



ESSEX COUNTY COLLEGE
Mathematics and Physics Division
MTH 122 – Calculus and Analytic Geometry II
Course Outline

Course Number & Name: MTH 122 Calculus and Analytic Geometry II

Credit Hours: 4.0 **Contact Hours:** 4.0 **Lecture:** 4.0 **Lab:** N/A **Other:** N/A

Prerequisites: Grade of "C" or better in MTH121 or placement

Co-requisites: None

Instructor: TBA

Email: TBA

Office Hours: By appointment

Course Description: This course is a continuation of MTH 121. Topics covered include techniques of integration with applications of surface area and arc length, parametric equations, polar coordinates, conic sections, and infinite sequences and series.

Textbook: *Calculus: Early Transcendentals*, 6th edition, by Stewart; published by Cengage/Brooks/Cole, 2008; ISBN #: 0538782560

General Education Goals: The aggregate of the core courses required for any major at ECC have the following goals:

1. **Written and Oral Communication:** Students will communicate effectively in both speech and writing.
2. **Quantitative Knowledge and Skills:** Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
3. **Scientific Knowledge and Reasoning:** Students will use the scientific method of inquiry through the acquisition of scientific knowledge.
4. **Technological Competency/Information Literacy:** Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.
5. **Society and Human Behavior:** Students will use social science theories and concepts to analyze human behavior and social and political institutions and to act as responsible citizens.

6. **Humanistic Perspective:** Students will analyze works in the field of art, music, or theater; literature; and philosophy and/or religious studies; and will gain competence in the use of a foreign language.
7. **Historical Perspective:** Students will understand historical events and movements in World, Western, non---Western, or American societies and assess their subsequent significance.
8. **Global and Cultural Awareness of Diversity:** Students will understand the importance of global perspective and culturally diverse peoples.
9. **Ethics:** Students will understand ethical issues and situations.

Course Goals: Upon successful completion of this course, students should be able to do the following:

1. demonstrate knowledge of the fundamental concepts and theories from calculus; (GEG 2)
2. utilize various problem-solving and critical-thinking techniques to set up and solve applied problems in engineering, sciences, business, and technology fields; (GEG 2)
3. communicate accurate mathematical terminology and notation in written and/or oral form in order to explain strategies to solve problems as well as to interpret found solutions; (GEG 1, GEG 2) and
4. use appropriate technology, such as graphing calculators and computer software, effectively as a tool to solve such problems as those described above. (GEG 2)

Measurable Course Performance Objectives (MPOs): Upon successful completion of this course, students should specifically be able to do the following:

1. Demonstrate knowledge of the fundamental concepts and theories from calculus:
 - 1.1 *calculate integrals using the Fundamental Theorem in Calculus and solve application problems involving arc length and surface area of revolution;*
 - 1.2 *evaluate definite integrals using various techniques such as substitution, integration by parts, and transformations.*
 - 1.3 *use the polar coordinate system to solve integral application problems;*
 - 1.4 *identify various conic sections by their equations and graph them;*
 - 1.5 *define convergence and divergence of sequences and series and determine the convergence by using appropriate tests;*
 - 1.6 *identify the convergence intervals of power series and find related convergent functions when possible;*
 - 1.7 *write power series representations of functions (i.e., Taylor series and Maclaurin series) and approximate functions with polynomials;*
 - 1.8 *apply integration techniques to determine integrals of various functions including exponential, logarithmic and trigonometric functions*

2. Utilize various problem---solving and critical---thinking techniques to set up and solve applied problems in science, business, engineering, and technology fields:
 - 2.1 *apply polar coordinates to evaluate integrals for functions arising from engineering and business applications*

3. Communicate accurate mathematical terminology and notation in written and/or oral form in order to explain strategies to solve problems as well as to interpret found solutions:
 - 3.1 *write and explain solutions to application problems including areas, optimization, work in two--- and three--- dimensional spaces and other application problems*

4. Use appropriate technology, such as graphing calculators and computer software, effectively as a tool to solve such problems as those described above:
 - 4.1 *use a graphing calculator and/or web---based application programs such as Applet to visualize graphs of conic section and functions in polar coordinates;and*
 - 4.2 *use tables, Computer Algebra Systems, and other computer software such as Mathematica and Maple to calculate indefinite and definite integrals*

Methods of Instruction: Instruction will consist of a combination of lectures, class discussion, group work, board work, computer lab work, and individual study.

Outcomes Assessment: Test and exam questions are blueprinted to course objectives. Data is collected and analyzed to determine the level of student performance on these assessment instruments in regards to meeting course objectives. The results of this data analysis are used to guide necessary pedagogical and/or curricular revisions.

Attendance Policy: Regular and prompt attendance is essential for academic success. Faculty members take attendance at each scheduled class session. Students are expected to attend and be on time for all classes. Individual faculty members may establish specific attendance policies. Attendance records will be turned in to the appropriate Division/Department Chair and/or Program Director at the end of the term and in the interim upon request. Any students with more than three unexcused absences will automatically fail the course.

