Wharton County Junior College

Administrative - Master Syllabus
COVER SHEET

Purpose: *It is the intention of this Administrative-Master Syllabus to provide a general description of the course, outline the required elements of the course and to lay the foundation for course assessment for the improvement of student learning, as specified by the faculty of Wharton County Junior College, regardless of who teaches the course, the timeframe by which it is instructed, or the instructional method by which the course is delivered. It is not intended to restrict the manner by which an individual faculty member teaches the course but to be an administrative tool to aid in the improvement of instruction.*

Course Title – Calculus III
Course Prefix and Number – MATH 2415
Department - MATH   **Division** – Math and Science
Course Type: (check one)
☐ Academic General Education Course (from ACGM – but not in WCJC Core)
☒ Academic WCJC Core Course
☐WECM course (This course is a Special Topics or Unique Needs Course: Y☐ or N☐)

Semester Credit Hours # : Lecture hours # : Lab/other hours #   <u>4</u>**:4:0**

Equated Pay hours for course - <u>4</u>

 Course Catalog Description – Advanced topics in calculus, including vectors and vector-valued functions, partial differentiation, Lagrange multipliers, multiple integrals, and Jacobians; application of the line integral, including Green's Theorem, the Divergence Theorem, and Stokes' Theorem.

 Prerequisites/Co-requisites – TSI satisfied in math and MATH 2414; or consent of department head

Type: ACAD

List Lab/ Other Hours	
Lab Hours	0
Clinical Hours	0
Practicum Hours	0
Other (list)	0

Prepared by Dale Neaderhouser   ***Date*** 8-24-13

Reviewed by department head Dale Neaderhouser   ***Date*** 8-24-13

Accuracy verified by Division Chair Kevin Dees   ***Date*** 8-24-13

Approved by Dean or Vice President of Instruction *gghunt*   ***Date*** 8-24-13

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I. Topical Outline – Each offering of this course must include the following topics (be sure to include information regarding lab, practicum, clinical or other non- lecture instruction):

Three-Dimensional Analytic Geometry and Vectors
       Three Dimensional Coordinate Systems
       Vectors
       The Dot Product
       The Cross Product
       Equations of Lines and Planes
       (The above 5 topics are a review from Calculus II)
       Quadric Surfaces
       Vector Functions and Space Curves
       Arc Length and Curvature
       Motion in Space: Velocity and Acceleration
       Cylindrical and Spherical Coordinates
Partial Derivatives
       Functions of Several Variables
       Limits and Continuity
       Partial Derivatives
       Tangent Planes and Differentials
       The Chain Rule
       Directional Derivatives and the Gradient Vector
       Maximum and Minimum Values
       Lagrange Multipliers
Multiple Integrals
       Double Integrals over Rectangles
       Iterated Integrals
       Double Integrals over General Regions
       Applications of Double Integrals
       Surface Area
       Triple Integrals
       Triple Integrals in Cylindrical and Spherical
       Coordinates
Vector Calculus
       Vector Fields
       Line Integrals
       The Fundamental Theorem for Line Integrals

II. Course Learning Outcomes

Course Learning Outcomes	Assessment Methods

Upon successful completion of this course, students will:
 	
