The Governor's Scholl for Science and Technology

Calculus I / Calculus II Course Syllabus

Required material:

Calculus Volume I https://openstax.org/details/books/calculus-volume-1
Calculus Volume II https://openstax.org/details/books/calculus-volume-2

Lecture: 4 hours per week (Monday, Tuesday, Thursday, Friday).

INSTRUCTOR: Dr. Jiashi Hou
Email: jiashi.hou@nhrec.org **Phone / Text:** (757) 362-6338

GSST website: https://nhrec.org/gsst/ Students must check Canvas at least twice a day for updates and announcements.

PREREQUISITES for Calculus I: Pre-Calculus I and II
PREREQUISITES for Calculus II: Calculus I

CALCULUS I

Calculus I (TNCC MTH 263) presents the calculus of algebraic and trigonometric functions including the study of limits, continuity, derivatives, differentials, and an introduction to integration which includes definite and indefinite integrals. Analytic geometry is integrated into the course as are applications of the derivative and definite integral.

CALCULUS II

Calculus II (TNCC MTH 264) continues the study of calculus of algebraic and transcendental functions including rectangular, polar, and parametric graphing, indefinite and definite integrals, methods of integration, and power series along with applications. Features instruction for mathematical, physical and engineering science programs.

COURSE GOALS: The sequence of courses, Calculus I and II is an introductory, two semester study of Calculus. This sequence provides the mathematics necessary to support the science, engineering, and liberal arts curricula. These courses must be taken in sequence. The general purpose of Calculus I/II courses is to prepare students for further study in calculus with analytic geometry as well as topics such as linear algebra and differential equations so that they meet the necessary competencies in integration, algebraic and transcendental functions, graphing, power series and their applications.

The overall goals of Calculus I/II courses are:

- To develop the concept of the limit of a function.
- To develop the concept of continuity of a function.
- To develop the concept of the derivative of a function.
- To develop the concept of the antiderivative of a function.
- To develop the concepts of the definite integral and indefinite integrals of functions.
- To develop an understanding of various applications of derivatives and definite integrals.
- To develop an understanding of various applications of integration.
- To develop the concepts of techniques of integration.
- To develop the concepts of infinite sequences and series.
- To develop the concepts of parametric curves and polar coordinates.

INSTRUCTIONAL METHODS:

The course content will be taught primarily through a series of lectures with ample class time being reserved for student questions and interaction. Homework will be assigned on a regular basis covering material from the lectures and/or the textbook. Each student is expected to study the assigned material and to work all the assigned homework problems before coming to class. Some class time will be spent discussing the difficulties encountered with the homework exercises. Classroom participation is a definite part of the instructional process and includes taking notes. Students are encouraged to ask questions in class, demonstrate their ability to solve problems, and present ideas which will assist other students in the solution of problems or the development of concepts. Study groups are encouraged outside of classroom. Students are urged to seek help from their instructor during office hours and use the alternate sources listed below, as needed.

GRADING

9-week grades are computed as following	
Tests	50%
Homework	15%
Quizzes	15%
Classwork	10%
Project	10%

Semester grades will be computed as follows:	
Average quarter grade	80%
Semester final exam grade	20%

Grading Scale

%	90-100	80-89	70-79	60-69	<60
Grade	A	B	C	D	E

Your **final course grade** for GSST Calculus is determined as the average Semester grades:

Semester 1 (Calculus I)	50%
Semester 2 (Calculus II)	50%

QUIZZES, TESTS, EXAM: All quizzes, tests and exam will be announced with ample opportunity for preparation. Students are expected to take quizzes, tests and exam on the specified day and time. There will be no retests. **Students are NOT allowed to use calculator on the quiz, test, exam.**

No make-up test will be given to any student who does not show up on the test date and has not contacted the instructor. Under NO circumstances will make-ups be given after the tests have been returned.

HOMEWORK: All homework assignments will be announced with ample opportunity for preparation. Students are expected to complete and submit homework on the specified day and time. One point off per day will be taken for a late submission.