Course Requirements: All students are required to:

1. Maintain regular attendance.
2. Complete assigned homework or projects in a timely manner.
3. Take part in class discussions and do problems on the board when required.

4. Take all tests and quizzes when scheduled; these include a minimum of two class tests as well as a comprehensive midterm exam and a cumulative final exam.

Methods of Evaluation: Final course grades will be computed as follows:

Grading Components	% of final course grade
<ul style="list-style-type: none"> • Optional Assignments Problem sets, research projects, etc. are designed to enhance understanding of the applications of calculus in engineering and related disciplines. 	0 - 10 %
<ul style="list-style-type: none"> • Tests (dates specified by the instructor) Tests will show evidence of the extent to which students meet course objectives, including, but not limited to, identifying and applying concepts, analyzing and solving problems, estimating and interpreting results, and stating appropriate conclusions using correct terminology. 	40 - 50 %
<ul style="list-style-type: none"> • Midterm Exam The same objectives apply as with tests, but it is anticipated that students will provide evidence of synthesizing a combination of concepts. 	20 - 30 %
<ul style="list-style-type: none"> • Final Exam The comprehensive final exam will examine the extent to which students have understood and synthesized all course content and achieved all course objectives. 	20 - 30 %

NOTE: The instructor will provide specific weights, which lie in the above-given ranges, for each of the grading components at the beginning of the semester. Also, students may use a scientific or graphing calculator or laptop computer to enhance understanding during class or while doing homework. However, no form of technological aid can be used on tests/exams.

Grading System:

A	90% - 100%	Superior
B+	87% - 89%	Very Good
B	80% - 86%	Good
C+	77% - 79%	Above Average
C	70% - 76%	Satisfactory
D	60% - 69%	Passing
F	59% - 0	Failing

Academic Integrity: Dishonesty disrupts the search for truth that is inherent in the learning process and so devalues the purpose and the mission of the College. Academic dishonesty includes, but is not limited to, the following:

- plagiarism – the failure to acknowledge another writer’s words or ideas or to give proper credit to sources of information;
- cheating – knowingly obtaining or giving unauthorized information on any test/exam or any other academic assignment;
- interference – any interruption of the academic process that prevents others from the proper engagement in learning or teaching; and
- fraud – any act or instance of willful deceit or trickery.

Violations of academic integrity will be dealt with by imposing appropriate sanctions. Sanctions for acts of academic dishonesty could include the resubmission of an assignment, failure of the test/exam, failure in the course, probation, suspension from the College, and even expulsion from the College.

Student Code of Conduct: All students are expected to conduct themselves as responsible and considerate adults who respect the rights of others. Disruptive behavior will not be tolerated. All students are also expected to attend and be on time all class meetings. No cell phones or similar electronic devices are permitted in class. Please refer to the Essex County College student handbook, *Lifeline*, for more specific information about the College’s Code of Conduct and attendance requirements.

Course Content Outline: This is a tentative course schedule, the instructor reserve the right to make changes on it to make it better for the student`s development. Notice will be given should any changes take place.

Class Meeting

(120 minutes)

Topics to be Covered/ Class Activities

1 – 2

Orientation & Course Introduction/Review of Class Syllabus

CHAPTER 6 APPLICATIONS OF INTEGRATION

Chapter 6 Review

CHAPTER 7 TECHNIQUES OF INTEGRATION

3

7.1 Integration by Parts

4

7.2 Trigonometric Integrals

5

7.3 Trigonometric Substitution

6

7.4 Integration of Rational Functions by Partial Fractions

7.5 Strategy for Integration

7

7.6 Integration Using Tables and Computers Algebra Systems

8

7.7 Approximate Integration

9

7.8 Improper Integrals

10

Test #1 on Chapters 6 & 7

CHAPTER 8 FURTHER APPLICATION OF INTEGRATION

11

8.1 Arc length

12

8.2 Area of a Surface of Revolution

CHAPTER 10 PARAMETRIC EQUATIONS AND POLAR COORDINATES

11

10.1 Curves Defined by Parametric Equations

10.2 Calculus with Parametric Curves

12

10.3 Polar Coordinates

10.4 Areas and Lengths in Polar Coordinates

13

10.5 Conic Sections

10.6 Conic Sections in Polar Coordinates

Class Meeting**(120 minutes)****Topics to be Covered/ Class Activities**

14**Midterm Exam****CHAPTER 11 INFINITE SEQUENCE AND SERIES**

15

11.1 Sequences

16

11.2 Series

17

11.3 The Integral Test and Estimates of Sums

18

11.4 The Comparison Test

19

11.5 Alternative Series

20

11.6 Absolute Convergence and the Ratio and Root Test

21

11.8 Power Series

22

Test #2 on Sections 11.1 – 11.6

23

11.9 Representation of Functions as Power Series

24

11.10 Taylor and Maclaurin Series

25

11.11 Applications of Taylor Polynomials

26

Final Exam