Course Syllabus

MATH 2451, CALCULUS III

Spring Semester, 2013-14

Mathematics Department, Dr. Ernest Pyle, Department Chair

COURSE DESCRIPTION

A continuation of MATH 1452. Topics include: three dimensional coordinate systems, quadric surfaces, cylindrical and spherical coordinates, vector calculus in three dimensions, partial derivatives, the total differential, multiple integrals, line integrals, surface integrals, vector fields, Green's Theorem, Stokes' Theorem, the Divergence Theorem, and applications. This course includes one semester hour credit for laboratory sessions.

COURSE SEQUENCE IN CURRICULUM

This course is a continuation of Calculus II, MATH 1452. It is a prerequisite for MATH 3334, 3371, 3383, 4301, 4332, 4333, 4380, and 4401 and is required for all students majoring in mathematics. It is also required for a minor in mathematics and is one option (along with MATH 3353) for a major in mathematical studies with high school certification.

PRE-REQUISITE INFORMATION

MATH 1452

INSTRUCTOR INFORMATION

Name:	Dr. Jared Painter
E-mail:	jpainter@hbu.edu
Office Phone:	281-649-3215
Office Location:	S107A
Office Hours:	TR:10:45 am – 12:00 pm Or by appointment
Web Page Address, Web Board, ListServ:	Blackboard

LEARNING RESOURCES

Course Text:	*Calculus, Early Transcendentals*, 7th ed., by James Stewart, Brooks/Cole Publishing Company, 2012, ISBN 978-0-538-49790-9.
Laboratory Text	None
Supplementary Text:	*Student Solutions Manual*, *Multivariable Calculus,* 7th ed., by Dan Clegg and Barbara Frank, Brooks/Cole Publishing Co., 2013 (optional but strongly recommended).
Other Required Materials:	A graphing calculator, preferably a TI-83, aTI-84, or a TI-86. A TI-89 or a TI-92 graphing calculator may be used on homework and lab assignments but may not be used on tests. You will be expected to clear the memory of any calculator used on a test. If your calculator contains programs or data that you want to keep, you should save the programs or data before the test or arrange to borrow a calculator from someone else. Calculators may be used during tests only to draw graphs, perform numerical calculations, and check answers. Unless specifically stated otherwise, they may not be used during tests to solve problems by using calculus-related commands, such as computing derivatives and integrals. A WebAssign Access Code. This code may be included with your textbook if you purchased a new copy from the HBU University

Bookstore; if not, it may be purchased online through WebAssign or at the University Bookstore.

COURSE OBJECTIVES

Purpose of the course:

To introduce the student to vector calculus of two and three dimensions, space geometry, limits and continuity in three dimensions, partial and directional derivatives, the total differential, line integrals, multiple integrals, and applications.

Aims for the course:

To extend the concepts and techniques of differential and integral calculus learned in Calculus I and II to functions of more than one variable and to functions using vectors.

On completion of this course, students should be able to:

1. understand the concepts of functions, limits and continuity for functions of two or more variables and for vector-valued functions.
2. identify the equations of lines, planes, quadric surfaces, and cylinders and be able to sketch their graphs.
3. compute and evaluate partial and directional derivatives.
4. find equations of tangent planes to three-dimensional surfaces.
5. find extrema of functions of two variables and be able to solve word problems involving such extrema.
6. evaluate double and triple integrals and use them to find areas, volumes, surface areas, moments, etc.
7. use polar, cylindrical, and spherical coordinates to evaluate double and triple integrals.
8. understand the basic concepts of parameterization and its application to line integrals.
9. test a linear form to see if it is an exact differential and use exact differentials to evaluate line integrals and solve differential equations.
10. apply Green's Theorem, Stokes' Theorem*, and the Divergence Theorem* to compute line and surface integrals.

*This topic may be omitted due to time constraints.

RELATION TO DEPARTMENTAL GOALS AND PURPOSES

The Mathematics/Physics Department "…will offer an academically rigorous, undergraduate curriculum in classical and modern mathematics. The curriculum will prepare students majoring in mathematics and mathematical studies for careers and further education in mathematics and will encourage a lifetime of learning."

"…will provide academically rigorous and modern courses in mathematics to support other programs at the University."

"…will offer courses to enable all graduates of the University to become mathematically literate and develop useful skills in mathematics."

