Math 151 (Engineering Mathematics I) **Sections 534 – 536, 555 – 557** **Fall 2016**

Instructor: Dr. Mariya Vorobets

Class hours : 534 – 536 TR 2:20 – 3:35, HELD 113
555 – 557 TR 12:45 – 2:00, HELD 113

Web page: `http://math.tamu.edu/~mvorobet/Math151/F16/`

Office: BLOC 223A, **e-mail:** `mvorobet@math.tamu.edu`

Office hours: MW 10:00 – 12:00 or by appointment

Recitations:

534	W 11:30–12:20	BLOC 121
535	W 12:40–1:30	CE 222
536	W 1:50–2:40	CE 222
555	W 1:50–2:40	CE 137
556	W 3:00–3:50	BLOC 148
557	W 4:10–5:00	CE 223

Labs:

534	M 11:30–12:20	BLOC 123
535	M 12:40–1:30	BLOC 124
536	M 1:50–2:40	BLOC 124
555	M 1:50–2:40	BLOC 123
556	M 3:00–3:50	BLOC 123
557	M 4:10–5:00	BLOC 126

Teaching assistant: 534–536 Amudhan Krishnaswamy-Usha , email: `amudhan@tamu.edu`
555–557 Kashif Bari, email: `kashbari@math.tamu.edu`

Course description: (Credit 4) Rectangular coordinates, vectors, analytic geometry, functions, limits, derivatives of functions, applications, integration, computer algebra. MATH 171 designed to be a more demanding version of this course. No credit will be given for more than one of MATH 131, MATH 142, MATH 147, MATH 151 and MATH 171.
Prerequisites: MATH 150 or equivalent or acceptable score on TAMU Math Placement Exam.

Texts:

- **Textbook:** Stewart, Calculus: Early Vectors, Cengage Learning. The textbook is available in different formats. You can buy a hard-back or loose-leaf copy or you can purchase an eBook within the online system WebAssign. See the link below for more information on WebAssign and purchasing options.
- **Lab Manual:** Gilat-Amos, MATLAB: An Introduction with Applications, 5th edition, Wiley ISBN 9781118629864
- **WebAssign Account Access Code:** WebAssign will be used for homework in this class. In order to use WebAssign, you must purchase an access code. For access code and textbook purchasing information and options, please see the Student Information Page at `http://www.math.tamu.edu/courses/eHomework/`

Course Web Page: The course web page will be my main source of communication to you aside from class and office hours. Check the course page regularly for announcements, exam information and the course schedule.

The Mathematics Department has a web-page for Math 151
`http://www.math.tamu.edu/courses/math151/`
Here you can find a description of the course, approximate weekly schedule, past exams, help session schedules and other information.

Email Policy: Check your official TAMU email account regularly. You are responsible for any information I send via email. Because of the privacy rights, I cannot discuss grades via email or over the phone. Please include your name and the section number in the subject line.

Calculator Policy: Calculators are not allowed on exams or quizzes, although they may be used on homework assignments. Use of a calculator on a quiz or exam is considered academic dishonesty and will be reported to the Aggie Honor Council.

Online homework: Graded homework assignments will be done online in WebAssign. For important information such as how to purchase access, how to log in and take assignments, the Student Help Request Form, and other WebAssign issues, please see `http://www.math.tamu.edu/courses/eHomework`. You may use scratch paper, calculators etc. on the online homework. The deadlines are programmed into the computer system, so submitting your homework well before the deadline is recommended. If you submit your homework late, the computer will automatically give you a zero for the assignment and not record your answers. You are responsible for remembering to do the homework. The lowest three homework grades will be dropped at the end of the semester.

Suggested homework: Selected problems from your textbook will be assigned but NOT graded. You are strongly recommended to do all of them which will provide a valuable practice for both on-line HWs and exams. For list of suggested HWs see:
`http://www.math.tamu.edu/courses/math151/currenthw.html`

Computer labs: Computer labs will be assigned in section each week with breaks for the exams. These assignments will be done in a group. Groups will be assigned in section during the first week of classes.

Quizzes: Quizzes will be given regularly, almost every week (except exam weeks) during the recitation meeting on Wednesdays. All of them are mandatory, although, the lowest grade will be dropped at the end of the semester.

Grading: Your grade will be determined by three exams, a cumulative final exam, and a laboratory grades. The weights of each of these are as follows.

Exam I	20% of course grade	Sept. 29
Exam II	20% of course grade	Oct. 27
Exam III	20% of course grade	Nov. 29
Final Exam	20% of course grade	
Homework	5% of course grade	
Quizzes	10% of course grade	
Lab reports	5% of course grade	

I may curve any grade and will then compute the course grade by the following rule: A for at least 90% points, B for at least 80% points, C for at least 67% points, D for at least 57% points and F for less than 57% points.

