Authorizing Signature: _____

Date: _____

LEHIGH CARBON COMMUNITY COLLEGE

MASTER COURSE OUTLINE

for

Prefix: MAT No.: 201 Name: Calculus and Analytic Geometry III

School/Division: Mathematics
Submitted by: Erik Csikos
Course Origination Date: April 5, 2016
Review Date: July 9, 2019
Credit Hours: 4
Lecture Hours: 4
Laboratory Hours: 0
Other: 0
Prerequisite(s): MAT 196 (at least a "C" grade)
Corequisite(s): None

Course Description

Conclusion of the 12-credit calculus sequence. Differential and integral calculus of multivariable real and vector-valued functions. Topics include vectors and the geometry of space, continuity, motion in space, partial derivatives, multiple integrals, integrals and vector fields, line and surface integrals, and Green's and Stokes' Theorems.

Course Objective/Competency

(for each objective, identify program objective accreditation standard, and/or collegewide student competency or N/A)

Course Objective	Program Objective and/or Collegewide Student Competency
1. Use vectors in a variety of geometric applications.	Think critically, apply quantitative reasoning
2. Sketch graphs of three-dimensional quadric surfaces.	Think critically, apply quantitative reasoning
3. Use vector functions to describe the position of a particle in space at time *t*.	Think critically, apply quantitative reasoning
4. Find derivatives and integrals of vector-valued functions and apply to position, velocity and acceleration.	Think critically, apply quantitative reasoning
5. Find partial derivatives and apply them to finding extrema of functions of several variables.	Think critically, apply quantitative reasoning

Course Objective	Program Objective and/or Collegewide Student Competency
6. Find and interpret the gradient and directional derivative.	Think critically, apply quantitative reasoning
7. Evaluate double and triple integrals and apply them to such physical concepts as surface area, volume, and center of gravity.	Think critically, apply quantitative reasoning

Course Content
(please provide chapter-level detail)

I. Vectors and the Geometry of Space
- A. Three-dimensional coordinate systems
- B. Vectors
- C. The dot product
- D. The cross product
- E. Lines and planes in space
- F. Cylinders and quadric surfaces

II. Vector-Valued Functions and Motion in Space
- A. Curves in space and their tangents
- B. Integrals of vector functions; projectile motion
- C. Arc length in space
- D. Curvature and normal vectors of a curve
- E. Tangential and normal components of acceleration
- F. Velocity and acceleration in polar coordinates

III. Partial Derivatives
- A. Functions of several variables
- B. Limits and continuity in higher dimensions
- C. Partial derivatives
- D. The chain rule
- E. Directional derivatives and gradient vectors
- F. Tangent planes and differentials
- G. Extreme values and saddle points
- H. Lagrange multipliers
- I. Taylor's formula for two variables
- J. Partial derivatives and constrained variables

IV. Multiple Integrals
- A. Double and iterated integrals over rectangles
- B. Double integrals over general regions
- C. Area by double integration
- D. Double integrals in polar form
- E. Triple integrals in rectangular coordinates
- F. Applications
- G. Triple integrals in cylindrical and spherical coordinates
- H. Substitutions in multiple integrals

V. Integrals and Vector Fields
   A. Line integrals of scalar functions
   B. Vector fields and line integrals; work, circulation, and flux
   C. Path independence, conservative fields, and potential functions
   D. Green's theorem in the plane
   E. Surface and area
   F. Surface integrals
   G. Stokes' theorem
   H. The divergence theorem and a unified theory

Advisement Comments

Grading Procedures

This will consist of several exams, quizzes, homework problem assignments and a comprehensive final exam. A standard grading scale will be used. Also, MyLabsPlus should be incorporated into the grading of this course, including homework and/or quizzes.

Attendance and participation shall count as no more than 5% of the overall course grade.

Textbook(s)

Hass, Heil, Weir, Thomas' Calculus: Early Transcendentals, Pearson.

A MyLabsPlus course shell will be provided for each instructor/section. Instructors must provide instructions to the students about how to access their course in MLP; for students purchasing an eBook, this is the only way that students can access their textbook. Instructors must incorporate MyLabsPlus into their course and into student grades in a meaningful fashion. Furthermore, if the instructor requires students to bring the textbook to class, then he or she must either allow Hass, Heil, Weir, Thomas' Calculus: Early Transcendentals, Pearson.

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A graphing calculator is required. The TI-83 or TI-84 is recommended.

Bibliography

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Course-Specific Student Learning/Collegewide Competencies

#1	#2	#3	#4	#5	#6	#7	#8
Course Learning Objective	**Accred Std #**	**Prg Obj #**	***CWC #**	**What tool will be used to measure the objective? (Assessment Method)**	**What is the criteria for success?**	**Measurement Tool Grading Scale (Numeric)**	**How will the measurement outcome be reported?**
Use vectors in a variety of geometric applications.			1, 3	In-Class Examination	Overall Grade 70% of students achieving 70% or better.	1 pass 0 fail	Reported data from MLP loaded in to TracData
Sketch graphs of three-dimensional quadric surfaces.			1, 3	In-Class Examination	Overall Grade 70% of students achieving 70% or better.	1 pass 0 fail	Reported data from MLP loaded in to TracData
Sketch graphs of three-dimensional quadric surfaces.			1, 3	In-Class Examination	Overall Grade 70% of students achieving 70% or better.	1 pass 0 fail	Reported data from MLP loaded in to TracData
Find derivatives and integrals of vector-valued functions and apply to position, velocity and acceleration.			1, 3	In-Class Examination	Overall Grade 70% of students achieving 70% or better.	1 pass 0 fail	Reported data from MLP loaded in to TracData
Find partial derivatives and apply them to finding extrema of functions of several variables.			1, 3	In-Class Examination	Overall Grade 70% of students achieving 70% or better.	1 pass 0 fail	Reported data from MLP loaded in to TracData
Find and interpret the gradient and directional derivative.			1, 3	In-Class Examination	Overall Grade 70% of students achieving 70% or better.	1 pass 0 fail	Reported data from MLP loaded in to TracData

#1	#2	#3	#4	#5	#6	#7	#8
Course Learning Objective	**Accred Std #**	**Prg Obj #**	***CWC #**	**What tool will be used to measure the objective? (Assessment Method)**	**What is the criteria for success?**	**Measurement Tool Grading Scale (Numeric)**	**How will the measurement outcome be reported?**
Evaluate double and triple integrals and apply them to such physical concepts as surface area, volume, and center of gravity.			1, 3	In-Class Examination	Overall Grade 70% of students achieving 70% or better.	1 pass 0 fail	Reported data from MLP loaded in to TracData

CWC KEY: *#1-Think critically; #2-Communicate effectively; #3-Apply quantitative reasoning; #4-Participate cooperatively within a team; #5-Use current technology effectively; #6-Apply information literacy skills; #7-Analyze human diversity; #8-Apply scientific reasoning; #9-Evaluate ethical aspects of decision making

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