

Repetitio est mater studiorum
(*Repetition Is the Mother of Study*)
Latin wisdom

Interest comes with success,
and success comes with hard work.
Professor Yaroslav Tagamlizki

Eastern Connecticut State University
MAT 155-01, Precalculus, Spring 2017

Instructor: Christian Yankov

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Time and Place: **M** 9:00-9:50 am, **W** 9:00-10:50 am, **F** 9:00-9:50 am, Goddard 217.

Text: *Precalculus Essentials*, Ratti and McWaters, ISBN-13: 978-0321816962.

Calculator: A graphing calculator is required for the course. The recommended one, especially if you are continuing with Calculus classes at Eastern later, is **TI-89**, since it is required in these classes.

Office hours: **M** 10:00-11:00 am, and 12:30-2:00 pm, **W** 12:30-2:00 pm, **F** 10:00-11:00 am.

Prerequisites: Placement at this level.

Course description and topics: Topics include the study of functions, domain and range, building new functions through algebraic operations, composition of functions, and inverse functions. The course will also include the study of families of functions such as polynomial, rational, radical, exponential, logarithmic, and trigonometric functions. Specifically, students are expected to gain an understanding of algebraic notation, expressions, equations, inequalities and their use in describing and interpreting relationships, functions and function notation, proportional and inversely proportional relationships, and applications of periodic phenomena and trigonometric identities. The use and mastery of graphing technology is an essential aspect of the course. This course is designed for students majoring in STEM disciplines. May also be useful to other quantitative disciplines.

Class format: Each class meeting will consist of a lecture and include related problem solving.

Eastern Liberal Arts Curriculum (LAC) Tier I Mathematics Outcomes: This course meets the Tier I requirements for the Mathematics category of the Liberal Arts Core Curriculum. This course will achieve the following outcomes:

- Use mathematical thinking as a model of deductive reasoning (lecture content, class activities, homework, quizzes, and/or exams);
- Understand the importance of variation both how a single quantity can vary and how one quantity varies in relation to another (i.e. functional relationships) (lecture content, class activities, homework, quizzes, and/or exams);
- Understand the important mathematical idea of growth (linear, quadratic, exponential, etc.) (lecture content, class activities, homework, quizzes, and/or exams);
- Apply quantitative reasoning to problems encountered in other academic areas (lecture content, class activities, homework, quizzes, and/or exams);
- Use appropriate technology (e.g. graphing calculators, spreadsheets, mathematical manipulation software) to solve quantitative problems (lecture content, class activities, homework, quizzes, and/or exams);
- Effectively communicate ideas orally, visually, and in writing (group activities, student responses to questions during lectures, quizzes, and/or exams);

- Understand the value of rigorous inquiry and research, academic integrity, and active engagement in the ECSU learning community and beyond (contributing to class activities, timely completion of homework, clearly crediting work of others, penalties for violations of academic integrity)
- Discern the ethical dimensions of the production and acquisition of knowledge within disciplines (penalties for violations of academic integrity, contributing to class activities);
- Ability to think critically (lecture content, class activities, homework, quizzes, and/or exams);
- Effectively seek and employ information to achieve academic goals (lecture content, class activities, homework, quizzes, and/or exams).

Ethical Behavior in the Mathematical Sciences: Ethical behavior in the mathematical sciences is embedded throughout the course. The key concepts are discussed in lecture and students demonstrate these principles through various modes such as class activities and group activities and assessments such as homework, quizzes and exams. These key principles include, but are not limited to, clearly crediting work of others and the study of a historic or current mathematical controversy, such as the Cardano -Tartaglia dispute, involving plagiarism and ownership.

Learning Outcomes: In this course, students will:

1. Construct, solve, graph and transform functions.
2. Understand and use function notation.
3. Find the inverse of a function.
4. Solve quadratic equations using factors, square root properties, completing the square, formula, graphing, up to complex roots.
5. Solve quadratic-type equations (e.g. $2^{2x} - 9 \cdot 2^x + 8 = 0$) by substitution.
6. Solve third and fourth degree polynomial equations by factors and use of synthetic division.
7. Graph polynomial functions given in factored form using zeros and their multiplicities.
8. Know and apply the Remainder Theorem, the Factor Theorem, and the Fundamental Theorem of Algebra.
9. Find the domain and the vertical, horizontal, and oblique asymptotes of a rational function.
10. Graph rational functions given in factored form using zeros, identifying asymptotes, analyzing their behavior for large values of x .
11. Solve rational equations.
12. Use the concept of variation (direct, inverse, joint) to solve problems.
13. Graph exponential functions.
14. Use exponential functions including with base e to model and solve real-world problems (common logarithms and natural logarithms).
15. Solve basic exponential equations that do not require logarithms.
16. Use the definition of logarithm to evaluate logarithms with any base with and without a calculator.

