Revised 1/22/20

Program Cover Document --- MAT 127: Calculus A

I. Basic Course Information

MAT 127: Calculus A is a freshmen/sophomore level introductory course to single-variable calculus. It will be scheduled for three lecture periods: two periods of 80 minutes length and one one-hour meeting period. Its prerequisite is MAT 120: Precalculus.

II. Learning Goals

The primary emphasis of Calculus A is on learning the first-half of single-variable calculus. Its subject matter is part of the foundation that many higher-level courses in mathematics, science, and engineering are built upon.

The major topics covered are limits and derivatives, the rules of differentiation, applications of differentiation, an introduction to integrals, and applications of integrals. Upon completion of the course, we expect students to show competence with the ideas of calculus and its calculations, to understand how to apply calculus to solve real-world problems, to exhibit an improved ability to describe a real-world problem mathematically, to have an increased mathematical maturity, and to have an improved ability to read, write, and understand mathematics. These performance goals are in agreement with the department's program goals.

In Calculus A, students will gain exposure to both the theoretical and applied aspects of calculus. By working on many real-life problems, students will gain an appreciation for the practical applications of calculus. Simultaneously, their mathematical maturity will be built up through the presentation of theory and the expectation of a higher level of reasoning than has previously been demanded in their mathematics courses. They are also exposed to the concepts and techniques of problem solving through individual and group work on the exercises.

Calculus A, together with its continuation MAT 128: Calculus B, serves as a bridge course between the high-school and college mathematical curricula. College level mathematics, science, and engineering courses demand a higher level of quantitative reasoning than that demanded in the high school curriculum. As incoming students comprise the majority of enrolled students, an important goal of Calculus A is to raise the level of their mathematical reasoning skills to the collegiate level.

III. Student Assessment

Students will receive regular feedback on their work through the assignment of homework, quizzes, student presentations and examinations. Through this feedback, students will be able to see and correct their misunderstandings and improve their performance. Student performance on these assessment instruments and the performance of students in their future courses such as Calculus B will be used to assess the success of Calculus A in achieving its learning goals and its contribution to the fulfillment of the department's program goals. Peer reviews and student evaluations will also be used to evaluate the course.

IV. Learning Activities

Learning activities will consist of a combination of lectures, group work, student presentations, and computer assignments. The specific choice will depend upon the individual instructor. Outside of class, students are expected to do a significant amount of individual and group homework to achieve the learning goals. These learning activities are typical of the learning activities in the department's programs. By giving students a multitude of ways to learn and do mathematics, the learning activities promote a deeper understanding of the concepts of calculus and contribute to the learning goals of these programs.

Course Syllabus Guide -- MAT 127: Calculus A

Introduction: A typical syllabus for Calculus A follows this sheet. All syllabi for Calculus A should include the points listed below and cover the items on the Calculus A Topics list with the indicated depth.

I. Basic information on course and instructor

A. Purpose statement: Calculus A, the first half of the single-variable calculus experience, is a foundational course for the mathematics, science, and engineering curricula. It introduces students both to calculus and the higher expectations of college-level mathematics courses. Calculus A should also inspire mathematical curiosity and interest in its students.

B. Course description: This course provides students with a solid grounding in single-variable calculus. The course is designed for students in the mathematical and physical sciences. Topics include functions and limits, derivatives and differentiation rules, applications of derivatives, and an introduction to integrals and their applications.

C. Course prerequisites: MAT 120: Precalculus.

II. Learning goals

This course aims to develop student proficiency in the understanding of calculus concepts through numerical, graphical and functional analyses.

The course should be taught in a manner that develops and exhibits the following mathematical practices. Students of calculus should:

- Engage with the subject matter as they progressively grow in mathematical maturity and expertise throughout the sequence.
- Be able to address and demonstrate understanding of rigorous problems in multiple representations;
- Be able to explain and justify their solutions (including discussing them with other students),;
- Be able to apply mathematics to real-life applications;
- Be able to express their thought process and solution strategies in clear, written form.
- Be exposed to the purposeful and appropriate use of technology in the course.

