**ESSEX COUNTY COLLEGE**

**Mathematics and Physics Division**

**MTH 118 *–* Pre-calculus**

**Course Outline**

**Course Number & Name:** MTH 118 Pre-calculus

**Credit Hours:**  4 .0 **Contact Hours:**  4.0 **Lecture:** 4.0 **Lab:**  N/A **Other:**  N/A

**Prerequisites**: Grade of “C” or better in MTH 100 or placement

**Co-requisites:** None **Concurrent Courses:** None

**Course Outline Revision Date:** Spring 2016

**Course Description**: Topics covered include polynomial, piecewise, rational, exponential, logarithmic, and trigonometric functions, their graphs, and applications involving such functions; polar coordinates; conic sections; and a brief introduction to sequences. This course is designed for students who are pursuing the 2+2 ECC – Rutgers-Newark Biology/Pre-Medicine major and, as such, plan to take only MTH 121 in the calculus sequence. This is not an appropriate course for students who plan to take more than one course in the calculus sequence.

**Fall 2019 - Section 001**

**Instructor: Dr. Alvin Williams**

**Office:** 2160 – Blue Area

**Office Phone:** 973-877-4449

**Office E-mail: williams@essex.edu**

**Office Hours:** *Regular*

Monday Wednesday, Friday 2:25 – 3:45pm

Monday 3:50 pm –5:10pm

*By Appointment*

Monday 5:15 – 5:45pm

Wednesday, Friday 3:50pm – 5:10 pm

**Term: Fall 2019**

First Day of Class: September 4, 2019 Last Day of Class: December20, 2019

**Class Days/Times: MWF** 8:30am – 9:50am

**Classroom: 2110**

**MyMathLab Course ID:** williams33956

**MyMathLab** **Instructions**

1. Go to www.pearson.com/mylab
2. Under Register, select **Student**.
3. Confirm you have the information needed, then select **OK! Register now**.
4. Enter your instructor’s course ID: williams33956, and **Continue**.
5. Enter your existing Pearson account **username** and **password** to **Sign In**.

You have an account if you have ever used a Pearson MyLab & Mastering product, such as MyMathLab, MyITLab, MySpanishLab, MasteringBiology or MasteringPhysics.

If you don’t have an account, select **Create** and complete the required fields.

1. Select an access option.

Enter the access code that came with your textbook or was purchased separately from the bookstore.

Buy access using a credit card or PayPal account.

If available, get temporary access by selecting the link near the bottom of the page.

1. From the You're Done! page, select **Go To My Courses**.
2. On the My Courses page, select the course name **MTH 118 001 F2019** to start your work.

**To sign in later:**

1. Go to [www.pearson.com/mylab](http://www.pearson.com/mylab)
2. Select **Sign In**.
3. Enter your Pearson account **username** and **password,** and **Sign In**.
4. Select the course name **MTH 118 001 F2019** to start your work.

**To upgrade temporary access to full access:**

1. Go to [www.pearson.com/mylab](http://www.pearson.com/mylab)
2. Select **Sign In**.

3. Enter your Pearson account **username** and **password,** and **Sign In**.

4. Select **Upgrade access** for **MTH 118 001 F2019.**

5. Enter an access code or buy access with a credit card or PayPal account.

**Grading:** Final course grades are recommended to be computed as follows:

**% of**

**Grading Components Final Course Grade**

* **Test 1** **20 %**
* **Test 2 20 %**
* **Test 3** **20 %**
* **Final Exam** **30 %**
* **Average of Quizzes**  **5 %**
* **Homework 5 %**

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**Total 100 %**

The Grading System to be applied is as follows:

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| --- | --- | --- |
| **Description** | **Final Average** | **Letter Grade** |
| Superior | 90 - 100 | A |
| Very Good | 85 - 89 | B+ |
| Good | 80 - 84 | B |
| Above Average | 75 - 79 | C+ |
| Satisfactory | 70 - 74 | C |
| Not Passing  (must repeat course) | 60 - 69 | D |
| Failing (must repeat course) | 59 or less | F |

Please note the following items that pertain to grading in this course:

* **Attendance:** Attendance will be monitored daily. Research studies have continuously shown that good attendance is one of the most important factors in performing well in a course.
* **There are NO MAKE-UP TESTS or EXAMS.**  You will be excused from a missed test or exam only if you contact your instructor immediately to explain reasonable circumstances. The instructor may eliminate the missed test or exam from the overall course grade.
* **There are NO MAKE-UP QUIZZES.** The average of quizzes will be calculated using the top scores (lowest quiz grade is dropped).
* Completing assigned reading and homework in a timely manner and contributing to class discussions will greatly enhance your chance of success in this course. Mathematics cannot be understood without doing a significant amount of outside study.
* Incomplete (I) grades will only be given to students with a ‘C’ average or better who are unable to take the final exam in the event of an emergency. You must contact the instructor immediately if you miss the final exam and give a valid explanation of why you were unable to take the final. You then need to make special arrangements with the instructor to take the missed final within one month of the end of the semester.

