COURSE OUTLINE

Math 104H (C-ID Number: MATH 221)
Honors Calculus and Analytic Geometry (C-ID Title: Single Variable Calculus II Late Transcendentals)

Catalog Statement

MATH 104H is a study of the calculus of inverse functions, transcendental functions, techniques of integration, indeterminate forms, applications of integration, differential equations, parametric equations, polar coordinates, conic sections, and infinite sequences and series. The honors section of this course features more theory and proof, and one or more projects related to the topics of the course.

Total Lecture Units: 5.0
Total Laboratory Units: 0.0
Total Course Units: 5.0

Total Lecture Hours: 80.0
Total Laboratory Hours: 0.0
Total Laboratory Hours To Be Arranged: 0.0
Total Faculty Contact Hours: 80.0

Prerequisite: MATH 103.

Course Entry Expectations

Prior to enrolling in the course, the student should be able to:

- find limits of functions at points and at infinity;
- determine and prove continuity of a function at a point;
- use the derivative for rate of change problems;
- implicitly differentiate and apply the technique of implicit differentiation.
- find derivatives of composite functions;
- determine relative and absolute maximum and minimum point of functions and points of inflection;
- evaluate the area under a curve using Riemann sums;
- apply the mean-value theorem for integrals and demonstrate an understanding of the Fundamental Theorem of Calculus;
- use substitution to integrate;
- determine the area between curves and the average value of a function;
- determine the volumes of solids of revolution using the disk method, the cylindrical shell method, and the cross-section method;
- determine work done in applications involving liquids and springs.

Course Exit Standards

Upon successful completion of the required coursework, the student will be able to:

- graph logarithmic and exponential functions;
- graph equations in polar parametric form;
- graph conic sections;
- integrate functions using variety of techniques;
- differentiate inverse trigonometric functions;
- apply l'Hospital's rule to find limits of indeterminate forms;
- evaluate improper integrals;
- model differential equations;
- solve separable differential equations;
- solve differential equations using slope fields and Euler's Method;
- work with exponential and logistic models of growth and decay;
- determine divergence or convergence of infinite series;
- determine the radius and interval of convergence of power series;
- differentiate and integrate power series;
- find Taylor and Maclaurin series for a function.

Course Content **Total Faculty Contact Hours = 80.0**

Inverse Functions **(12 Hours)**
- Inverse functions
- Exponential functions and their derivatives
- Logarithmic functions
- Derivatives of logarithmic functions
- Exponential growth and decay
- Inverse trigonometric functions
- Hyperbolic functions
- Indeterminate forms and l'Hospital's rule

Techniques of Integration **(16 Hours)**
- Integration by parts
- Trigonometric integrals
- Trigonometric substitution
- Integration of rational functions by partial functions
- Rationalizing substitutions
- Strategy for integration
- Using computer algebra systems
- Approximate integration, including midpoint, trapezoidal, and Simpson's rules
- Improper integrals

Further Applications of Integration **(10 Hours)**
- Differential equations
- Arc length
- Area of a surface of revolution
- Moments and center of mass
- Hydrostatic pressure and force

Differential Equations **(8 Hours)**

Modeling with Differential Equations
Directions Fields and Euler's Method
Separable Differential Equations
Exponential Growth and Decay
Logistic Equations

Parametric Equations and Polar Coordinates **(12 Hours)**
Curves defines by parametric equations
Tangents and areas
Arc length and surface area
Polar coordinates
Areas and lengths in polar coordinates
Conic sections
Conic sections in polar coordinates

Infinite Sequences and Series **(22 Hours)**
Sequences
Series
The integral test
The comparison tests
Alternating series
Absolute convergence and the ration and toot tests
Strategy for testing series
Power series including radius and interval of convergence
Representation of functions and power series
Taylor and Maclaurin series
The binomial series
Applications of Taylor polynomials

Methods of Instruction

The following methods of instruction may be used in this course:

- lecture and discussion;
- graphing calculator demonstrations;
- group work;
- guided computer explorations.

Out of Class Assignments

The following out of class assignments may be used in this course:

- homework (e.g. problem sets related to course content);
- assignments and/or projects (e.g. group project to solve a "challenging" application problem from the textbook);
- individual or group reports and/or presentations (e.g. prove a theorem stated in the textbook and present the proof to the instructor).

Methods of Evaluation

The following methods of evaluation may be used in this course:

- quizzes;
- four or more chapter examinations are required;
- a two-hour-and-twenty-minute comprehensive final examination.

Textbooks

Stewart, James. *Calculus.* 8th ed. Boston: Cengage Learning, 2016. Print.
10th Grade Textbook Reading Level. ISBN 978-1-285-74062-1

Student Learning Outcomes

Upon successful completion of the required coursework, the student will be able to:

- evaluate the derivatives and/or integrals of functions;
- evaluate the limits of indeterminate forms;
- apply the methods of integration to calculating arc-lengths, surface areas, and volumes;
- solve calculus problems using parametric equations and polar coordinates;
- determine the convergence or divergence of sequences and series, and find the Taylor series of basic functions.