

**NEOSHO COUNTY COMMUNITY COLLEGE  
MASTER COURSE SYLLABUS**

**COURSE IDENTIFICATION**

Course Code/Number: MATH 150  
Course Title: Analytic Geometry and Calculus I  
KRSN: MAT2010 – Calculus I  
(Kansas Regents Shared Number)

Please visit the Kansas Board of Regents website for more information.

Division:  Applied Science (AS)    Liberal Arts (LA)    Workforce Development (WD)  
 Health Care (HC)    Lifetime Learning (LL)    Nursing    Developmental

Credit Hour(s): 5  
Effective Date: Summer 2016  
Assessment Goal Per Outcome: 80%

**COURSE DESCRIPTION**

A study is made of some topics in analytic geometry, functions, and limits. The theory and applications of the derivative and integral are then developed.

**MINIMUM REQUIREMENTS/PREREQUISITES AND/OR COREQUISITES**

MATH 113 or its equivalent. This requirement may be satisfied by a College-Level Examination Program (CLEP) College Algebra test score of 50.

**TEXTS**

The official list of textbooks and materials for this course is found on [myNeosho](http://www.neosho.edu).

<http://www.neosho.edu/ProspectiveStudents/Registration/CourseSyllabi.aspx>

## GENERAL EDUCATION OUTCOMES

1. Practice Responsible Citizenship through:
  - identifying rights and responsibilities of citizenship,
  - identifying how human values and perceptions affect and are affected by social diversity,
  - identifying and interpreting artistic expression.
2. Live a healthy lifestyle (physical, intellectual, social) through:
  - listing factors associated with a healthy lifestyle and lifetime fitness,
  - identifying the importance of lifetime learning,
  - demonstrating self-discipline, respect for others, and the ability to work collaboratively as a team.
3. Communicate effectively through:
  - developing effective written communication skills,
  - developing effective oral communication and listening skills.
4. Think analytically through:
  - utilizing quantitative information in problem solving,
  - utilizing the principles of systematic inquiry,
  - utilizing various information resources including technology for research and data collection.

## COURSE OUTCOMES/COMPETENCIES

The following outcomes and competencies, excepting those denoted with an asterisk, comprise the official list of outcomes and competencies submitted by the Kansas Core Outcomes Group and approved by the Kansas Board of Regents. Outcomes and competencies denoted with an asterisk are additional requirements specific to Neosho County Community College. All students will be assessed upon their performance regarding the following outcomes.

1. Reviewing algebraic and trigonometric concepts. \*
  - a. Graph and identify linear, polynomial, power, rational, trigonometric, exponential, and logarithmic functions. \*
  - b. Recognize and create combinations and compositions of functions. \*
  - c. Find the inverse of a one-to-one function, including trigonometric functions. \*
  - d. Simplify expressions and solve equations involving logarithmic and exponential expressions. \*
2. Using Limits.
  - a. Evaluation of Limits
    - Evaluate the limit of a function at a point both algebraically and graphically
    - Evaluate the limit of a function at infinity both algebraically and graphically
    - Use the definition of a limit to verify a value for the limit of a function
  - b. Use of Limits
    - Use the limit to determine the continuity of a function
    - Apply the Intermediate-Value Theorem
    - Use the limit to determine differentiability of a function
  - c. Limiting Process

