Calculus III Honors Course Overview

Content Area:	**Math**
Course(s):	**CALCULUS III H**
Time Period:	
Length:	**Full Year**
Status:	**Published**

Cover

EAST BRUNSWICK PUBLIC SCHOOLS

East Brunswick New Jersey

Superintendent of Schools

Dr. Victor P. Valeski

Mathematics

Calculus III Honors-Course Number: 1182

K-12 Supervisor of Mathematics

Mr. Anthony J. Gugliotta Jr.

Mathematics Department Chairperson (Grade 8-12)

Dr. Manjit K. Sran

Revisions Prepared By

Dr. Manjit K. Sran

Mrs. Raisa Berkovich

Course Adoption: 9/6/07

Curriculum Adoption: 11/2/17

Date of Last Revision Adoption: 9/1/2017

Course Overview

COURSE DESCRIPTION:

This course will build on the students' understanding of the concepts of calculus including the understanding of the derivative and the integral. The course emphasizes the relationship between the graphical, numerical, verbal and analytical representations of problems and solutions. Through the exploration of problems, students also develop fluency in computational procedures for find derivatives and antiderivatives of algebraic, rational, exponential, parametric and trigonometric functions. Technology is used regularly by students to reinforce the understanding of the relationships.

Textbooks and other resources

Textbook: Calculus Early Transcendentals by Anton, Bivens, and Davis, adopted 2016

TI-83 or TI-84 graphing calculator is required for this course

Scope and Sequence

Sequential Unit Description:	Marking Period Guide	Other Pacing Guide References	Proficiency (Summative) Assessments
Unit 1 – Review of Calculus I and Calculus II Topics Including: Limits and Continuity,Derivative, Topics in differntiation, The derivative in Graphing and Applications, Integration, Applications of definite Integral in Geometry, Science, and Engineering, Principals of Integral Evaluation, Mathematical Modeling with Differential Equations, Infinite Series, and Parametric and Polar Curve; Conic Sections	1	**Text Chapters 1-10**	**Quiz** **Worksheets** **Test**
Unit 2 - THREE-DIMENSIONAL SPACE; VECTORS In this chapter we will discuss rectangular coordinate systems in three	1	**Text Chapter 11**	**Lab** **Quiz/Test**

dimensions, and we will study the analytic geometry of lines, planes, and other basic surfaces. The second theme of this chapter is the study of vectors. These are the mathematical objects that physicists and engineers use to study forces, displacements, and velocities of objects moving on curved paths. More generally, vectors are used to represent all physical entities that involve both a magnitude and a direction for their complete description. We will introduce various algebraic operations on vectors, and we will apply these operations to problems involving force, work, and rotational tendencies in two and three dimensions. Finally, we will discuss cylindrical and spherical coordinate systems, which are appropriate in problems that involve various kinds of symmetries and also have specific applications in navigation and celestial mechanics.			
Unit 3 – VECTOR-VALUED FUNCTIONS In this chapter we will consider functions whose values are vectors. Such functions provide a unified way of studying parametric curves in 2-space and 3-space and are a basic tool for analyzing the motion of particles along curved paths. We will begin by developing the calculus of vector-valued functions—we will show how to differentiate and integrate such functions, and we will develop some of the basic properties of these operations. We will then apply these calculus tools to define three fundamental vectors that can be used to describe such basic characteristics of curves as curvature and twisting tendencies. Once this is done, we will develop the concepts of velocity and acceleration for such motion, and we will apply these concepts to explain various physical phenomena. Finally, we will use the calculus of vector-valued functions to develop basic principles of gravitational attraction and to derive Kepler's laws of planetary motion.	**2**	**Text Chapter 12**	**Lab** **Quiz/Test**
Unit 4 – PARTIAL DERIVATIVES In this chapter we will extend many of the basic concepts of calculus to functions of two or more variables, commonly called functions of several variables. These concepts include limits and continuity, differentiability, tangents, rates of change, and extreme values. Although many of these ideas extend in a natural way to functions of several variables, such functions also possess unique features that will suggest the development of some new mathematical concepts and tools.	**2 & 3**	**Text Chapter 13**	**Lab** **Quiz/Test**
Unit 5 – MULTIPLE INTEGRALS In this chapter we will extend the concept of a definite integral to functions of two and three variables. Whereas functions of one variable are usually integrated over intervals, functions of two variables are usually integrated over regions in 2-space and functions of three variables over regions in 3-space. Calculating such integrals will require some new techniques that will be a central focus in this chapter. Once we have developed the basic methods for integrating functions of two and three variables, we will show how such integrals can be used to calculate surface areas and volumes of solids; and we will also show how they can be used to find masses and centers of gravity of flat plates and three-dimensional solids. In addition to our study of integration, we will generalize the concept of a parametric curve in 2-space to a parametric surface in 3-space. This will allow us to work with a wider variety of surfaces than previously possible and will provide a powerful tool for generating surfaces using computers and other graphing utilities.	**3**	**Text Chapter 14**	**Lab** **Quiz/Test**

