Course Syllabus

CALCULUS I (Math 131)

Description: *A first course in the calculus sequence. Topics include limits, continuity, differentiation, application of the derivative, the Intermediate Value Theorem, definite integrals and the Fundamental Theorem of Calculus, with transcendental functions throughout. May be used to fulfill the Quantitative Analysis component of the General Education Requirements. This course is not open to students with credit for MATH 122. Prerequisite: Grade of C- or higher in MATH 115, or placement higher than MATH 115 in the Math Placement process.*

Credit Hours: 4

Audience: Required for many STEM majors. Prerequisite for MATH 132, 321 (& BIO 321), 323, STAT 240, CHEM 115, CS 325, 365; ECON 321, 325; MET 216, 440; PHIL 315, 320, 325; ASTR 252, 253; PHYS 109, 141, 281; GE 109; ECE 100, 261, 281, 357; . May be used to fulfill the Quantitative Analysis component of the General Education Requirements.

Prerequisites: Grade of C- or higher in MATH 115, or placement higher than MATH 115 in the math placement process.

Format: 3 lectures (50 min), 1 computer lab (75 min) per week

Textbook: The open educational resource (OER), i.e. free etextbook, for this course is *OpenStax Calculus: Volume I* located at: https://openstax.org/details/books/calculus-volume-1 (Required). Homework for this course is through the online system WeBWork. There is a $25 fee for WeBWork in lieu of a textbook fee for the course.

Software: Use of *Maple* is common (available on campus computers; purchase of student version is recommended).

Internet: Course material and grades are often maintained in Blackboard, at the discretion of the instructor.

Access & Accommodations: The Access & Accommodations Resource Center (AARC) is the campus office that works with students to provide access and accommodations in cases of diagnosed mental or emotional health issues, attentional or learning disabilities, vision or hearing limitations, chronic diseases, or allergies. You can contact the office at aarc@valpo.edu or 219.464.5206. Students who need, or think they may need, accommodations due to a diagnosis, or who think they have a diagnosis, are invited to contact AARC to arrange a confidential discussion with the AARC office. Further, students who are registered with AARC are required to contact their professor(s) if they wish to exercise the accommodations outlined in their letter from the AARC.

Emergencies: VU's Emergency Notification System (ENS) uses multiple forms of communication, including e-mail, building alarms, outdoor sirens, message boards, computer alerts, Twitter, and public address messaging. Please review the specific procedures for this

	class found in Blackboard. Remember: "Siren inside, GO outside; Siren outside, GO inside." To evacuate, gather your personal belongings quickly and proceed to the nearest exit. Do not use the elevator. To shelter in place, move away from the windows and stay low to the ground; lock or barricade the door if there is a threat of violence.
Notice of Cancellation:	In the event class is cancelled, you will be notified through your Valparaiso University e-mail account

Student Learning Objectives:

A. Students can perform algebraic, geometric and technological operations required for success in calculus.
B. Students understand fundamental concepts of differential and integral calculus (up to the Fundamental Theorem of Calculus).
C. Students develop and improve analytical thinking for problem solving, both manual and using technology.
D. Students develop a skill-set necessary for success in mathematics (Calculus II in particular) and in disciplines which rely on mathematics.
E. Students can communicate mathematics effectively, with proper notation and terminology.

Topics & Performance Requirements Include (but are not limited to):

1. finding limits and identifying discontinuities from graphs, formulas, and numerical data
2. finding limits using fundamental limits laws
3. using the method of bisection and the Intermediate Value Theorem to approximate solutions to equations
4. knowing the relationship between limits and derivatives, and the derivative as a rate of change
5. using basic differentiation formulas (power, product, quotient), and simplification of results
6. forming relationships between derivatives with the chain rule
7. assessing differentiability and continuity of functions
8. assessing the relationships between graphs and derivatives
9. finding critical and inflection points, intervals of increase and decrease, and concavity of a function
10. finding maximums and minimums, related rates, and linear approximations
11. assessing behavior of a function on a given interval using the Mean Value Theorem
12. constructing sums and using summation (sigma) notation
13. partitioning a function and assembling a definite integral via Riemann Sums
14. construction and estimation of a definite integral using Riemann Sums and limits
15. using simple estimation methods for definite integrals: left & right hand rules, midpoint rule

16. the relation between definite integrals and areas, and evaluating some definite integrals using geometry
17. knowing when the Fundamental Theorem of Calculus applies, and using it to assert the existence and value of a derivative
18. finding antiderivatives using basic formulas or substitution
19. working with functions defined as integrals (i.e. the Fundamental Theorem “Part 2”)