"…will provide the appropriate administrative processes, facilities, research experiences, and faculty to achieve the goals stated above."

RELATION TO COLLEGE GOALS AND PURPOSES

"…to prepare students for careers and further education in the natural sciences and mathematics in a nurturing Christian environment. The College will also serve the HBU community by providing science and mathematics classes that empower HBU students to meet the goals and requirements of their field of study and enrich their liberal arts education."

RELATION TO THE PURPOSE STATEMENT OF THE UNIVERSITY

University mission and purpose statement from the Houston Baptist University Catalog, 2009-2010: "…to provide a learning experience that instills in students a passion for academic, spiritual, and professional excellence as a result of our central confession, "Jesus Christ is Lord"

"…Committed to providing a responsible and intellectually stimulating environment that:

- fosters spiritual maturity, strength of character, and moral virtue as the foundation for successful living
- develops professional behaviors and personal characteristics for life-long learning and service to God and to the community
- meets the changing needs of the community and society
- remains faithful to the **'Nature of the Institution'** statement"

"…Promotes learning, scholarship, creative endeavor, and service".

ATTENDANCE

Please see the official Attendance Policy in the HBU Classroom Policy on Blackboard. Students missing more than 25% of the class will be given a failing grade.

Students missing more than 25% of the class (more than 18 class meetings, lecture and lab combined) will be given a failing grade. Any student missing more than 5 class periods (lecture and lab combined) will have 1 point per additional class period missed deducted from their final grade. Additionally, you will be given one absence if you are late to class three times.

ACADEMIC ACCOMODATIONS

Students needing learning accommodations should inform the professor immediately and consult the Academic Accommodations section of the HBU Classroom Policy posted on Blackboard.

COURSE REQUIREMENTS & GRADE SCALE

Course requirements:

Each student will take three exams during the semester and a final exam. Each of the exams will be comprehensive. In addition there will be online homework assignments on Webassign and weekly lab assignments. A lab final will be given near the end of the semester. Students are expected to participate during class and lab sessions. **Students must create their own Webassign account for this class and must purchase Webassign access if not bundled with the textbook. To create a Webassign account browse to www.webassign.net and click "I have a class key" in the Account Login area, you will then be prompted to enter your class key which is hbu 9825 8238. Fill in the rest of the required information to setup your account.**

Grading standards:

Course grading is as follows:

Homework, Lab, Participation, and Presentation – 25%
Three Regular Exams – 45%
Lab Final – 5%
Final Exam – 25%

The grading scale is:

A = 90 – 100; B = 80 – 89; C = 70 – 79; D = 60 – 69; F = Below 60.

PROFICIENCIES:

Technology component:

Laboratory sessions will include computer activities using Maple. The computer labs are designed to demonstrate how computers can be used to solve calculus problems as well as to assist students in developing a better understanding of calculus concepts. Students will be able to use the software learned in this course as a tool in more advanced math and science courses. Some classes will also include instruction on the use of graphing calculators. Note: Although it is not required, if you would like to purchase a student version of Maple for home use, you may do so from the Maplesoft webstore at http://webstore.maplesoft.com. See your instructor for a promotion code that will allow you to purchase the software at a discounted price.

In addition to Maple, required homework assignments will be submitted using WebAssign, a web-based homework grading system.

Designated essay/writing component:

Some problems included on exams and homework assignments may require essay-type answers.

Reading component:

Students are required to read the textbook. They are responsible for all assigned material even if it is not covered in class.

Oral communication component:

Students are sometimes required to answer questions orally during class.

Mathematics component:

Entire course.

Critical thinking component:

Students are required to read, understand, and analyze problems, develop solution strategies, implement these strategies to solve the problems, then interpret and verify their results.

LATE WORK & TEST POLICY

Late work:

Late homework will not be accepted NO EXCEPTIONS. Two Webassign homework assignments and one of the lab assignments will be dropped at the end of the semester.

Missed tests:

No make-up exams will be given, unless you have a verifiable excused absence. **If you will have a verifiable excused absence on the day of a scheduled exam, you must schedule a make-up exam at least one week prior to the exams.**

EVALUATION

Method of student appraisal of faculty:

Students will be given an opportunity to appraise the professor by completing the IDEA Faculty Evaluation Questionnaire, and/or the COSM course evaluation at the end of the semester. The instructor, the department chairman and dean will review the responses of the students after the completion of the course.