A. Learning goals: MAT 127 will focus on an in depth understanding of:

a. Concept and evaluation of limits
b. Concept of continuity
c. Notions of (average and instantaneous) rate of change and computing rates of change
d. Notion of the derivative and methods of differentiation
e. Solving problems involving applications of limits and derivatives including related rates, sketching, and optimization
f. Fundamental Theorem of Calculus and Applications of Fundamental Theorem of Calculus
g. Notions of integration (Riemann sums, area under the curve)

Students will gain experience in communicating calculus topics utilizing mathematical language. The course will cover the topics listed on the attached "Calculus A Topics List" with the indicated emphases.

B. Learning Outcomes: Through solving rigorous problems and presenting written solutions clearly on formal and informal assessments, students will be able to demonstrate mastery of concepts involving:

a. Notion of Limits and evaluation of limits (one-sided, two-sided, infinite)
b. Continuous functions
a. Rate of change of functions
b. Derivatives and differentiation techniques of various functions.
c. Applications of limits and derivatives
d. Fundamental Theorem of Calculus and its Applications
e. Notions of Integration including Riemann sums, and area under the curve

f. Students should be able to demonstrate understanding of multiple (numerical, graphical and algebraic) representations of a calculus problem.
g. Students should be able to justify their thought processes and solutions in clear, written form.
h. Students should be able to solve a real-life problem involving calculus.

III. Student assessment

A. Assessment plan: Students will receive regular feedback on their work through the assignment of homework, quizzes, student presentations and examinations. The department has created a set of computerized homework problems (currently using the WeBWorKsystem) that all professors are required to assign to students. The amount of weight given to these homework problems is at the discretion of the instructor. The syllabus should clearly describe the schedule for these assessment tools and how they will be used to calculate grades.
B. Rationale: Students need to be able to use calculus correctly in their future courses. Through the use of regular feedback from homework, quizzes, student presentations and examinations, students will be able to see and correct their misunderstandings and improve their performance.
C. Methods and criteria: We will use the assessment of homework, quizzes, student presentations, and examinations to evaluate student accomplishment of the course learning goals. These assessment tools are similar to the manner in which students will need to display their knowledge of calculus in the future and are an appropriate way to assess the accomplishment of course learning goals.

IV. Learning activities

A. Summary of learning activities: Learning activities will consist of a combination of lectures, group work, student presentations, and computer assignments. The specific choice will depend upon the individual instructor. Outside of class, students are expected to do a significant amount of individual and group homework to achieve the learning goals.
B. Calendar or outline: A guide to the organization of the course, a schedule of assessment tools, and a plan for the coverage of topics should be provided to the students. As an approximate guide, 1-2 topics on the recommended list can be covered in a class period. Homework, quizzes, and examinations should be spaced at appropriate intervals throughout the semester.
C. Rationale By giving students a multitude of ways to learn and do mathematics, the learning activities promote a deeper understanding of the concepts of calculus and contribute to the learning goals of these programs. A regular spacing of assessment tools insures that students continual regular feedback on their work.

Calculus A Topics List

All listed topics are to be covered. Topics in bold should be covered in depth. The chapter numbers correspond with Stewart's *Calculus: Early Transcendentals* book.

Chapter 2: Limits and Derivatives

- 2.1 Average rate of change, Tangent and velocity problems
- 2.2 Numerical/Graphical approach to limits, **One sided limits, Infinite limits**
- 2.3 **Calculating limits using the limit laws, Algebraic manipulations to evaluate limits,** Squeeze Theorem
- 2.5 **Continuity, Intermediate Value Theorem**
- 2.6 **Limits at infinity, Horizontal asymptotes**
- 2.7 **Derivatives and rates of change, Definition of derivative at a point**
- 2.8 **Derivative as a function, Differentiability and continuity, Higher derivatives**

Chapter 3: Differentiation Rules

- 3.1 **Basic differentiation rules, Derivatives of polynomials and exponential functions**
- 3.2 **Product and quotient rules**
- 3.3 **Derivatives of trigonometric functions,** Trigonometric limits
- 3.4 **Chain rule, Derivatives of general exponential functions**
- 3.5 Implicit differentiation, Derivative of inverse functions (not done explicitly in Stewart), Derivatives of inverse trigonometric functions
- 3.6 **Derivatives of general logarithmic functions,** Logarithmic differentiation
- 3.9 Related rates
- 3.10 Linear approximation