You must bring either your student ID or your driver's license to each of the above exams. There will be no extra credit under any circumstances. Exams I, II and III are common exams (same exam is given for all sections of Math 152) and are administered in the evenings from 7:30-9:30 PM. An examination room would be announced in class and posted on the course website as soon as it is assigned

For Common Exams 1 and 2 only, if your score is below a 70, you will have the opportunity to take a different exam covering the same content to improve your grade. The maximum score you may earn on a retest is 70, and if your score on the retest is higher than your first attempt, it will replace your original score, up to the maximum of 70.

Final Exam: The final exam will be a cumulative (comprehensive) exam and is required for all students. If your final exam grade is higher than your lowest test grade, the grade on your final will replace your lowest test grade in the course grade calculation.
A two-hour comprehensive FINAL exam will be given on: 534–536 Dec, 14 at 1:00–3:00 in HELD 113
555–557 Dec. 14 at 8:00–10:00 in HELD 113

Grade Appeals: If you believe an error has been made in grading, you have until the next class period after the exam, quiz, or assignment has been handed back to let me know. Otherwise, you must accept the grade you received.

Help Sessions: The Mathematics Department offers help sessions for Math 151 students. See

http://www.math.tamu.edu/courses/helpsessions.html for more information.

Week-in-Review: There will be a week-in-review conducted by Dr. Mariya Vorobets and Dr. Constantin Onica. Problems will be posted before each session. For more information see
http://www.math.tamu.edu/~mvorobet/Math151/WIR_F16/
and
http://www.math.tamu.edu/~onicac/math151weekinreview.html

Weekly Schedule:

Week 1. Appendix D, Section 1.1 (Trigonometry Review, Two-Dimensional Vectors)

Week 2. Sections 1.2–1.3, 2.2 (Dot Product, Parametric Curves and Vector Functions, Limit of a Function)

Week 3. Sections 2.3, 2.5–2.6 (Calculation of Limits, Continuity, Limits at Infinity and Horizontal Asymptotes)

Week 4. Sections 2.7, 3.1 (Tangents, Velocities, and Other Rates of Change, Derivatives)

Week 5. Sections 3.2–3.3 (Differentiation Formulas, Rates of Change in the Natural and Social Sciences)
Exam I (Covering thru Section 3.1)

Week 6. Sections 3.4–3.6 (Derivatives of Trigonometric Functions, Chain Rule, Implicit Differentiation)

Week 7. Sections 3.7–3.10 (Derivatives of Vector Functions, Higher Derivatives, Slopes and Tangents of Parametric Curves, Related Rates)

Week 8. Sections 3.11, 4.1 (Differentials, Linear and Quadratic Approximation, Exponential Functions and Derivatives)

Week 9. Sections 4.2–4.3 (Inverse Functions, Logarithmic Functions)
Exam II (Covering Sections 3.2–4.2)

Week 10. Sections 4.4–4.6 (Derivatives of Logarithmic Functions, Exponential Growth and Decay, Inverse Trigonometric Functions)

Week 11. Sections 4.8, 5.1–5.2 (L'Hospital's Rule, Graphical Interpretation of the Derivative, Maximum and Minimum Values)

Week 12. Sections 5.3, 5.5, 5.7 (Derivatives and Shapes of Curves, Applied Max/Min Problems, Antiderivatives)

Week 13. Sections 6.1–6.2 (Sigma Notation, Area)

Week 14. Section 6.3–6.4 (The Definite Integral, The Fundamental Theorem of Calculus)
Exam III (Covering Sections 4.3–6.2)

Week 15. Section 6.4, Review for Final.

Make-up Policy:

- No make-ups will be given without written evidence of an official University excused absence (see *University Student Rules*). In addition, you must notify me **NO LATER** than the end of the second working day after the missed assignment.
- In the case of injury or illness, students are required to obtain a confirmation note from a health care professional affirming date and time of a medical office visit regarding the injury or illness. I will NOT accept the "Explanatory Statement for Absence from Class" form as sufficient written documentation of an excused absence.
- Make-up exams will be only allowed due to excused absences and the next possible make-up time be chosen from http://www.math.tamu.edu/courses/makeupexams.html

Late Work Policy: Late work (for which you do not have a University approved excused absence) will NOT be accepted. This includes all written and online assignments.

Scholastic Dishonesty: Copying work done by others, either in-class or out-of-class, is an act of scholastic dishonesty and will be prosecuted to the full extent allowed by University policy. Collaboration on assignments, either in-class or out-of-class, is forbidden unless I grant permission.If you cheat on an assignment, you will receive a zero. Also, you will be reported to the University.

Remember the Aggie Code of Honor:

"An Aggie does not lie, cheat, or steal or tolerate those who do."

For more information about the Honor Council Rules and Procedures visit the web site:
`http://aggiehonor.tamu.edu`

Copyright notice: All course materials (both printed and web-based) are protected by U.S. Copyright Laws. No multiple copies can be made without written permission by the instructor.