Unit 6 – TOPICS IN VECTOR CALCULUS We begin this chapter by introducing the concept of a vector field, an important tool for the study of gravitational and electrostatic force fields, the flow of fluids, and conservation of energy. Next, we will introduce the "line integral," a new type of integral with a variety of applications to the analysis of vector fields. Finally, we conclude with three major theorems, Green's Theorem, the Divergence Theorem, and Stokes' Theorem. These theorems provide deep insight into the nature of vector fields and are the basis for many of the most important principles in physics and engineering.	**4**	**Text Chapter** **15**	**Lab** **Quiz/Test**

Standards for Mathematical Practices

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.

Grading and Evaluation Guidelines

GRADING GUIDELINES:

As per Math Department Policy, grades will be determined by a variety of assessment strategies, including Major Assessments, Minor Assessments, and Performance Assessments. In addition to tests and quizzes, students will be evaluated on a combination of performance assessment instruments, including homework completions, cooperative group participation, note-taking, open ended question responses, lab reports and/or supplemental projects.

GRADING PROCEDURES:

Grading procedures must be described in sufficient detail so that a pupil will understand, the minimal to advanced proficiency, expected of him/her as the outcome of each unit, for the marking period and for the course as a whole. Benchmark level assessments associated with the course also need to be identified. While assessments of proficiency levels must be valid and reliable they do not need be the same for all students. Other criteria to be considered in grading must be identified and the degree to which such criteria will be considered in a grade. Each pupil must receive a copy of the grading procedures, proficiencies and criteria for each unit and/or marking period.

COURSE EVALUATION:

Course achievement will be evaluated as the percent of all pupils who achieve the minimum level of proficiency (final average grade) in the course. Student achievement levels above minimum proficiency will also be reported. Final grades, and where relevant mid-term and final exams, will be analyzed by staff for the total cohort and for sub-groups of students to determine course areas requiring greater support or modification.

In terms of proficiency the East Brunswick grades are as follows:

A	**Excellent**	**Advanced Proficient**
B	**Good**	**Above Average Proficient**
C	**Fair**	**Proficient**
D	**Poor**	**Minimally Proficient**
F	**Failing**	**Partially Proficient**

In this course the goal is that a minimum of 95% of the pupil's will meet at least the minimum proficiency level (D or better) set for the course. The department will analyze the achievement of students on Unit Assessments, Mid-term and Final Exams and Final Course Grades, and for Final Course Grades the achievement of sub-groups identified by the state to determine if modifications in the curriculum and instructional methods are needed.

Course evaluation requires the answering of the following questions:
1. Are course content, instruction and assessments aligned with the required NJSLS? 2. Is instruction sufficient for students to achieve the Standards? 3. Do all students achieve the set proficiencies/benchmarks set for the course?

Other Details

SCED

02122 Calculus III Honors

This courses specifically addresses advanced topics in calculus. Students will learn to use vectors and coordinate systems for three-dimensional space and represent lines, planes, cylinders, and quadric surfaces in space. Students will explore the use of multivariable calculus to represent phenomenon in three dimensional space and to analyze functions of more than one variable. Students will apply the skills learned in AP calculus BC to this course and further explore the concepts of differential and integral calculusas they relate tofunctions of more than one variable such as volumesand surface areas.