A. Perform calculus operations on vector-valued functions, including derivatives, integrals, curvature, displacement, velocity, acceleration, and torsion.
B. Perform calculus operations on functions of several variables, including partial derivatives, directional derivatives, and multiple integrals.
C. Find extrema and tangent planes.
D. Solve problems using the Fundamental Theorem of Line Integrals, Green's Theorem, the Divergence Theorem, and Stokes' Theorem.
E. Apply the computational and conceptual principles of calculus to the solutions of real-world problems.
F. Be able to evaluate improper integrals
G. Calculate volumes of solids of revolution.
  1. Disc Method
  2. Shelf Method
H. Be able to calculate moments and center of mass.
I. Calculate centroids of plane regions
J. Be able to calculate centroids of solids of revolution
K. Calculate moments of inertia and fluid pressure.
L. Evaluate indeterminate forms.
M. Be able to handle vectors in two and three dimensions.
  1. Dot product
  2. Cross product
  3. The plane
N. Be able to convert from cylindrical to spherical coordinates and vice versa.
O. Be able to apply derivatives to:
  1. Functions of several variables
  2. The Chain Rule
  3. Tangents to planes and surfaces
P. Be able to calculate directional derivatives
Q.   Demonstrate the ability to evaluate multiple integrals.
  1. Volume, area, and mass
  2. Double integrals in polar coordinates
R. Be able to calculate centers of mass and moments of inertia
S. Be able to evaluate triple integrals
  1. Volume
  2. Mass
T. Perform calculus operations on vector-valued functions, including derivatives, integrals, curvature, displacement, velocity, acceleration, and torsion.
U. Perform calculus operations on functions of several variables, including partial derivatives, directional derivatives, and multiple integrals.
V. Find extrema and tangent planes.
	<u>Hour exams and final.</u>
	
	Outcomes assessed by:
	
	Hour exams
	Final
	Short Answer
	Discussion Board

W. Solve problems using the Fundamental Theorem of Line Integrals, Green's Theorem, Divergence Theorem, and Stokes' Theorem. X. Apply the computational and conceptual principles of calculus to the solutions of real-world problems.	

III. Required Text(s), Optional Text(s) and/or Materials to be Supplied by Student.

Calculus, 7th Edition 2011; Stewart; Cengage (required)
Calculator (instructor's option)

IV. Suggested Course Maximum - 35

V. List any specific spatial or physical requirements beyond a typical classroom required to teach the course.

Students must have computer access to the WCJC website, their WCJC student email and online accounts.   WCJC has open computer labs, with internet access, on all campuses for students to use.

VI. Course Requirements/Grading System – Describe any course specific requirements such as research papers or reading assignments and the generalized grading format for the course

Grading System:

a. Average of one hour exams   40-85%
b. Daily participation, quizzes, extra credit   0-15%
c. Homework grade   0-20%
d. Comprehensive Final   15-30%
Or grade as specified by the instructor

A= 90-100   B= 80-89   C= 70-79   D= 60-69   F= 59 and below

VII.   Curriculum Checklist

☐ - **Academic General Education Course** (from ACGM – but not in WCJC Core)
     No additional documentation needed

☒ - **Academic WCJC Core Course**
     Attach the Core Curriculum Review Forms
- ☒ Critical Thinking
- ☒ Communication
- ☒ Empirical & Quantitative Skills
- ☐ Teamwork
- ☐ Social Responsibility
- ☐ Personal Responsibility

☐ - **WECM Courses**
     If needed, revise the Program SCANS Matrix & Competencies Checklist.

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Core Curriculum Review Form

Foundational Component Area: **Mathematics**   Course Prefix & Suffix: Math 2415

Core Objective: **Critical Thinking Skills**—to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information

Student Learning Outcome supporting core objective: *For each core objective, there must be at least two different methods of assessment.*

SLO Status	Student Learning Outcome (SLO)	Learning Activity	Assessment
The SLO is:	Insert SLO (from Administrative Master Syllabi (AMS)) below	Provide a brief name and description of the sample learning activity:	Provide a brief name and description of the sample quiz, exam, rubric, assignment, etc. for assessing the objective:
■ Existing ☐ Revised ☐ New ■ State Mandated	Apply the computational and conceptual principles of calculus to the solutions of real-world problems. (AMS SLO E)	A word problem (application) where the student must identify variables, assemble the correct formulas and solve for the desired result. Including a brief paragraph explaining what was done.	A quiz, test or discussion board artifact showing the student's written answer. Grading for correctness and the rubric for critical thinking will assess this.
■ Existing ☐ Revised ☐ New ■ State Mandated	Perform calculus operations on functions of several variables, including partial derivatives, directional derivatives, and multiple integrals. (AMS SLO B)	A written paragraph explaining the steps one takes to find the solution.	A quiz, test or discussion board artifact showing the student's written answer. Grading for correctness and the rubric for critical thinking will assess this.
■ Existing ☐ Revised ☐ New ■ State Mandated	Solve problems using the Fundamental Theorem of Line Integrals, Green's Theorem, the Divergence Theorem, and Stokes' Theorem. (AMS SLO D)	Have the student grade an incorrect problem. The student should write a brief paragraph stating what was done incorrectly and what must be done to correct the solution.	A quiz, test or discussion board artifact showing the student's written answer. Grading for correctness and the rubric for critical thinking will assess this.