**General Education Goals**: MTH 118 is affirmed in the following General Education Foundation Category: **Quantitative Knowledge and Skills.** The corresponding General Education Goal is as follows: Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

**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 pre-calculus;
2. utilize various pre-calculus problem-solving and critical-thinking techniques to set up and solve applied problems in various science disciplines and other fields;
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; and
4. use calculators effectively as a tool to solve such problems as those described above.

**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 pre-calculus:
   1. *evaluate and graph polynomial, rational, piecewise, exponential, logarithmic, and trigonometric functions*;
   2. *solve polynomial, exponential, logarithmic, and trigonometric equations*;
   3. *solve quadratic inequalities*;
   4. *identify key characteristics (e.g., domain and range, zeros, etc.) of polynomial functions, logarithmic functions, exponential functions, and trigonometric functions and use these traits to find the equations of and to graph the functions in an appropriate coordinate system*;
   5. *identify and describe function transformations*;
   6. *graph polar coordinates and polar equations in the polar coordinate system*;
   7. *convert between radian and degree measures and between polar coordinates and rectangular coordinates*;
   8. *evaluate trigonometric functions of any angle using identities and formulas to simplify as necessary*;
   9. *apply trigonometric definitions and the Law of Sines and the Law of Cosines to solve right and oblique triangles*;
   10. *identify key characteristics (i.e., vertices, foci, directrix and/or asymptotes) of various conic sections (i.e., circles, parabolas, ellipses, and hyperbolas) and use these traits to find the equations of and to graph the conics;* and
   11. *express sequences using summation notation and evaluate the sum of a given sequence*
2. Utilize various pre-calculus problem-solving and critical-thinking techniques to set up and solve applied problems in various science disciplines and other fields:
   1. *solve geometry and distance problems;*
   2. *solve Newton’s Law of Cooling problems;*
   3. *solve growth and decay problems (in finance, biology, chemistry, physics, etc.) using exponential functions;* and
   4. *evaluate trigonometric mathematical models*
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 geometry, distance, and growth and decay problems*

1. Use graphing calculators effectively as a tool to solve such problems as those described above:
   1. *use the graph feature to display polynomial, rational, piecewise, exponential, logarithmic,* and *trigonometric functions as well as circular, elliptical, hyperbolic, and polar functions*;
   2. *use the table feature with an exponential function to approximate the value of the e-constant*;
   3. *use the zero feature to find zeros of various functions*;
   4. *use the minimum and maximum features to find relative minimum and maximum values of various functions*; and
   5. *use the graph feature to observe the domain, range, and period (as applicable) of polynomial, rational, exponential, logarithmic and trigonometric functions*

**Methods of Instruction**: Instruction will consist of a combination of lectures, class discussions, group work, board 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.

**Course Requirements:** All students are required to:

1. Maintain regular attendance; excessive absences will negatively affects student understanding and performance.

2. Complete assigned reading and homework in a timely manner and contribute to class discussions. Mathematics cannot be understood without doing a significant amount of outside study.

3. Take exams and submit all problem sets, research projects, etc. when scheduled. **Make-ups are permitted at the discretion of the instructor**. The Comprehensive Final Exam is required and cannot be rescheduled unless some **extraordinary** event occurs and prior arrangement is made with the instructor. **CALCULATORS OR FORMULA SHEETS ARE *NOT* ALLOWED TO BE USED DURING ANY IN-CLASS EXAM.**

Note: Students may use a scientific or graphing calculator or laptop computer to enhance understanding during class or while doing homework. However, ***technological aids may only be used on select assessments (homeworks, quizzes, etc.) – not on any in-class tests or exams as per the decision of the MAP Curriculum Committee***. Instructors should inform students in advance when these technological aids are needed and may be used.

