

Math 221 - Calculus & Analytic Geometry III

Summer 2003 Course Syllabus

James Jones, Professor of Mathematics
Richland Community College

Course Meeting Information:

Section 01 meets from 1:00 pm to 2:50 pm on Mon, Tue, Wed, and Thu in room S137.

Instructor Information:

James Jones, Professor of Mathematics.

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Office hours are not required for summer courses but I am available for students between 12:00 pm and 1:00 pm on class days.

Texts:

- ! *Calculus: A New Horizon, 7th edition..* Howard Anton. Copyright 2002, John Wiley & Sons, Inc. (Required)
- ! *Student Resource Manual.* Copyright 2002, John Wiley & Sons, Inc. (Optional)

Student Audience:

Transfer students. Students pursuing degrees in engineering, mathematics, life sciences.

Prerequisite:

Successful completion (C or better grade) of Math 122, Calculus and Analytic Geometry II.

Course Description:

MATH 221 - Calculus and Analytic Geometry III

Hours: 4 lecture - 0 lab - 4 credit

Mathematics 221, Calculus and Analytic Geometry III, begins with the rectangular coordinate system in three-dimensional space, vectors, and operations with vectors. Lines, planes, quadric surfaces, spherical and cylindrical coordinates, vector-valued functions, curvature, Kepler's Laws of Planetary Motion, partial derivatives, relative extrema of functions of two or more variables, centroid, Lagrange Multipliers, and multiple integrals in different coordinate systems are introduced. At the end, students will learn integrals of functions over a curve or a surface, Green's theorem, the divergence theorem, and Stoke's theorem.

Applicable toward graduation where program structure permits:

- ! Certificate or degree: All certificates and all degrees.
- ! Group requirement: Mathematics
- ! Area of Concentration: Mathematics.

Illinois Articulation Initiative (IAI)

The mathematics component of general education focuses on quantitative reasoning to provide a base for developing a quantitatively literate college graduate. Every college graduate should be able to apply simple mathematical methods to the solution of real-world problems. A quantitatively literate college graduate should be able to:

- ! interpret mathematical models such as formulas, graphs, tables, and schematics, and draw inferences from them;
- ! represent mathematical information symbolically, visually, numerically, and verbally;
- ! use arithmetic, algebraic, geometric, and statistical methods to solve problems;
- ! estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives, and select optimal results; and
- ! recognize the limitations of mathematical and statistical models.

Courses accepted in fulfilling the general education mathematics requirement emphasize the development of the student's capability to do mathematical reasoning and problem solving in settings the college graduate may encounter in the future. General education mathematics courses should not lead simply to an appreciation of the place of mathematics in society, nor should they be merely mechanical or computational in character.

To accomplish this purpose, students should have at least one course at the lower-division level that emphasizes the foundations of quantitative literacy and, preferably, a second course that solidifies and deepens this foundation to enable the student to internalize these habits of thought.

Math 221, Calculus & Analytic Geometry III, satisfies the Illinois Articulation Initiative Definition of a General Education Mathematics Course. It corresponds to MI 900, College-level Calculus.

Richland's Math 221, Calculus & Analytic Geometry III also satisfies the requirements for the IAI Mathematics Major course MTH 903: Calculus III and the Engineering Major course EGR 903: Calculus III.

For more information on the Illinois Articulation Initiative, visit their website at <http://www.itransfer.org/>

General Course Objectives:

While learning Calculus is certainly one of the goals of this course, it is not the only objective. Upon completion of this course, the student should be able to ...

- ! demonstrate comprehension and understanding in the topics of the course through symbolic, numeric, and graphic methods
- ! demonstrate the use of proper mathematical notation
- ! use technology when appropriate and know the limitations of technology
- ! work with others towards the completion of a common goal
- ! use deductive reasoning and critical thinking to solve problems

A detailed topical outline of the content covered in this course is at the end of this syllabus.

Type of Instruction:

Types of instruction include discussion, problem solving, student questions, student participation, lecture, and guided exercises. Students are strongly encouraged to come to class with a list of questions and to ask these questions.

Method of Evaluation:

Could include any of the following: problem solving exams, objective exams, essays, written papers, oral presentations, group projects, quizzes, homework.