CALCULATORS: A graphing calculator is an essential tool for this course and each student is expected to have one. The TI-83 Plus or TI-84 Plus calculator is recommended for use in class activities and homework. Borrowing calculators from other students is not allowed. Calculators with Computer Algebra System (CAS) capabilities may not be used (TI-89, TI-92, etc).

Students are NOT allowed to use calculator on the quiz, test, exam.

ATTENDANCE: Regular attendance is expected. Daily attendances are recorded.

CODE OF CONDUCT: Coming to class prepared to learn includes (but is not limited to) having all of the necessary supplies, arriving on time, staying the full time, and participating in the activities of the class.

CALCULUS I COURSE CONTENT:

- **Limits**
  - Differentiate between the limit and the value of a function at a point
  - Find the limit of a function by numerical, graphical and analytic methods
  - Apply Limit Laws
  - Calculate one-sided limit of a function
  - Prove the existence of a limit using precise definition of the limit
  - Determine the continuity of a function
  - Calculate Vertical and Horizontal asymptotes using limits
- **Derivatives and Differentiation Rules**
  - Define Derivatives and Rates of Change
  - Compute derivatives of basic functions using the definition of the derivative
  - Differentiate polynomial, rational, radical, exponential and logarithmic functions
  - Find equation of a tangent line using derivative
  - Differentiate trigonometric functions
  - Apply product, quotient, chain rules
  - Apply implicit differentiation and find derivatives of inverse trigonometric functions
  - Apply concept of rates of change to natural and social sciences
  - Apply the concept of related rates
  - Define hyperbolic functions and their derivatives
  - Find linear approximation of a function at a given point
- **Applications of Differentiation**
  - Calculate local and absolute maximum and minimum values of a function
  - Apply Rolle's Theorem and Mean Value Theorem to study properties of a function
  - Find critical points, and intervals of increasing and decreasing values of a function
  - Find points of inflection and intervals of different concavities
  - Sketch a curve for a given function
  - Apply rules of differentiation to solve optimization problems
  - Find antiderivatives for basic functions using knowledge of derivatives
- **Integrals**
  - Relate areas to definite integrals using sigma notation, Riemann Sums, and limits.
  - Apply Fundamental Theorem of Calculus to find definite integrals and derivatives
  - Find indefinite integrals of polynomials and basic trigonometric and exponential function
  - Apply Net Change Theorem
  - Perform integration using substitution
  - Find areas between curves
  - Find average value of a function

CALCULUS II COURSE CONTENT:

- **Applications of Integration**
  - Compute Volumes by cross-section
  - Compute Volumes by disk-washer
  - Compute Volumes by shells
  - Compute Work (spring, rope)
  - Compute Work (pumping liquids)
  - Compute Arc length
  - Compute Areas of surfaces of revolution
  - Compute Application (center of mass)
- **Techniques of Integration**
  - Integrate by parts
  - Calculate trigonometric integrals
  - Calculate integrals by trigonometric substitution
  - Define the indeterminate form and apply L'Hopital's Rule.
  - Calculate improper integrals
  - Integrate by partial fractions
  - Integrate using Tables and Software
  - Approximate integrals (Trapezoidal, Simpson) with error estimation.
- **Infinite Sequences and Series**
  - Write definition of and understand Sequences
  - Write definition of and understand Series (intro)
  - Determine convergence by integral test
  - Determine convergence by comparison test
  - Determine convergence of alternating series
  - Determine absolute convergence (ratio, root tests)
  - Apply strategies for testing series
  - Work with power series
  - Represent functions as power series
  - Find Taylor, Maclaurin series & polynomials
  - Calculate Taylor and Maclaurin series
- **Parametric Curves and Polar Coordinates**
  - Represent curves by parametric equations
  - Perform calculus with parametric curves
  - Use and graph with polar system
  - Calculate areas and lengths in polar coordinates
  - Define the conic forms in polar form

Any changes to this syllabus will be noted in class.