Students with disabilities: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit `http://disability.tamu.edu`.

Learning outcomes: This course focuses on quantitative literacy in mathematics along with real world applications to physics, related rate problems, and optimization. Upon successful completion of this course, students will be able to:

- Understand vectors and vector functions, both graphically and quantitatively, and apply them to real world situations involving velocity, forces, and work.
- Construct vector and parametric equations of lines and understand vector functions and their relationship to parametric equations.
- Understand the concept of a limit graphically, numerically, and algebraically, and apply the relationship between limits, continuity, and differentiability in determining where a function is continuous and/or differentiable.
- Define the limit definition of the derivative and calculate derivatives using the limit definition, differentiation formulas, the chain rule, and implicit differentiation, with applications to tangent line and velocity problems.
- Calculate limits and derivatives of vector functions with applications to physics such as computing velocity and acceleration vectors.
- Identify exponential, logarithmic, and inverse trigonometric functions, and compute limits and derivatives involving these classes of functions.
- Apply the derivative to mathematically model velocity and acceleration as well as real world related rate applications, such as calculating the rate at which the distance between two moving objects is changing or the rate at which the volume of a cone being filled with water is changing.
- Approximate functions and function values using the derivative and the tangent line.
- Identify and understand indeterminate forms and apply the derivative to calculate limits using LHospitals Rule.
- Understand and apply the Intermediate Value Theorem and the Mean Value Theorem, and be able to logically determine when these theorems can be used.
- Use calculus and logic to sketch graphs of functions and analyze their properties, including where a function is increasing/decreasing and in describing the concavity of the function.

- Determine the maximum/minimum values of functions, including applied optimization problems.
- Compute antiderivatives and understand the concept of integration as it relates to area and Riemann sums.
- Articulate the relationship between derivatives and integrals using the Fundamental Theorem of Calculus, and evaluate definite integrals using the Fundamental Theorem of Calculus.
- Use a Computer Algebra System to solve problems.This course is focused on quantitative literacy in mathematics as applied to Engineering and Physics. Upon successful completion of this course, students will be able to:

Course objectives

Critical Thinking:

- Students will think critically about limits in determining how the limit conceptually relates to the behavior of the function.
- Students will think critically about continuity and differentiability to justify whether a function is continuous and or differentiable at a point.
- Students will evaluate the proper technique to use when computing limits and derivatives of functions.
- Students will synthesize data determined from the first and second derivatives to determine the properties and shape of a function.
- Students will use inquiry to determine on what intervals a function is increasing/decreasing and to determine the intervals of concavity of the function by analyzing the signs of the first and second derivatives.
- Students will innovatively think about how to solve related rate word problems and optimization problems.
- Students will analyze functions using continuity and the derivative in determining the maximum and minimum values of the function, and if they exist.
- Students will develop a critical understanding of the relationship between the derivative and the integral using the Fundamental Theorem of Calculus.

Communication Skills:

- Students will recognize and construct graphs of basic functions, including polynomials, exponential functions, logarithmic functions, and trigonometric functions.
- Students will justify solutions to optimization problems in writing.
- Students will interpret information from the derivatives of a function in order to develop a visual sketch of the graph of the function and to communicate in writing the properties of the function.
- Students will identify points of discontinuity and non-differentiability by examining the graphs of functions.
- Students will express mathematical concepts, such as the definition of the derivative, both abstractly with equations and in writing solutions to problems.
- Students will develop solutions to problems that involve the use of theorems, such as the Squeeze Theorem, the Intermediate Value Theorem, and the Mean Value Theorem.
- Students will use graphs of functions to determine the value of definite integrals as they relate to area.
- Students will be required to communicate orally with other group members when working on Computer Algebra System projects or other group activities.
- Students will communicate orally in group discussion in the required weekly recitation sessions.

Empirical and Quantitative Skills:

- Students will analyze limits numerically to determine the sign of the infinite limit.
- Students will analyze numerical data in determining the signs of the first and second derivative in order to make conclusions on the shape of the graph.
- Students will compute derivatives and interpret the results as they relate to tangent line, velocity, and other rate of change problems.
- Students will numerically approximate the values of a function by using the tangent line approximation.
- Students will calculate antiderivatives of functions and use initial data to determine any unknown constants.
- Students will make conclusions involving maximum and minimum values of functions (both local and absolute) based on information from the derivative.
- Students will manipulate given information to develop a function to be used in optimization problems and then apply calculus to find and interpret the optimal solution.
- Students will approximate the value of a definite integral numerically using Riemann sums.
- Students will compute definite integrals and interpret the results as they relate to area under a curve.
- Students will manipulate given information to create a related rate model involving known quantities, and then apply calculus to solve for an unknown rate of change.