Chapter 4: Applications of Differentiation

- 4.1 **Maximum and Miminum values including local and absolute extrema, Critical points, Optimizing on a closed interval**
- 4.2 Rolle's Theorem, Mean Value Theorem
- 4.3 How derivatives affect the shape of a graph including monotonicity of a function, **concavity and inflection points**, second derivative test for critical points
- 4.4 **Indeterminate forms and L'Hospital's Rule**
- 4.5 Summary of curve sketching, aAymptotes
- 4.7 Optimization problems
- 4.9 **Antiderivatives**

Chapter 5: Integrals

- 5.1 Summations, Areas and Distances

5.2 **Definite integral including approximating areas by rectangles using endpoints or midpoints**, General Riemann sums, **Definite integral as signed area, Properties of the definite integral**
5.3 **Fundamental Theorem of Calculus, part I and part II**
5.4 Indefinite integrals and the net change theorem
5.5 **Substitution rule, including change of variables for definite integrals**

Chapter 6: Applications of Integration

6.1 **Areas between curves,** including integration along the y–axis.
6.5 Average value of an integrable function over closed interval.

Department of Mathematics and Statistics

MAT 127 Section 1 & 2
Calculus A
Fall 2017

Instructor: Dr. S.Van der Sandt *Office: Science Complex P240*
Phone: 609 771 3061 *Email: vandersa@tcnj.edu*
Office Hours: Monday/ Thursday 11-noon (SCP 202), Wednesday 11-noon (SCP 202), other hours by appointment only.
Textbook: Calculus Early Transcendentals (8th Edition) by James Steward, published by Thomson Learning, ISBN: 9781305743663 (with WebAssign access)

Instructor	*Section*	*Class Key*
Suriza Sandt	*MAT127 Section 01*	*tcnj 7217 9890*
Suriza Sandt	*MAT127 Section 02*	*tcnj 9943 5525*

Basic Course Information

MAT 127: Calculus A is a freshmen/sophomore level introductory course to single-variable calculus. It will be scheduled for three lecture periods: two periods of 80 minutes length and one one-hour meeting period. Its prerequisite is a passing grade in MAT 120.

Learning Goals

The primary emphasis of Calculus A is on learning the first-half of single-variable calculus. Its subject matter is part of the foundation that many higher-level courses in mathematics, science, and engineering are built upon.

The major topics covered are limits and derivatives, the rules of differentiation, applications of differentiation, an introduction to integrals, and applications of integrals. Upon completion of the course, we expect students to show competence with the ideas of calculus and its calculations, to understand how to apply calculus to solve real-world problems, to exhibit an improved ability to describe a real-world problem mathematically, to have an increased mathematical maturity, and to have an improved ability to read, write, and understand mathematics. These performance goals are in agreement with the program goals of the MATA, MATT, and MATC majors.

In Calculus A, students will gain exposure to both the theoretical and applied aspects of calculus. By working on many real-life problems, students will gain an appreciation for the practical applications of calculus. Simultaneously, their mathematical maturity will be built up through the presentation of theory and the expectation of a higher level of reasoning than has previously been demanded in their mathematics courses. They are also exposed to the concepts and techniques of problem solving through individual and group work on the exercises.

Calculus A, together with its continuation MAT 128: Calculus B, serves as a bridge course between the high-school and college mathematical curricula. College level mathematics, science, and engineering courses demand a higher level of quantitative reasoning than that demanded in the high school curriculum. As the majority of the classes are incoming students, an important goal of Calculus A is to raise the level of their mathematical reasoning skills to the collegiate level.

Learning Activities

Learning activities will consist of a combination of lectures, group work, student presentations, and computer assignments. Outside of class, students are expected to do a significant amount of individual and group homework to achieve the learning goals. By giving students a multitude of ways to learn and do mathematics, the learning activities promote a deeper understanding of the concepts of calculus and contribute to the learning goals of these programs.

