and the purpose is to extend the student's understanding of basic analysis (and ~~the~~ Calculus). Topics include the Mean Value Theorem, Existence of the Riemann integral, Riemann-Stieltjes Integration, Infinite Series, Convergence tests and Fourier series.

III. Conclusion

This two course sequence is necessary in order to bring our department up to the basic minimal standards required to permit students to be able to go on to more advanced (i.e., Graduate) programs elsewhere. The basic training in methods of logical thinking is also an important part of the sequence and is obviously useful to the pursuit of any successful profession.

In addition, the present staff, resources, and facilities are adequate for immediate implementation of this course sequence.

Proposed Catalogue Description

- a. Course number - - 1701.330
Course title - Introduction to Real Analysis I
Semester hours - 3 s.h.
Prerequisites - 1701.230 or the equivalent

Course Description:

This course will prepare the student for more advanced courses in analysis as well as introduce him to rigorous mathematical thought processes. Topics encountered will include: Symbolic Logic, Sets, Functions, the Real Number System, Sequences, limits and continuity, and Derivatives.

- b. Course number - 1701.331
Course title - Introduction to Real Analysis II
Semester hours - 3 s.h.
Prerequisite - 1701.330

Course Description:

This course is a continuation of Introduction to Real Analysis I and the purpose is to extend the student's understanding of basic analysis (and the Calculus). Topics include the Mean Value Theorem, Existence of the Riemann Integral, Riemann-Stieltjes Integration, Infinite Series, Convergence tests and Fourier series.