- Use the limiting process to find the derivative of a function.
3. Finding Derivatives
- Find derivatives involving powers, exponents, and sums
  - Find derivatives involving products and quotients
  - Find derivatives involving the chain rule
  - Find derivatives involving exponential, logarithmic, and trigonometric functions
  - Find derivatives involving implicit differentiation
4. Using Derivatives
- a. Curve Sketching
- Use the first derivative to find critical points
  - Apply the Mean-Value Theorem for derivatives
  - Determine the behavior of a function using the first derivative
  - Use the second derivative to find inflection points
  - Determine the concavity of a function using the second derivative
  - Sketch the graph of the function using information gathered from the first and second derivatives
  - Interpret graphs of functions
- b. Applications of Derivatives
- Use the derivative to find velocity, acceleration, and other rates of change
  - Use the derivative to find the equation of a line tangent to a curve at a given point
  - Use optimization techniques in areas such as economics, the life sciences, the physical sciences, and geometry
  - Use L'Hospital's rule to find limits of indeterminate forms. \*
  - Solve related rates problems
  - Use Newton's Method
  - Use differentials to estimate change
5. Finding Integrals
- Find area using Riemann sums and integrals
  - Express the limit of a Riemann sum as a definite integral
  - Evaluate the definite integral using geometry
  - Integrate algebraic, exponential, and trigonometric functions
  - Evaluate definite integrals using the Fundamental Theorem of Calculus
  - Apply the Mean-Value Theorem for integrals
  - Integrate indefinite integrals
  - Integrate using substitution
  - Approximate integrals using Simpson's Rule and the Trapezoidal Rule.

**As an additional comment from the Kansas Mathematics Core Outcome Group**

Kansas Public College and University mathematics professors believe that a strong foundation in the concepts of calculus will lead to success in careers that have a strong emphasis in critical thinking, such

as engineering, computer science, or biotechnology. However, this will not happen if calculus is taught at primarily a skills and formula level without sufficient time to engage students in the deeper, conceptual tenets of calculus. All calculus teachers have an obligation to the mathematics community to ensure that students completing a first-semester, mainstream calculus course understand the material in a rigorous fashion at the level required to pass the AP Calculus exam.

## **MINIMUM COURSE CONTENT**

The following topics must be included. However, the course is not limited to these topics. The order of topics is up to the discretion of the instructor.

### ***Unit I Functions***

Functions and Their Graphs

Identifying Function; Mathematical Models

Combining Functions; Shifting and Scaling Graphs

Graphing with Calculators and Computers

Exponential Functions

Inverse Functions and Logarithms

### ***Unit II Limits and Continuity***

Rates of Change and Limits

Calculating Limits Using the Limit Laws

The Precise Definition of a Limit

One-Sided Limits and Limits at Infinity

Infinite Limits and Vertical Asymptotes

Continuity

Tangents and Derivatives

### ***Unit III Differentiation***

The Derivative as a Function

Differentiation Rules for Polynomials, Exponentials, Products, and Quotients

The Derivative as a Rate of Change

Derivatives of Trigonometric Functions

The Chain Rule and Parametric Equations

#### **Unit IV Additional Study of Derivatives**

Implicit Differentiation

Derivatives of Inverse Functions and Logarithms

Inverse Trigonometric Functions

Related Rates

Linearization and Differentials

#### ***Unit V Applications of Derivatives***

Extreme Values of Functions

The Mean Value Theorem

Monotonic Functions and the First Derivative Test

Concavity and Curve Sketching

Applied Optimization Problems

Indeterminate Forms and L'Hôpital's Rule

Newton's Method

Antiderivatives

#### ***Unit VI Integration***

Estimating with Finite Sums

Sigma Notation and Limits of Finite Sums

The Definite Integral

The Fundamental Theorem of Calculus

Indefinite Integrals and the Substitution Rule

Substitution and Area Between Curves

## ***Unit VII Applications of Definite Integrals (Optional but Recommended)***

Volumes by Slicing and Rotation About an Axis

Volumes by Cylindrical Shells

Lengths of Plane Curves

Moments and Centers of Mass

Areas of Surfaces of Revolution and the Theorems of Pappus

Work

Fluid Pressures and Forces) Optional

### **STUDENT REQUIREMENTS AND METHOD OF EVALUATION**

See the syllabus supplement for a specific course section for details of student requirements and method of evaluation.

#### **GRADING SCALE:**

A: 90-100

B: 80-89

C: 70-79

D: 60-69

F: below 60%

See the syllabus supplement for a specific course section for details of grading scale.

