SYLLABUS

Code: **MATH 172** **Title**: **CALCULUS II**

Institute: STEM **Department: MATHEMATICS**

Course Description: This course is a continuation of MATH 171, Calculus I. Topics include applications of the definite integral, such as area, volume, arc length, and average value, techniques of integration with emphasis on substitution and integration by parts, approximate integration and error formulas, infinite sequences and series, power series, and Taylor series. Problems are approached from a variety of perspectives, including graphical, numerical, verbal, and algebraic. Computer software will be used extensively in class to gain a greater understanding of concepts as well as to consider non-routine problems.

Section Information: All tests will be proctored in person.

Prerequisites: A grade of C or higher in MATH 171.

Credits: 4 **Lecture Hours:** 4 **Lab:** 0

REQUIRED TEXTBOOK/MATERIALS

1. **Textbook:** Stewart, James, Math 171/172/273 Brookdale Community College with EWA, Brooks/Cole Cengage Learning, 2009. This is a customized edition that is available at the College Bookstore only.
2. **Enhanced WebAssign (EWA)** is an interactive website that will be used for online quizzes and homework. An EWA access code is included in the textbook bundle sold at the College bookstore. If you buy a used textbook or prefer the ebook, an access code can be purchased online at www.cengagebrain.com
3. **Computer software** – working with **Maple** is required for this course. Your instructor will provide options for accessing Maple.

   Note: In compliance with copyright law, the Mathematics Department cannot give students copies of software. The unauthorized copying and /or distributing of software owned by Brookdale Community College are **illegal**.

RECOMMENDED MATERIALS:

1. Graphing Calculator – If you are purchasing a new calculator, the TI-83 or TI-84 (any version) will be sufficient, but the TI-89 has more advanced capabilities. If you are considering buying one of these, talk to your instructor first.
2. Cole, Jeffrey A. and Flaherty, Timothy J., Student Solutions Manual for Stewart's Single Variable Calculus: Concepts and Contexts, 4th Edition, Brooks/Cole Cengage Learning, 2010.
3. Burton, Robert and Garity, Dennis, Study Guide for Stewart's Single Variable Calculus: Concepts and Contexts, 4th Edition, Brooks/Cole Cengage Learning, 2010.

SYLLABUS

ADDITIONAL TIME REQUIREMENTS

Projects are a required component of this course. You may need to allow some on-campus time during each unit to meet with your group to work on the projects. Some discussions can be done via email, but you may need some group meeting time and your group may need to meet with your instructor to discuss parts of the project.

***OTHER TIME COMMITMENTS*:**

- In addition to the regular class hours, you will need to set aside time each week for homework. The weekly time will vary by topic and level of difficulty, but as an estimate, you should expect two homework hours for *each* class hour per week. For example, if your class meets for four hours per week, you should expect to spend about ***eight*** hours per week on homework.
- You will need to allow time (possibly on campus) to do homework and/or project problems that require the use of computer software.
- If you are having any difficulty with the course material, you may need to allow time to see your instructor during office hours or to get help in the Math Lab.
- You may be required to spend time completing online assignments or contributing to online discussions during the semester.

COURSE LEARNING OUTCOMES

Upon completion of this course, students will be able to:

- Demonstrate the algebraic and calculus skills related to integration. (M)
- Understand and explain the concept of the definite integral in a variety of situations. (M)
- Use integral calculus to solve application problems. (M)
- Use computer software to understand concepts and to explore and solve problems. (M)

Learning Outcome(s) support the following General Education Knowledge Areas:

- (M) Mathematics

GRADING STANDARD

In this course, you will be evaluated by means of tests and projects, quizzes, homework or other assignments.

A. TESTS

There will be three tests, one after each unit, graded on the basis of 100 points. Each test is cumulative and covers material from the beginning of the course. Tests may consist of a computer part and a non-computer/non-technology part. All supporting work must be shown on tests in order for your instructor to properly assess your understanding of the material. The tests will be given in class and it is expected that you will be in class to take the test on the day it is given. If you are very ill (verifiable with a doctor's note) or you have some other emergency, you *must* contact your instructor immediately.

Note: All tests will be proctored in person, see Instructor Addendum for more information.

SYLLABUS

B. PROJECTS/QUIZZES/HOMEWORK/OTHER ASSIGNMENTS

Projects for the course will be done in groups. In the projects, you will apply the concepts and skills learned in class to problem situations, present the mathematics, write careful explanations, and interpret your results. The final copy of each project will be kept by your instructor. There are periodic quizzes in the course. Some of these may be online quizzes. Your instructor may also choose to use homework and other assignments for evaluation, which may be online as well.