Method of evaluating student response to course:

Students will be given an opportunity to describe their response to the course by completing the IDEA Faculty Evaluation Questionnaire and/or the COSM course Evaluation at the end of the course. The instructor, the department chairman and dean will review the responses of the students after the completion of the course.

LABORATORY DRESS CODE

Students may be asked in advance to wear closed-toed shoes and long pants during certain experimental procedures.

LABORATORY CONDUCT AND SAFETY

Not applicable.

TOPICAL OUTLINE - ***include table, calendar, or topical outline with dates***

Topics Covered:

Tentative Schedule:

List of Topics for Spring 2013		
Week	**Day**	**Topics**
1-1 (Jan 21)	T	§12.1 Three-Dimensional Coordinate Systems
1-2	W	§12.2 Vectors
1-3	R	§12.2 Vectors (cont.)
1-4	F	Computer Lab 1: Review of Maple Topics in Algebra and Single-Variable Calculus
1-5 (Jan 27)	M	§12.3 The Dot Product
2-1	T	§12.4 The Cross Product
2-2	W	§12.5 Equations of Lines and Planes
2-3	R	Computer Lab 2: Vector Operations
2-4	F	§12.5 Equations of Lines and Planes (cont.)
2-5 (Feb 3)	M	§12.6 Cylinders and Quadric Surfaces
3-2	T	§12.6 Cylinders and Quadric Surfaces (cont.)

3-3	W	§13.1 Vector Functions and Space Curves
3-4	T	Computer Lab 3: Cross-Product, Scalar Triple Product, Lines and Planes
3-5	F	§13.2 Derivatives and Integrals of Vector Functions
4-1 (Feb 10)	M	§13.3 Arc Length and Curvature
4-2	Tu	§13.3 Arc Length and Curvature (cont.)
4-3	W	§13.4 Motion in Space, Velocity and Acceleration
4-4	Th	Computer Lab 4: Space Curves and Quadric Surfaces, Vector-Valued Functions, Tangent Vectors, Arc Length
4-5	F	§13.4 Motion in Space, Velocity and Acceleration (cont.)
5-1 (Feb 17)	M	§14.1 Functions of Several Variables
5-2	Tu	§14.2 Limits and Continuity
5-3	W	**Review for Test 1, time permitting**
5-4	Th	**Test 1 (February 7, 2013)**
5-5	F	§14.3 Partial Derivatives
6-1 (Feb 24)	M	§14.4 Tangent Planes and Linear Approximations
6-2	Tu	§14.4 Tangent Planes and Linear Approximations (cont.)
6-3	W	§14.5 The Chain Rule
6-4	Th	Computer Lab 5: Curvature, Velocity and Acceleration, Level Curves, Limits of Functions of More than One Variable, Partial Derivatives.
6-5	F	§14.5 The Chain Rule (cont.)
7-1 (Mar 3)	M	§14.6 Directional Derivatives and the Gradient
7-2	Tu	§14.6 Directional Derivatives and the Gradient (cont.)
7-3	W	§14.7 Maximum and Minimum Values of Functions
7-4	Th	Computer Lab 6: Linear Approximations, Differentials, Tangent Planes, Directional Derivatives
7-5	F	§14.7 Maximum and Minimum Values of Functions (cont.)
Spring Break, March 10-14, 2014		
8-1 (Mar 17)	M	§15.1 Double Integrals over Rectangles
8-2	Tu	§15.2 Iterated Integrals
8-3	W	§15.3 Double Integrals over General Regions
8-4	Th	Computer Lab 7: Tangent Planes and Normal Lines, Gradient Vectors, Local and Absolute Extrema, Double Riemann Sums
8-5	F	§15.3 Double Integrals over General Regions (cont.)
9-1 (Mar 24)	M	§15.4 Double Integrals in Polar Coordinates
9-2	Tu	§15.4 Double Integrals in Polar Coordinates (cont.)
9-3	W	**Review for Test 2 (time permitting)**
9-4	Th	**Test 2 (March 7, 2013)**
9-5	F	§15.5 Applications of Double Integrals
10-1 (Mar 31)	M	§15.6 Surface Area
10-2	Tu	§15.7 Triple Integrals
10-3	W	§15.7 Triple Integrals (cont.)
10-4	Th	Computer Lab 8: Double Integrals, Volume between two surfaces
10-5	F	§15.7 Triple Integrals in Cylindrical Coordinates **(March 22, 2013, Last Day to Drop)**
11-1 (Apr 7)	M	§15.8 Triple Integrals in Spherical Coordinates
11-2	Tu	§15.8 Triple Integrals in Spherical Coordinates (cont.)
11-3	W	§15.9 Change of Variables in Multiple Integrals
11-4	Th	Computer Lab 9: Use of Polar Coordinates with Double Integrals, Applications of Double Integrals
11-5	F	**Good Friday/Easter Holiday (March 29, 2013)**
12-1 (Apr 14)	M	§15.9 Change of Variables in Multiple Integrals **Priority Reg. Begins (April 1, 2013)**
12-2	Tu	§15.9 Change of Variables in Multiple Integrals (cont.)
12-3	W	§16.1 Vector Fields, §16.2 Line Integrals