17. Use the definition of logarithm to convert an exponential equation to log form and vice-versa.
18. Apply the properties and laws of logarithms to simplify and evaluate expressions.
19. Solve exponential and logarithmic equations.
20. Use exponential, logarithmic, and logistic models to solve real-world problems.
21. Use the inverse relationship between exponential and logarithmic functions to solve equations and problems (compound interest, exponential growth, etc).
22. Explain how the rates of change of functions in different families (e.g., linear functions, exponential functions, etc.) differ, referring to graphical representations.
23. Apply the definition and geometric interpretation of the difference quotient.
24. Simplify difference quotients and interpret difference quotients as rates of change and slopes of secant lines.
25. Apply the concept of the rate of change to real world problems.
26. Define and evaluate the six basic trigonometric functions.
27. Define radian measure and convert angle measures between degrees and radians.
28. Use angle units of degrees (minutes and seconds), and radians.
29. Understand basic trigonometric identities ($\tan x = \frac{\sin x}{\cos x}$, $\sin^2 x + \cos^2 x = 1$, $\sin(-x) = -\sin x$, $\cos(-x) = \cos x$, etc).
30. Use trigonometric functions to model and solve real-world problems, including right triangle relations, arc length, speed, and navigation problems.
31. Find the values of the other five trigonometric functions given one of them.
32. Evaluate trigonometric functions of the special angles.
33. Evaluate trigonometric functions on the graphing calculator.
34. Apply trigonometry to solve real world problems.
35. Solve triangles using trigonometric functions.
36. Define the inverse trigonometric functions of the six basic trigonometric functions.
37. Apply the sum and difference formulas.
38. Apply the double-angle and half-angle formulas.
39. Solve trigonometric equations graphically and algebraically in degrees and radians.
40. Establish and verify simple trigonometric identities.
41. Solve triangles using the Law of Sines and the Law of Cosines.
42. Find the area of a triangle using $A = \frac{1}{2} ab \sin C$.
43. Apply the mathematical concepts and skills studied in this course to real world problems and other academic areas.

Technology Skills: By the end of this course, students should be able to use their graphing calculator to do the following:

1. Do basic calculations (including understanding order of operations).
2. Convert from fraction to decimal and decimal to fraction.

3. Evaluate a function.
4. Generate a table of a function's values.
5. Graph functions (linear, quadratic, cubic, absolute value functions).
6. Adjust the settings on the viewing window.
7. Check solutions to a linear equation:
 - (a) from a table of values;
 - (b) from a graph.
8. Find the solution of a system of linear equations by graphing (using the intersection option).
9. Set an appropriate window and graph more complex functions such as polynomials, rational, radical and exponential functions.
10. Approximate the zeros of a polynomial function (and make the connection with the polynomials x -intercepts).

Attendance: It is expected that you be there on time for each and every class. If for some reason you should miss a class, then it is your responsibility to find out from a friend what has been covered and assigned before the next class, and make it up.

Homework: After each class you will get a homework assignment. It will not be collected and graded, but must be completed and should prepare you for the quizzes and exams. I cannot stress enough the importance of doing the homework. It is a critical factor in building and reinforcing your knowledge, as well as helping you identify your weak points.

Quizzes: Quite often at the beginning of class time there will be a short quiz, often unannounced in advance. This should keep you alert and following the material carefully, closely and timely.

Exams: There will be two longer exams throughout the semester. The first one will be given around the 5th week of classes and the second one around the 10th week.

Final Exam: There will be a cumulative final on **Friday, May 12, 2017, 8:00-10:00 am.**

Evaluation: Quizzes will account for 15% of your grade, the two longer exams will account for 25% each, and the final exam will account for the remaining 35%.

Grades: The ranges for the grades are the following:

A-, A	90% and above	B-, B, B+	80% - 89%
C-, C, C+	70% - 79%	D, D+	60% - 69%

How to get help: You should come see me during my office hours, if you have difficulties with the subject matter. You can get free tutoring at the Mathematics Achievement Center (MAC), located on the first floor of the E. J. Smith Library, Room 107. Please visit www.easternct.edu/mathematics/department-index/mathematics-achievement-center/ or call 465-0383 for the schedules of the MAC. If you feel you need help, do not wait until an exam is imminent.

Make-ups: There will be no make-ups for quizzes, since I will drop the lowest one (or, two). Make-ups for exams are strongly discouraged and might be allowed for truly exceptional reasons only, and with my prior permission.

Inclement weather: For cancellation of classes due to bad weather follow the messages on the university weather hot line at (860) 465-4444, or 1-800-578-1449, or visit the website <http://www.easternct.edu/easternalert/>

Eastern uses also the local radio and TV station broadcasts to announce cancellations. If you are subscribed to Eastern Alert, you should also be notified via that channel, as well.

Weather Closing Policy: In the event of a delayed opening of the University, any class that would have at least 45 minutes of meeting time remaining after the announced opening time will meet starting at the announced opening time. Any class meeting that would have fewer than 45 minutes of meeting time after the announced opening time will not meet. For example, if opening the campus is delayed until 10 a.m., classes running from 9:30-10:45 a.m. would meet from 10-10:45 a.m.

In the event of an early closing of the University, any class that would have at least 45 minutes of meeting time prior to the announced closing time will meet until the announced closing time. Any class meeting that would have fewer than 45 minutes of meeting time before the announced closing time will not meet. For example, if we were to close the University early at 3 p.m., classes running from 2-3:15 p.m. would meet from 2-3 p.m.

Students with disabilities: Eastern Connecticut State University is committed to following the requirements of the Americans with Disabilities Act and Section 504 of the Rehabilitation Act. If you are a student with a disability (or think you may have a disability), and require adaptations or accommodations, or assistance evacuating a building in the case of an emergency, please contact the Office of AccessAbility Services (OAS) at 860-465-0189 to discuss your request further. Any student registered with the OAS should contact the instructor as soon as possible for assistance with classroom accommodations. Please note that accommodations are not retroactive, and must be communicated through a Letter of Accommodation which is drafted by the OAS.

Classroom Etiquette: The use of cell phones, or headphones is inappropriate in class. Cell phones should be turned off (or on vibrate for emergencies) and stored off the class desk. No food is allowed during class.

Academic Misconduct: Students should read and understand Eastern's Academic Misconduct Policy, which can be found in the student handbook or at the following website:

<http://ecsu-svkb2.easternct.edu/index.php?View=entry&EntryID=307>

All violations will be handled under the procedures established in this policy.

Disclaimer: *The instructor reserves the right to make changes to this syllabus during the semester as necessary.*