City College of NY :Department of Mathematics
Mathematics 20500 (Elements of Calculus) Syllabus

COURSE #: 20500 **COURSE TITLE: Elements of Calculus** CATEGORY: Introductory, part of sequence Math 205, Math 209 TERM OFFERED: Every Term PRE-REQUISITES: Grade C or higher in Math 19500 pre-calculus; or placement by the department. Credit will be given for only one of Math20100 or Math20500. HOURS/CREDITS: 4 hrs/wk; 4 credits DATE EFFECTIVE: 01/01/13 COURSE COORDINATOR: Akin	**CATALOG DESCRIPTION** Limits, derivatives, rules of differentiation, grap sketching, maximum and minimum problems, related rates, exponential an logarithmic functions, differential equati anti-derivatives, area, volume Text: Brief Applied Calculus, Stewart and Clegg, Brooks-Cole

Section	Topics	Suggested # of Hours
1.1, 1.2	Review of functions, including piecewise defined functions and composition of functions (Omit transformations of functions)	1
1.3	Lines and Linear Models: Go through page 33. Include some linear model verbal problems.	1
1.5, 1.6	Exponential Models and Logs: Introduce *e* and use exponentials to define logs. Note the change of base formula on page 75. (You might derive it from the formula $\log_a b \cdot \log_b x = \log_a x$ showing that *a* raised to each of these powers yields x).	2
2.1, 2.2	Rates of change and Limits.	2
2.3	Limit definition of the derivative. Tangent lines. Go through page 106.	2
2.4,pp.119-123	Leibniz notation and higher derivatives	1
3.1	Initial derivative formulas, including e^x	2
3.2	Linear approximation and marginal cost.	1
3.3	Product and quotient rules.	2
3.4	Chain rule.	2
3.5	Implicit and Logarithmic differentiation. Include derivation of the derivative of ln *x*.	2
3.6	Exponential growth and decay.	2
4.1	Related rates.	2
4.2	Maxima and minima. Include the closed interval case.	2
4.3, 4.4	Curve sketching.	2
4.5	Curve sketching	2
4.6, 4.7	More optimization problems	2
5.1, 5.2	Introducing the integral, antiderivatives and the Fundamental Theorem of Calculus.	2
5.4	u-substitution	3
6.1	Area between curves	2
6.2, 6.3	Other applications of integration.	2

Total 39 hours

Revised for Fall, 2013

COURSE LEARNING OUTCOMES

The student is expected to acquire the skills which are presented in the text and demonstrated by the instructor in class. These skills include the following, with associated departmental learning outcomes(see below):

1 Use limits to calculate derivatives	a,b.e1.e2
2.Differentiate algebraic, logarithmic and exponential functions	a,b,e1,e2
3. Solve related rates problems	a,b,c
4. Apply methods of calculus to curve sketching	a, b
5 Solve maximum and minimum problems	a,b,c,e1,e2
6. Use exponential functions to model growth and decay	a, c
7 Antidifferentiate polynomial, logarithmic and exponential functions	a,b,c,e1,e2
8 Use calculus to find areas	a,b

COURSE ASSESSMENT TOOLS

Please describe below all assessment tools that are used in the course.
You may also indicate the percentage that each assessment contributes to the final grade.

1. class work and 2 or 3 in class tests (60%)
2. departmental final exam (40%)

DEPARTMENTAL LEARNING OUTCOMES *(to be filled out by departmental mentor)*

The mathematics department, in its varied courses, aims to teach students to

a. perform numeric and symbolic computations
b. construct and apply symbolic and graphical representations of functions
c. model real-life problems mathematically
d use technology appropriately to analyze mathematical problems
e. state (e1) and apply (e2) mathematical definitions and theorems
f. prove fundamental theorems
g. construct and present (generally in writing, but, occasionally, orally) a rigorous mathematical argument.

Course Supervisor: Prof. Ethan Akin