GRADING

At the end of the semester, you will have three test grades and a project/quizzes/homework/other assignments grade. See your instructor addendum for how projects, quizzes, homework and other assignments will be averaged into your final grade. There are no grade curves applied in this course. Your final course average is determined by a weighted average as follows:

Test 1	25%
Test 2	25%
Test 3	30%
Project/quizzes/homework/other assignments	20%

FINAL GRADE

Your final grade is determined by your final course average, using only the above grades. There are no extra-credit options (e.g. research papers, special projects, essays, etc.) available for this course. Your final grade is determined as follows:

If your final course average is	Your final grade is
90 – 100	A
88 – 89	A-
86 – 87	B+
80 – 85	B
78 – 79	B-
76 – 77	C+
70 – 75	C
60 – 69	D**
Below 60	F

** To use this course as a prerequisite for another mathematics course, you must have a grade of C or better.

Incomplete

INC is only given at the discretion of your instructor. This may occur in documented cases of hardship or emergency. In this case, you must meet with the instructor to discuss the work that must be completed to earn a grade in the course. All work must be completed within 21 days after the end of the term, exclusive of official college closings.

Withdrawal

You may withdraw from the course, without penalty, up to a date set by the College. If you do not withdraw from the course but stop attending, your grade at the end of the semester will be F.

SYLLABUS

COURSE CONTENT

Unit 1: In this unit, you will review derivatives and the definite integral, use integration by substitution, change of variable substitution, and integration by parts. You will learn approximation techniques for definite integrals and use error-bound formulas. You will use integrals to find area under a curve and between two curves, and apply integration to problems such as volumes of solids of revolution.

Unit 1 Outcomes: You will: (Text Section)

- Define and explain the derivative and the definite integral.
- Review derivative and integral formulas.
- Evaluate integrals using the method of integration by substitution. (5.5)
- Evaluate integrals by using a change of variable substitution. (Supplement)
- Evaluate integrals of a product of functions using the method of integration by parts. (ET 7.1)
- Evaluate integrals of powers of trigonometric functions using integration by substitution. (ET 7.2)
- Use *Maple* to approximate definite integrals by the Trapezoidal Rule and Simpson's Rule. (5.9)
- Use the error-bound formulas for the Trapezoidal Rule and Simpson's Rule to find an upper bound on the error generated from those approximations. (5.9)
- Use integration to find the area under a graph of a function and between two graphs using both horizontal and vertical representative rectangles. (6.1)
- Use integration to find volumes of solids of revolution using discs and washers. (6.2)
- Use integration to find volumes of solids of revolution using shells. (6.3)

Unit 2: In this unit, you will continue your study of integration techniques and applications of integration. You will apply integration to problems such as arc length of a curve and average value of a function. You will learn integration by trigonometric substitution and partial fractions. You will determine limits of functions that give rise to indeterminate forms and evaluate improper integrals.

Unit 2 Outcomes: You will:

- Use integration to find the length of an arc along the graph of a function. (6.4)
- Determine the average value of a function using an integral. (6.5)
- Explain and apply the Mean Value Theorem for Integrals. (6.5)
- Apply integration to selected problems in Physics and Engineering. (6.6)
- Explain the process of constructing an integral in an applied problem situation. (6.2 – 6.6)
- Evaluate integrals by trigonometric substitution. (ET 7.3)
- Evaluate integrals using partial fractions. (ET 7.4)
- Establish a strategy to help identify which technique of integration to use when evaluating an integral. (ET 7.5)
- Identify indeterminate forms and use L'Hospital's Rule to evaluate limits resulting in these forms. (4.5)
- Use limits to determine the convergence or divergence of improper integrals. (5.10)

SYLLABUS

Unit 3: In this unit, you will study infinite sequences and series and determine their convergence and divergence using various tests. Additionally, you will recognize special types of series and the conditions under which they converge. You will define power series and their interval of convergence and you will write functions as power series and use them to approximate values of the function.

Unit 3 Outcomes: You will:

- Define a sequence and determine whether a sequence converges or diverges. (ET 11.1)
- Use *Maple* to produce numerical and graphical evidence about the convergence or divergence of a sequence. (ET 11.1)
- Define an infinite series and the conditions for convergence. (ET 11.2)
- Use *Maple* to produce numerical and graphical evidence about the convergence or divergence of a series. (ET 11.2)
- Use *Maple* to approximate the sum of a convergent infinite series. (ET 11.2)
- Define a geometric series, determine whether a geometric series converges, and find the sum of a geometric series. (ET 11.2)
- Use the n^{th} term test to determine whether a series diverges. (ET 11.2)
- Use the integral test to determine whether a series converges. (ET 11.3)
- Define a *p*-series and determine whether a *p*-series converges. (ET 11.3)
- Use the comparison tests to determine whether a series converges. (ET 11.4)
- Define an alternating series. (ET 11.5)
- Use the alternating series test to determine whether an alternating series converges. (ET 11.5)
- Use the Alternating Series Estimation Theorem to estimate the sum of an alternating series and to find an upper bound on the error produced (with assistance from *Maple*). (ET 11.5)
- Determine whether a series is absolutely convergent. (ET 11.6)
- Use the ratio and root tests to determine whether a series is convergent. (ET 11.6)
- Establish a strategy to help determine how to test a series for convergence or divergence. (ET 11.7)
- Define a power series. (ET 11.8)
- Use the ratio test to determine the interval of convergence for a power series. (ET 11.8)
- Use the geometric power series for the function $\frac{1}{1-x}$ and substitution, differentiation, and integration to find power series representations for other related functions. (ET 11.9)
- Find the Maclaurin series for a function (both by hand and with assistance from *Maple*) and determine the interval of convergence. (ET 11.10)
- Find the Taylor series for a function centered at *a* (with assistance from *Maple*) and determine the interval of convergence. (ET 11.10)
- Use the power series for a function to evaluate a function and determine an upper bound on the error (with assistance from *Maple*). (ET 11.10)
- Use Taylor series to approximate polynomials (with assistance from *Maple*). (ET 11.11)

