STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

MATH 461 – Advanced Calculus I

Created by: Daniel Gagliardi

Updated by: Daniel Gagliardi

Canino School of Engineering Technology

Department: Mathematics

Semester/Year: Fall 2018

A. **TITLE**: Advanced Calculus I

B. **COURSE NUMBER:** MATH 461

C. **CREDIT HOURS: 4 credit hour(s) per week for 15 weeks**

☒ One hour (50 minutes) of lecture per week 4
☐ Two to three hours of lab or clinical per week
☐ Two hours of recitation per week
☐ 40 hours of internship

D. **WRITING INTENSIVE COURSE**: Yes ☐ No ☒

E. **GER CATEGORY: None: ☒ Yes:**
***If course satisfies more than one*:**

F. **SEMESTER(S) OFFERED: Fall ☐ Spring ☒ Fall & Spring ☐**

G. **COURSE DESCRIPTION:**

This course is sequel to Calculus III and serves as an introduction to topics in Advanced Calculus. Specifically, we consider line, surface and volume integrals in two and three dimensional space. We also investigate the gradient of a scalar field and discuss conservative fields and potential functions. The divergence and curl of a vector field is defined. Generalizations of the fundamental theorem of calculus are presented and used to evaluate integrals. Other topics include curvilinear coordinates, multiple integrals and transformation of multiple integrals, implicit functions, Jacobians, partial derivatives, higher order partial derivatives, mean value theorems, the theory of infinite series, Taylor series along with an introduction to Fourier series. To motivate the subject, applications will be given to fluid and solid mechanics, Electrostatics and Electromagnetism.

H. **PRE-REQUISITES: None ☐ Yes ☒ If yes, list below:**

Calculus III (MATH 263) and Linear Algebra (Math 361) with a grade of C or better or permission of the instructor.

CO-REQUISITES: None ☒ Yes ☐ If yes, list below:

KEY	Institutional Student Learning Outcomes [ISLO 1 – 5]
ISLO #	ISLO & Subsets
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit,/Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

*Include program objectives if applicable. Please consult with Program Coordinator

I. STUDENT LEARNING OUTCOMES: (*see key below*)

By the end of this course, the student will be able to:

Course Student Learning Outcome [SLO]	***Program Student Learning Outcome [PSLO]***	***GER*** *[If Applicable]*	***ISLO & SUBSETS***	
Develop an understanding of the various ways to evaluate line integrals (parameterization, potential function, Green's Theorem)			3-Found Skills	QTR
Compute double and triple integrals using a change and variables and the Jacobian.			3-Found Skills	QTR
Compute the divergence and curl of a vector field. Use them to evaluate the flux of a vector field through a surface			3-Found Skills	QTR
Compute surface and line integrals using the Divergence Theorem and Stoke's Theorem.			3-Found Skills	QTR
Analyze infinite series of scalars. Decide whether the series is convergent or diviergent			3-Found Skills	QTR
Analyze power series and compute the radius of convergence			3-Found Skills	QTR
Create Taylor and Maclauren series using the definition and/or by differenting or integrating know power series.			3-Found Skills	QTR
Create Fourier series from piecewise continous functions by computing the Fourier coefficients.			3-Found Skills	QTR

J. **APPLIED LEARNING COMPONENT:** Yes ☐ No ☒

If YES, select one or more of the following categories:

- ☐ Classroom/Lab
- ☐ Internship
- ☐ Clinical Placement
- ☐ Practicum
- ☐ Service Learning
- ☐ Community Service
- ☐ Civic Engagement
- ☐ Creative Works/Senior Project
- ☐ Research
- ☐ Entrepreneurship (program, class, project)

K. **TEXTS:**

Professor will supply notes online

L. **REFERENCES:**

1) Advanced Calculus: A Geometric View, by James J. Callahan, Springer 2010,

2) Advanced Calculus 5th ed. by Wilfred Kaplan, Pearson, 2002

3) Div, Grad, Curl, and All That 4th ed. By H.M. Schey, W.W. Norton and Company, 2005.

M. **EQUIPMENT: None ☒ Needed:**

N. **GRADING METHOD:** A-F

O. **SUGGESTED MEASUREMENT CRITERIA/METHODS:**

P. **DETAILED COURSE OUTLINE:**

I. Line Integrals
A. Vector-Valued Functions
B. Derivatives and Integrals of Vector-Valued Functions
C. Vector Fields
D. Introduction to Line Integrals
E. Computing Line Integrals by Parameterizing Plane and Space Curves
F. Conservative Vector Fields and Path Independent Line Integrals
G. Green's Theorem

II. Multiple Integrals
A. Double Integrals and Fubini's Thoerem
B. Change of Variables and Jacobians
C. Triple Integrals
D. Cylindrical Coordinates
E. Spherical Coordinates

III. Vector Operators
A. Gradient
B. Divergence
C. Curl

IV. Surface Integrals
A. Surface Area
B. Surface Normal and Flux
C. The Divergence Thereom
D. Stokes Theorem

V. Infinite Series
A. Sequences of Scalars and Convergence Criteria
B. Series of Scalars and Convergence Criteria
C. Tests for Convergence of Infinite Series
D. Power Series and the Radius of Convergence
E. Pointwise and Uniform Convergence
F. Maclauren and Taylor Series given by Definition and from Existing Series

VI. Fourier Series
A. Periodic Functions
B. Orthogonality conditions for sine and cosine
C. Odd and Even functions
D. Fourier Series
E. Differentiation and Integration of Fourier Series

Q. LABORATORY OUTLINE: None ☒ Yes ☐

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C. **CREDIT HOURS: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)**

 # Credit Hours: 4
 # Lecture Hours: 4 **per week**
 # Lab Hours: **per week**
Other: **per week**

Course Length: 15 **Weeks**

D. **WRITING INTENSIVE COURSE**: Yes ☐ No ☒

E. **GER CATEGORY**: **None:** ☐ **Yes:** GER 1 Mathematics
***If course satisfies more than one*:** GER

F. **SEMESTER(S) OFFERED: Fall** ☐ **Spring** ☒ **Fall & Spring** ☐

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