12-4	Th	§16.2 Line Integrals (cont.)
12-5	F	Computer Lab 10: Triple Integrals, Cylindrical and Spherical Coordinates, Applications of Triple Integrals
13-1 (Apr 21)	M	§16.3 The Fundamental Theorem for Line Integrals
13-2	Tu	§16.3 The Fundamental Theorem for Line Integrals (cont.)
13-3	W	§16.4 Green's Theorem
13-4	Th	Computer Lab 11: Change of Variables in Double and Triple Integrals, Vector Fields, Line Integrals, the Fundamental Theorem for Line Integrals,
13-5	F	§16.5 Curl and Divergence
14-1 (Apr 28)	M	§16.6 Parametric Surfaces and their Area
14-2	Tu	§16.6 Parametric Surfaces and their Area (cont.)
14-3	W	**Review for Test 3, time permitting**
14-4	Th	**Test 3 (April 18, 2013)**
14-5	F	§16.7 Surface Integrals
15-1 (May 5)	M	§16.7 Surface Integrals (cont.)
15-2	Tu	§16.8 Stokes' Theorem*
15-3	W	§16.9 The Divergence Theorem*
15-4	Th	Computer Lab 12: Green's Theorem, Divergence and Curl, Surface Area; Tangent Planes or Lab Final Exam
15-5	F	**Review for Final Exam (time permitting)**
16 (May 12)	M	**Reading Day**

*This topic may be omitted due to time constraints.

Tentative Computer Lab Schedule	
Week/Lab	**Topic**
1/1	Review of Maple Topics in Algebra and Single-Variable Calculus
2/2	Vector Operations
3/3	Cross-Product, Scalar Triple Product, Lines and Planes
4/4	Space Curves and Quadric Surfaces, Vector-Valued Functions, Tangent Vectors, Arc Length
5	**Test 1 (February 7, 2013)**
6/5	Curvature, Velocity and Acceleration, Level Curves, Limits of Functions of More than One Variable, Partial Derivatives
7/6	Linear Approximations, Differentials, Tangent Planes, Directional Derivatives
8/7	Tangent Planes and Normal Lines, Gradient Vectors, Local and Absolute Extrema, Double Riemann Sums
9	**Test 2 (March 7, 2013)**
10/8	Double Integrals, Volume between two surfaces
11/9	Use of Polar Coordinates with Double Integrals, Applications of Double Integrals
12/10	Triple Integrals, Cylindrical and Spherical Coordinates, Applications of Triple Integrals
13/11	Vector Fields, Line Integrals, the Fundamental Theorem for Line Integrals, Change of Variables in Double and Triple Integrals
14	**Test 3 (April 18, 2013)**
15/12	Green's Theorem, Divergence and Curl, Surface Area; Tangent Planes
16	**Final Exam TBA** **Lab Final TBA**

Homework: Homework assignments will be made daily but only homework assigned using WebAssign will be graded. In addition to the problems from WebAssign, students are strongly encouraged to work as many of the problems shown below as their time permits. The assignments made with WebAssign provide only the minimal amount of homework needed; the additional problems shown below provide additional depth—the more of these you do, the greater your chances will be to be successful in this course.