Diversity Statement

I consider this classroom to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

Safe Zone Statement

I am a member of a Safe Zone Ally community network, and I am available to listen and support you in a safe and confidential manner. As a Safe Zone Ally, I can help you connect with resources on campus to address problems you may face that interfere with your academic and social success on campus as it relates to issues surrounding sexual orientation and gender identity. My goal is to help you be successful and to maintain a safe and equitable campus.

Preferred Name / Pronoun Statement

I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records.

Fourth Hour

In this class, the deep learning outcomes associated with TCNJ's fourth hour are accomplished by a series of rigorous educational assignments that extend beyond the typical scheduled class time. These include activities conducted in the scheduled recitation section.

Student Assessment

Students will receive regular feedback on their work through the assignment of homework, tests and examinations. Through this feedback, students will be able to see and correct their misunderstandings and improve their performance. Student performance on these assessment instruments and the performance of students in their future courses such as Calculus B will be used to assess the success of Calculus A in achieving its learning goals and its contribution to the fulfillment of the MATA, MATT, and MATC program goals. Peer reviews and student evaluations will also be used to evaluate the course.

The course grade will be determined by performance on tests, homework and the final exam:

Tests	45 %	Test 1 : Chapter 1 and 2 - 15% Test 2 : Chapter 3 - 15% Test 3 : Chapter 4 - 15%
Homework	30%	WebAssign Assignments – 15% Weekly Quizzes -15%
Final Exam	25%	

The professor reserves the right to modify this formula, but the weight of the final exam will not change.

Course Grading scale

		A	95 – 100%	A-	90 – 94%
B+	87 – 89%	B	83 – 86%	B-	80 – 82%
C+	77 – 79%	C	73 – 76%	C-	70 – 72%
D+	67 – 69%	D	60 – 66%		
F	< 60%				

Suggested Homework Assignments

In class homework will be assigned daily/ weekly and you will be expected to work on it in groups of two or three. These will not be collected but would serve as self-assessment and used in quizzes/ tests/ exam. The answers of the assigned problems appear in the back of the book or in the solution manual available in the main Mathematics and Statistics Office.

Web Work Assignments

Assignments will be assigned regularly and you will be expected to work on it individually and submit before the deadline. No extensions will be given.

Quizzes

Once a week a quiz will be given that covers the week's work. Quiz problems are usually from assigned homework (or would be similar to homework). If a student is late for the class and misses the quiz, a 0 will be given for that quiz. A student leaving the class after the quiz (and not attending the rest of the lecture) will be given a 0 for the quiz.

Tests

There will be three in-class tests. Tests will mostly consists of questions based on material presented in class, and problems done either in class, on homework, or on quizzes (or similar questions). As a result, it is strongly encouraged that you attend every class and that you take detailed notes. Your notes should be accurate for you own benefit. In particular, all material written on the blackboard or shown on the document camera should be faithfully and legibly recorded in your notes. One particularly effective study suggestion is to develop the habit of rewriting the notes for a class before in the class. If you should need to miss a class, please ensure that you get the notes from another student in the class. There will be no attendance policy for the lectures, but in the past there has been a strong correlation between regular attendance and a good grade in this course.

Final Exam

There will be a cumulative final exam at the end of semester. The date is determined by the College.

Late or Missed Work

THERE WILL BE NO MAKE-UP ASSIGNMENTS OR QUIZZES. Make-up tests will be given in EXTRAORDINARY, EMERGENCY situations only.

Standards for Work Submitted

Your work will be graded on the basis of content (correctness) and other academic and professional standards (academic honesty, timeliness, neatness, organization, presentation style and completeness). For example, paperwork submitted should be stapled, with no rough edges. Also, there should be nothing crossed out and it should be readable. In general, work should be done in pencil or on a computer so that minor errors can be corrected neatly. Credit will be deducted for failure to do any of the above and/or the work will be returned as unacceptable, depending on the extent and/or frequency of the problem.