Grading Policy:

Letter grades will be assigned to final adjusted scores as follows:

- ! A: 90 - 100%
- ! B: 80 - 89%
- ! C: 70 - 79%
- ! D: 60 - 69%
- ! F: below 60%

Consideration will be given to such qualities as attendance, class participation, attentiveness, attitude in class, and cooperation to produce the maximum learning situation for everyone.

The instructor will give you a grade sheet so that you can record your scores and keep track of your progress in the course. If you are concerned about your grades, see the instructor.

Attendance Policy:

Regular attendance is essential for satisfactory completion of this course. If you have excessive absences, you cannot develop to your fullest potential in the course. Students who, because of excessive absences, cannot complete the course successfully, will be administratively dropped from the class at midterm. If a student stops attending after midterm, it is the student's responsibility to withdraw to avoid an "F". The instructor has the ability to drop students who are not regularly attending at any time during the semester. The safest way to make sure you're not dropped for non-attendance is to continue to attend classes.

The student is responsible for all assignments, changes in assignments, or other verbal information given in the class, whether in attendance or not.

If a student must miss class, a call to the instructor (RCC's phone system has an answering system) is to be made, or an email message sent. When a test is going to be missed, the student should contact the instructor ahead of time if at all possible. Under certain circumstances, arrangements can be made to take the test before the scheduled time. If circumstances arise where arrangements cannot be made ahead of time, the instructor should be notified and a brief explanation of why given by either voice or email. This notification must occur before the next class period begins. At the instructor's discretion, the score on the final exam may be substituted for the missed exam.

Calculators:

A TI-92 or TI-89 calculator is highly recommended for this course. There are computers in the classroom with Derive on them, and these may be used by students who don't have the TI-92 or TI-89 calculator. Calculators may be used to do homework. Calculators may be used on exams and/or quizzes in class unless otherwise announced.

Additional Supplies:

The student should have a red pen, ruler, graph paper, stapler, and paper punch. The student is expected to bring calculators and supplies as needed to class. The calculator should be brought daily. There will be a paper punch and stapler in the classroom.

Additional Help:

Office hours will be announced. The student is encouraged to seek additional help when the material is not comprehended. Mathematics is a cumulative subject; therefore, getting behind is a very difficult situation for the student.

If your class(es) leave you puzzled, the Student Learning Center, in room S116, is a service that Richland Community College offers you. It is available free of charge to all RCC students. However, at this level of course work, you will find that the best resources are the other people in the class and the instructor. It is strongly recommended that you form a study group.

Be sure to get help before it is too late.

Homework:

Homework is crucial to your success in this course. There is a correlation between doing your homework and success in the course. Not only does the homework count towards your grade, but it also prepares you for the tests. Studies show that the average student will need to spend two hours outside of class for each hour in class. The very fact that you're in Calculus III shows that you're exceptional students, but still plan on allowing time outside of class for doing homework. Do not expect to master the subject without doing homework.

Topical Outline:

Hours Topic

- 12 **Three dimensional space and vectors.**
! Rectangular, spherical, and cylindrical coordinate systems
! Vectors, dot and cross products, projections.
! Parametric equations of lines, 3D planes, and quadric surfaces
- 11 **Vector valued functions**
! Differentiation and integration
! Arc length and change of parameters
! Unit tangent, normal, and binormal vectors
! Curvature, motion along a curve
! Kepler's laws of planetary motion
- 13 **Partial Derivatives**
! Multivariable graphs, contour plots
! Limits and continuity
! Partial derivatives, differentials
! The chain rule
! Directional derivatives and gradients
! Tangent planes and normal vectors
! Maxima and minima, Lagrange multipliers
- 12 **Multiple Integrals**
! Double integrals in rectangular and polar coordinates
! Parametric surfaces and surface area
! Triple integrals in rectangular, spherical, and cylindrical coordinates
! Centroid, center of gravity, theorem of Pappus
! Jacobians and change of variables
- 12 **Topics from Vector Calculus**
! Vector fields, divergence, curl
! Line integrals
! Independence of path, conservative vector fields, and Green's theorem
! Surface integrals, flux, divergence theorem
! Stoke's theorem