Supplementary Homework from Textbook (Not to be Handed In or Graded)

Section	Page No.	Problems
12.1	790	3, 7, 9, 11, 13, 15, 17, 21, 23, 25, 29, 31, 33, 35
12.2	798	1, 5, 7, 11, 13, 17, 19, 21, 23, 25, 26,27,29, 31,35,37, 39
12.3	806	1, 5, 7, 9, 11, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 39, 41, 43, 47, 49, 51, 55
12.4	814	3, 7, 9, 11, 13, 17, 18, 19, 23, 27,29, 31, 33, 35, 37, 41
12.5	824	3, 5, 7, 11, 13, 15, 17, 19, 21, 23, 25, 29, 33, 35, 37, 39, 43, 47, 49, 50, 51, 53, 55, 57, 59, 65, 67, 69, 71. 73
12.6	832	3, 5, 7, 13, 15, 17, 19, 21, 25, 27, 33, 35, 45
13.1	845	1, 3, 5, 7, 9, 11, 17, 19, 21, 25, 27, 29, 41, 43, 47
13.2	852	1, 3, 5, 7, 11, 13, 15, 17, 19, 21, 23, 25, 27, 33, 35, 37, 39, 41, 43, 49
13.3	860	3, 5, 7, 11, 13, 15, 17, 19, 21, 23, 25, 27, 43, 45, 47, 49
13.4	870	3, 7, 11, 13, 15, 19, 21, 23, 25, 35, 37, 39, 41
14.1	888	1, 5, 7, 9, 11, 13, 15, 19, 21, 23, 27, 29, 33, 35, 45, 61
14.2	899	1, 5, 7, 9, 11, 13, 15, 17, 19, 21, 25, 31, 33, 35, 37, 39
14.3	911	3, 5, 7, 11, 17, 19, 21, 27, 29, 35, 37, 43, 45, 49, 51, 57, 61, 63, 65, 69, 71, 76 c, d, 78 c, d, 81, 83, 93
14.4	922	3, 5, 13, 15, 17, 19, 23, 27, 29, 31, 33, 35, 39, 43
14.5	930	3, 5, 7, 9, 13, 15, 19, 23, 25, 27, 29, 31, 33, 37, 39, 41, 45, 47, 49, 51
14.6	943	1, 3, 5, 7, 9, 13, 15, 17, 21, 23, 25, 29, 31, 33, 39, 43, 45, 55, 59
14.7	953	1, 5, 9, 13, 15, 29, 31, 35, 39, 43, 47, 49, 51
15.1	981	1, 3, 5, 11, 13
15.2	987	1, 3, 7, 13, 17, 21, 23, 25, 29, 31, 35
15.3	995	3, 9, 11, 15, 17, 19, 23, 25, 27, 31, 35, 37, 45, 49, 51, 53, 55, 57, 59, 61
15.4	1002	1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 27, 29, 31, 39
15.5	1012	1, 3, 7, 11, 15, 17, 23, 27, 29
15.6	1016	1, 3, 7, 9, 11, 23
15.7	1025	1, 3, 7, 9, 11, 13, 17, 19, 21, 27, 31, 33, 37, 41, 47, 51, 53
15.8	1031	1, 3, 5, 9, 11, 13, 17, 19, 21, 23, 27, 29
15.9	1037	1, 3, 5, 7, 9, 11, 15, 17, 19, 21, 23, 25, 27, 29, 31, 35, 39, 41
15.10	1047	1, 3, 7, 11, 13, 15, 17, 19, 21, 23, 25, 27
16.1	1061	1, 11, 13, 17, 21, 23, 25, 29
16.2	1072	3, 5, 7, 9, 11, 13, 15, 19, 21, 25, 33, 39, 41, 43
16.3	1082	3, 7, 9, 13, 15, 17, 19, 23, 31, 33, 35
16.4	1089	1, 3, 7, 9, 11, 13, 17, 19, 27
16.5	1097	3, 5, 7, 13, 15, 17, 19, 21, 23
16.6	1108	1, 3, 5, 19, 21, 23, 25, 33, 35, 40, 43, 45, 47
16.7	1120	5, 7, 9, 11, 17, 19, 23, 25, 29, 31
16.8	1127	3, 5, 7, 9, 13
16.9	1133	3, 7, 11, 13

The content of this outline and the attached schedule are subject to change at the discretion of the professor.

Student Signature – I have read and understand the syllabus for this class. I understand that the content of this syllabus and the topical outline are subject to change at the discretion of the professor. I have read and understand the HBU Classroom Policy posted on Black Board. **I promise to uphold the Code of Academic Integrity at Houston Baptist University and will not tolerate its violation by others**.