Academic Dishonesty and Teamwork

Each student is expected to do his or her own work unless teamwork is done. Reference to any outside source must be provided with each assignment. Failure to do so will be considered as plagiarism.
ACADEMIC DISHONESTY WILL NOT BE TOLERATED. Any case of academic dishonesty will be dealt with according to college policy, with recommended punishment generally being a grade of "F" for the course. (See http://www.tcnj.edu/~academics/policy/integrity.html)

Adherence to TCNJ's attendance policy and ADA policy

Students are expected to adhere to TCNJ's attendance policy
http://policies.tcnj.edu/policies/digest.php?docId=9134

Students with disabilities are encouraged to visit TCNJ's Americans with Disabilities policy
http://differingabilities.pages.tcnj.edu

Also see p. 6 for more details on policies for students

Tentative Course Outline					
Week	***Date***	***Topic cover in class***	***Test/Exam***	***Quizzes***	***Homework***
1	August 30	Chapter 1			p.21 #27-33 odd,73-77odd p.33 #1ace, 3abc
	August 31	Chapter 1			p. 69 #1, 3, 5, 7, 10ac, 17ab
2	September 5 *Follow Mo sch*	Ch 2.1 / 2.2		Ch 1	p. 92 #1-39 odd
	September 6	Ch 2.3			p. 102 #1-27 odd
	September 7	Ch 2.5 / 2.6		Ch 2.2 &2.3	p. 124 #3-8,15-55 odd, 25-31 (find domains only)
3	September 11	Ch 2.6 / 2.7			p. 137 #1-9 odd, 15-41 odd, 47-51 odd, 60
	September 13	Ch 2.7 / 2.8			p. 148 #5-15 odd, 31-43 odd
	September 14	Ch 2.8		Ch 2.5 & 2.6	p. 160 #3-11 odd, 13, 14, 21-31 odd, 47-52
4	September 18	Ch 3.1			p. 180 #3-35 odd, 55-59
	September 20	Ch 3.2			p. 188 #1-35 odd, 41, 43, 44
	September 21		TEST 1 – Chapter 1 & 2		
5	September 25	Ch 3.3			p. 196 #1-33 odd, 39-51 odd
	September 27	Ch 3.4			p. 204 #1-57 odd, 69-73 odd
	September 28	Ch 3.5		Ch 3.1 & 3.2 & 3.3	p. 215 #1-31 odd, 49-55 odd
6	October 2	Ch 3.6			p. 223 #3-51 odd
	October 4	Ch 3.9			p. 249 #1-13 odd
	October 5	Ch 3.9		Ch 3.4 & 3.5 & 3.6	
7	October 9	*Fall Break*	*Fall Break*	*Fall Break*	*Fall Break*
	October 11	Ch 4.1			p. 283 #1-67 odd
	October 12		TEST 2 – Chapter 3		

Week	Date	Topic cover	Test/Exam	Quizzes	Homework
8	October 16	Ch 3.10			p. 256 #11-24 odd
	October 18	Ch 4.2			p. 291 #5-15 odd, 19
	October 19	Ch 4.3		Ch 4.1 & 4.2	p. 300 #1-21odd, 22, 23, 25-31 odd, 34, 35-55 odd
9	October 23	Ch 4.4			p. 311 #1-61 odd
	October 25	Ch 4.5			
	October 26	Ch 4.5		Ch 4.3 & 4.4	p. 321 #1,5,9,11, 17,21, 23,25,33,39, 43
10	October 30	Ch 4.7			
	November 1	Ch 4.7			p. 336 #3, 7, 11, 12, 13, 14, 15, 16, 35, 36, 37, 40, 42
	November 2	Ch 4.9		Ch 4.5 & 4.6	p. 355 #1-51 odd
11	November 6	Ch 5.4 / 5.1			p. 408 #1-17 odd
	November 8	Ch 5.1 / 5.2			
	November 9		TEST 3 – Chapter 4		
12	November 13	Ch 5.2			p. 388 #17,19, 21-25
	November 15	Ch 5.3			p. 400 #19-41 odd p. 409 #5-17odd, 21-43 odd, 47, 49
	November 16	Ch 5.5		Ch 5.1 & 5.2	p. 418 #1-47odd, 53-73 odd, 79
13	November 20	Ch 6.1			p. 434 #1-27 odd, 37, 39
	November 22	*Thanks giving Break*			
	November 23				
14	November 27	Ch 6.2			
	November 29	Ch 6.2		Ch 5.3 & 5.4	p. 446 #1-17 odd
	November 30	Ch 6.5			
15	December 4	Ch 6.5			p. 463 #1,3,4,6,9,10,15,19
	December 6	REVIEW			
	December 7	REVIEW			
		Reading days 9 - 12 Dec	FINAL EXAM Start 13 Dec	Grades Due: 22 Dec	