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Core Curriculum Review Form

Foundational Component Area: **Mathematics**   Course Prefix & Suffix: Math 2415

Core Objective: **Communication Skills**—to include effective development, interpretation and expression of ideas through written, oral and visual communication

Student Learning Outcome supporting core objective: *For each core objective, there must be at least two different methods of assessment.*

SLO Status	Student Learning Outcome (SLO)	Learning Activity	Assessment
The SLO is:	Insert SLO (from Administrative Master Syllabi (AMS)) below	Provide a brief name and description of the sample learning activity:	Provide a brief name and description of the sample quiz, exam, rubric, assignment, etc. for assessing the objective:
■ Existing □ Revised □ New ■ State Mandated	Apply the computational and conceptual principles of calculus to the solutions of real-world problems. (AMS SLO E)	A word problem (application) where the student must identify variables, assemble the correct formulas and solve for the desired result. Including a brief paragraph explaining what was done.	A quiz, test or discussion board artifact showing the student's written answer. Grading for correctness and the rubric for communication will assess this.
■ Existing □ Revised □ New ■ State Mandated	Perform calculus operations on functions of several variables, including partial derivatives, directional derivatives, and multiple integrals. (AMS SLO B)	A written paragraph explaining the steps one takes to find the solution.	A quiz, test or discussion board artifact showing the student's written answer. Grading for correctness and the rubric for communication will assess this.
■ Existing □ Revised □ New ■ State Mandated	Solve problems using the Fundamental Theorem of Line Integrals, Green's Theorem, the Divergence Theorem, and Stokes' Theorem. (AMS SLO D)	Have the student grade an incorrect problem. The student should write a brief paragraph stating what was done incorrectly and what must be done to correct the solution.	A quiz, test or discussion board artifact showing the student's written answer. Grading for correctness and the rubric for communication will assess this.

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Core Curriculum Review Form

Foundational Component Area: **Mathematics**   Course Prefix & Suffix: Math 2415

Core Objective: **Empirical and Quantitative Skills**—to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions

Student Learning Outcome supporting core objective: *For each core objective, there must be at least two different methods of assessment.*

SLO Status	Student Learning Outcome (SLO)	Learning Activity	Assessment
The SLO is:	Insert SLO (from Administrative Master Syllabi (AMS)) below	Provide a brief name and description of the sample learning activity:	Provide a brief name and description of the sample quiz, exam, rubric, assignment, etc. for assessing the objective:
■ Existing ☐ Revised ☐ New ■ State Mandated	Perform calculus operations on vector-valued functions, including derivatives, integrals, curvature, displacement, velocity, acceleration, and torsion. (AMS SLO A)	A problem where the student computes the solution of a given problem to the required significant digits.	A quiz, test or discussion board artifact showing the student's written answer. Grading for correctness and the rubric for EQS will assess this.
■ Existing ☐ Revised ☐ New ■ State Mandated	Find extrema and tangent planes. (AMS SLO C)	The student computes the extrema and tangent planes for a problem to the required significant digits.	A quiz, test or scanned artifact showing the student's written answer. Grading for correctness and the rubric for EQS will assess this.
■ Existing ☐ Revised ☐ New ■ State Mandated	Apply the computational and conceptual principles of calculus to the solutions of real-world problems. (AMS SLO E)	Have the student grade an incorrect problem and show the correct work to the required significant digits.	A quiz, test or discussion board artifact showing the student's written answer. Grading for correctness and the rubric for EQS will assess this.

Department Head: ___Dale Neaderhouser_____   Date: __8-24-13_____
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(Modified from Collin College)