### **ASSESSMENT OF STUDENT GAIN**

The purpose of assessing student learning at Neosho County Community College is to ensure the educational purposes of the institution are met and appropriate changes are made in program development and classroom instruction to allow for student success. The instructor(s) of this course will determine the methods of assessment most appropriate and complete an assessment report at the end of the course.

### **ATTENDANCE POLICY**

1. NCCC values interactive learning which promotes student engagement in the learning process. To be actively engaged, the student must be present in the learning environment.
2. Unless students are participating in a school activity or are excused by the instructor, they are expected to attend class. If a student's absences exceed one-eighth of the total course duration,

(which equates to one hundred (100) minutes per credit hour in a face-to-face class) the instructor has the right, but is not required, to withdraw a student from the course. Once the student has been dropped for excessive absences, the registrar's office will send a letter to the student, stating that he or she has been dropped. A student may petition the chief academic officer for reinstatement by submitting a letter stating valid reasons for the absences within one week of the registrar's notification. If the student is reinstated into the class, the instructor and the registrar will be notified. Please refer to the Student Handbook/Academic Policies for more information

3. Absences that occur due to students participating in official college activities are excused except in those cases where outside bodies, such as the State Board of Nursing, have requirements for minimum class minutes for each student. Students who are excused will be given reasonable opportunity to make up any missed work or receive substitute assignments from the instructor and should not be penalized for the absence. Proper procedure should be followed in notifying faculty in advance of the student's planned participation in the event. Ultimately it is the student's responsibility to notify the instructor in advance of the planned absence.

## **ACADEMIC INTEGRITY**

NCCC expects every student to demonstrate ethical behavior with regard to academic pursuits. Academic integrity in coursework is a specific requirement. Definitions, examples, and possible consequences for violations of Academic Integrity, as well as the appeals process, can be found in the College Catalog, Student Handbook, and/or Code of Student Conduct and Discipline.

## **ELECTRONIC DEVICE POLICY**

Student cell phones and other personal electronic devices not being used for class activities must not be accessed during class times unless the instructor chooses to waive this policy.

## **NOTE**

Information and statements in this document are subject to change at the discretion of NCCC. Students will be notified of changes and where to find the most current approved documents.

## **ACCOMMODATIONS**

If you are a student with a disability who may need accommodation(s), in compliance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA) of 1990, please notify the Dean of Student Services in the Student Services Office, Sanders Hall, 620-432-0304, on the Chanutte Campus, or the Dean for the Ottawa and Online Campuses, 785-248-2798, on the Ottawa Campus as soon as possible. You will need to bring your documentation for review in order to determine reasonable accommodations, and then we can assist you in arranging any necessary accommodations.

## **NON-DISCRIMINATION POLICY**

The following link provides information related to the non-discrimination policy of NCCC, including persons with disabilities. Students are urged to review this policy.

<http://www.neosho.edu/Departments/NonDiscrimination.aspx>

## **SEXUAL MISCONDUCT POLICY (TITLE IX)**

At NCCC, it is the responsibility of an instructor to help create a safe learning environment in the classroom, including both physical and virtual classrooms. All instructors are considered mandatory reporters at NCCC, therefore any information regarding sexual misconduct that is shared by a student in one-on-one meetings with the instructor must be reported to appropriate personnel at the College. Instructors will keep the information private to the greatest extent possible, but it is not confidential. Generally, climate surveys, classroom writing assignments or discussions, human subjects research, or events such as Take Back the Night events do not provide notice that must be reported to the Coordinator by employees, unless the reporting party clearly indicates that they wish a report to be made.

The following link provides information related to the sexual misconduct policy of NCCC, including resources, reporting options, and student rights. Students are urged to review this policy.

<http://www.neosho.edu/TitleIX.aspx>

## **COURSE NOTES**

All students will be expected to have a graphing calculator (TI-83/84 or 83/84+ recommended).