REMEMBER: WEBASSIGN ASSIGNMENTS ARE DUE REGULARLY.
Look on WebAssign to make sure you submit your assignment on time!

SELECTED TCNJ POLICIES

TCNJ's final examination policy is available on the web:
http://policies.tcnj.edu/policies/digest.php?docId=9136

Attendance

Every student is expected to participate in each of his/her courses through regular attendance at lecture and laboratory sessions. It is further expected that every student will be present, on time, and prepared to participate when scheduled class sessions begin. At the first class meeting of a semester, instructors are expected to distribute in writing the attendance policies which apply to their courses. While attendance itself is not used as a criterion for academic evaluations, grading is frequently based on participation in class discussion, laboratory work, performance, studio practice, field experience, or other activities which may take place during class sessions. If these areas for evaluation make class attendance essential, the student may be penalized for failure to perform satisfactorily in the required activities. Students who must miss classes due to participation in a field trip, athletic event, or other official college function should arrange with their instructors for such class absences well in advance. The Office of Academic Affairs will verify, upon request, the dates of and participation in such college functions. In every instance, however, the student has the responsibility to initiate arrangements for make-up work.

Students are expected to attend class and complete assignments as scheduled, to avoid outside conflicts (if possible), and to enroll only in those classes that they can expect to attend on a regular basis. Absences from class are handled between students and instructors. The instructor may require documentation to substantiate the reason for the absence. The instructor should provide make-up opportunities for student absences caused by illness, injury, death in the family, observance of religious holidays, and similarly compelling personal reasons including physical disabilities. For lengthy absences, make-up opportunities might not be feasible and are at the discretion of the instructor. The Office of Academic Affairs will notify the faculty of the dates of religious holidays on which large numbers of students are likely to be absent and are, therefore, unsuitable for the scheduling of examinations. Students have the responsibility of notifying the instructors in advance of expected absences. In cases of absence for a week or more, students are to notify their instructors immediately. If they are unable to do so they may contact the Office of Records and Registration. The Office of Records and Registration will notify the instructor of the student's absence. The notification is not an excuse but simply a service provided by the Office of Records and Registration. Notifications cannot be acted upon if received after an absence. In every instance the student has the responsibility to initiate arrangements for make-up work.

TCNJ's attendance policy *is available on the web: http://policies.tcnj.edu/policies/digest.php?docId=9134*

Academic Integrity Policy

Academic dishonesty is any attempt by the student to gain academic advantage through dishonest means, to submit, as his or her own, work which has not been done by him/her or to give improper aid to another student in the completion of an assignment. Such dishonesty would include, but is not limited to: submitting as his/her own a project, paper, report, test, or speech copied from, partially copied, or paraphrased from the work of another (whether the source is printed, under copyright, or in manuscript form). Credit must be given for words quoted or paraphrased. The rules apply to any academic dishonesty, whether the work is graded or ungraded, group or individual, written or oral. TCNJ's academic integrity policy *is available on the web: http://policies.tcnj.edu/policies/digest.php?docId=9394*

Americans with Disabilities Act (ADA) Policy

Any student who has a documented disability and is in need of academic accommodations should notify the professor of this course and contact the Office of Differing Abilities Services (609-771-2571). Accommodations are
individualized and in accordance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1992. TCNJ's Americans with Disabilities Act (ADA) policy is available on the web:
http://policies.tcnj.edu/policies/digest.php?docId=8082

TCNJ's Disability Support Services policy is available on the web**:** *http://differingabilities.pages.tcnj.edu*