DEPARTMENT POLICIES

The Math Department wants you to be successful in this course. Because of this, we have compiled a list of strategies and behaviors.

SYLLABUS

Attendance and class participation

- If you want to be successful in this course, attend every class.
- Come to class on time, and stay for the entire class period. If you are late or leave during class, you will miss important class material and you will also distract your classmates and your instructor. (See the Student Conduct Code)
- Turn off your cell phone during class. You and your classmates need to be free from distractions. (See the Student Conduct Code)
- Bring your book, supplement and graphing calculator (if you have one) to every class.
- Respect your classmates and your instructor. Listen carefully to questions asked and answers given. Treat all questions with respect.
- Participate fully in class. Volunteer answers, work problems, take careful notes, and engage in discussions about the material. Use computers only for designated work. Above all, stay on task.
- Contribute your share to all group work and projects and do your best to make the group experience a positive one for all members.
- Do your own work on tests and quizzes. Cheating will not be tolerated. (See the Academic Integrity Code.)

Homework

- Homework is the way you practice the ideas and skills that are introduced in class. To be successful on the tests, you must do the homework. Homework may be collected and homework questions may be included on quizzes or tests. The homework assignments are listed in the homework assignment section of the Supplement. The homework may be online and may be graded.
- When you do the homework, write down all supporting work. Using the correct process is at least as important as getting the correct answer, so your work and steps are very important.
- Remember to check your answers. They will be in the back of the text or in the student's solutions manual.
- If there are questions you can't get or don't understand, ask about them at the beginning of the next class. If you have trouble with more than a few problems, try starting your homework in the Math Lab, where help is available.

Absence

- If you are sick and an absence is unavoidable, please call or email your instructor. You are still responsible for all material that was covered during your absence. You are expected to read the textbook and do the homework.
- Make time to see your instructor when you return so that you can get any papers you missed.
- Remember that you are expected to be in class for the tests and quizzes. You will not be able to make up tests or quizzes.

Getting Help

After you have tried the homework, there are ways to get help:

- Look in your text and your class notes for examples similar to the problems you are finding difficult.
- See your instructor during office hours or make an appointment. Bring the work you have done.
- Go to the **Math Lab** to get extra help on your homework or simply go and do your homework there. Someone will be there if you get stuck. You don't need an appointment to use the Math Lab.
- Form a **study group** with other class members. Working with other students can be a great way to learn. If you have a group to work with, consider meeting and working together in the Math

Lab.
- Your textbook may have a complete solutions manual available in the Math Lab, which can be used in the Math Lab.
- You can use the computers in the computer lab within the Math Lab to do work related to your math course.
- In the Math Lab, you can get help on how to use your calculator.

Visit the **Math Lab website** to view hours and other useful information about the Math Lab.

COLLEGE POLICIES:

As an academic institution, Brookdale facilitates the free exchange of ideas, upholds the virtues of civil discourse, and honors diverse perspectives informed by credible sources. Our College values all students and strives for inclusion and safety regardless of a student's disability, age, sex, gender identity, sexual orientation, race, ethnicity, country of origin, immigration status, religious affiliation, political orientation, socioeconomic standing, and veteran status. For additional information, support services, and engagement opportunities, please visit www.brookdalecc.edu/support.

For information regarding:
- Brookdale's Academic Integrity Code
- Student Conduct Code
- Student Grade Appeal Process

Please refer to the **BCC STUDENT HANDBOOK AND BCC CATALOG.**

NOTIFICATION FOR STUDENTS WITH DISABILITIES:

Brookdale Community College offers reasonable accommodations and/or services to persons with disabilities. Students with disabilities who wish to self-identify must contact the Disabilities Services Office at 732-224-2730 (voice) or 732-842-4211 (TTY) to provide appropriate documentation of the disability, and request specific accommodations or services. If a student qualifies, reasonable accommodations and/or services, which are appropriate for the college level and are recommended in the documentation, can be approved.

MENTAL HEALTH:
- Mental Health Crisis Support: From a campus phone, dial 5555 or 732-224-2329 from an external line; off-hours calls will be forwarded to BCC police (2222 from a campus phone)
- Psychological Counseling Services: 732-224-2986 (to schedule an appointment during regular hours)

The syllabus is intended to give student guidance in what may be covered during the semester and will be followed as closely as possible. However, the faculty member reserves the right to modify, supplement, and make changes as the need arises