**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.

**STUDENTS WITH SPECIAL NEEDS**

Essex County College welcomes students with disabilities into all of the college’s educational programs.  It is the policy and practice of Essex County College to promote inclusive learning environments.  If you have a documented disability, you may be eligible for reasonable accommodations in compliance with college policy, the Americans with Disabilities Act, Section 504 of the Rehabilitation Act, and/or the New Jersey Law Against Discrimination.  Please note, students are not permitted to negotiate accommodations directly with Professors, Academic Chairpersons, and Deans.  To request accommodations or assistance, please self-identify with the Office of Differently-abled Support Services.  The office is located at the Student Development and Counseling Department at the Main Campus in Room 4122I, and on Tuesdays at West Essex Campus’ Advisement Center.  Contact us by telephone at 973-877-3071 or by email at [disability@essex.edu](mailto:disability@essex.edu).

**Course Content Outline:** based on the text **Precalculus***,* 10th Edition, by Sullivan; published by Pearson; ISBN #: 0-321-97907-9.

**Class Meeting**

**(80 minutes) Chapter/Section**

**Chapter 1 Graphs**

1 1.1 The Distance and Midpoint Formulas

1.2.4 Symmetry

2 1.4 Circles

**Chapter 2 Functions and Their Graphs**

3 2.1 Functions

2.2 The Graph of a Function

4 2.3 Properties of Functions

5 2.4 Library of Functions; Piecewise-defined Functions

6 2.5 Graphing Techniques: Transformations

2.6 Mathematical Models: Building Functions

**Chapter 3 Linear And Quadratic Functions**

7 3.1 Linear Functions and Their Properties

8 3.3 Quadratic Functions and Their Properties

3.4.1 Build Quadratic Functions from Verbal Descriptions

9 3.5 Inequalities Involving Quadratic Functions

10 **Exam #1** on all sections covered in Chapters 1, 2 & 3

**Chapter 4 Polynomial and Rational Functions**

11 4.1 Polynomial Functions and Models

4.2 Properties of Rational Functions (briefly)

12 4.3 The Graph of a Rational Function

13 4.4 Polynomial and Rational Inequalities

14 4.5.1 The Remainder and Factor Theorems

4.5.7 The Intermediate Value Theorem

15 4.6 Complex Zeros; Fundamental Theorem of Algebra

**Chapter 5 Exponential and Logarithmic Functions**

16 5.1 Composite Functions

17 5.2 One-to-One Functions; Inverse Functions

18 5.3 Exponential Functions

19 5.4 Logarithmic Functions

20 5.5 Properties of Logarithms

21 5.6 Logarithmic and Exponential Equations

22 5.8.1 Exponential Growth Models

5.8.2 Exponential Decay Models

5.8.3 Newton’s Law of Cooling

**Class Meeting**

**(80 minutes) Chapter/Section**

23 **Exam #2** on all sections covered in Chapters 4 & 5 (may contain questions from earlier sections/chapters as well)

**Chapter 6 Trigonometric Functions**

24 6.1 Angles and Their Measures

6.2 Trigonometric Functions: Unit Circle Approach

25 6.3 Properties of the Trigonometric Functions

26 6.4 Graphs of Sine and Cosine Functions

27 6.5 Graphs of the Other Trigonometric Functions

6.6.1 Phase Shift

**Chapter 7 Analytic Trigonometry**

28 7.1 The Inverse Sine, Cosine and Tangent Functions

29 7.2 The Inverse Trigonometric Functions (Continued)

30 7.3 Trigonometric Equations

31 7.4 Trigonometric Identities

32 7.5 Sum and Difference Formulas

7.6 Double-Angle and Half-Angle Formulas

7.7.1 Product-to-Sum Formulas

33 **Exam #3** on all sections covered in Chapters 6 & 7 (may contain questions from earlier sections/chapters as well)

**Chapter 8 Applications of Trigonometric Functions**

34 8.1 Right Angle Trigonometry; Applications

35 8.2 The Law of Sines

36 8.3 The Law of Cosines

8.4.1 The Area of SAS Triangles

**Chapter 9 Polar Coordinates; Vectors**

37 9.1 Polar Coordinates

9.2 Polar Equations and Graphs (optional)

**Chapter 10 Analytic Geometry**

38 10.1 Conics

10.2 The Parabola

39 10.3 The Ellipse

10.4 The Hyperbola

40 10.5 Rotation of Axes; General Form of a Conic

**Chapter 12 Sequences**

41 12.1 Sequences

**Class Meeting**

**(80 minutes) Chapter/Section**

42 Review for Final Exam

43 Comprehensive **Final Exam** on all course material covered