**1. COURSE TITLE\*:** Calculus I

2. **CATALOG – PREFIX/COURSE NUMBER/COURSE SECTION\*: MATH 2221**

**3. PREREQUISITE\*:**

One of the following:

* Math 1141 with a grade of B or higher and Math 1142
* Four High school STEM or Core Math courses with grades A, A, B, B or higher. This must include a course covering trigonometry
* ACT Math score of 26 or above.

**COREQUISITE(S)\*: None**

**4. COURSE TIME/LOCATION/MODALITY: (*Course Syllabus – Individual Instructor Specific*)**

**5. CREDIT HOURS\*:** 5 **LECTURE HOURS\*:** 5

**LABORATORY HOURS\*:** 0 **OBSERVATION HOURS\*:** 0

**6. FACULTY CONTACT INFORMATION: *(Course Syllabus – Individual Instructor Specific)***

**7. COURSE DESCRIPTION:**

This course introduces calculus using analytic geometry and transcendental functions. Topics include limits and continuity, derivatives, optimization, related rates, graphing and other applications of derivatives, definite and indefinite integrals, and numerical integration.

**8. LEARNING OUTCOMES\*:**

At the completion of this course the student will be able to:

1. Determine the existence of, estimate numerically and graphically and find algebraically the limits of functions. Recognize and determine infinite limits and limits at infinity and interpret them with respect to asymptotic behavior. (TMM005 – Outcome 1)
2. Determine the continuity of functions at a point or on intervals and distinguish between the types of discontinuities at a point. (TMM005 – Outcome 2)
3. Determine the derivative of a function using the limit definition and derivative theorems. Interpret the derivative as the slope of a tangent line to a graph, the slope of a graph at a point, and the rate of change of a dependent variable with respect to an independent variable. (TMM005 – Outcome 3)
4. Determine the derivative and higher order derivatives of a function explicitly and implicitly and solve related rates problems. (TMM005 – Outcome 4)
5. Determine absolute extrema on a closed interval for continuous functions and use the first and second derivatives to analyze and sketch the graph of a function, including determining intervals on which the graph is increasing, decreasing, constant, concave up or concave down and finding any relative extrema or inflection points. Appropriately use these techniques to solve optimization problems. (TMM005 – Outcome 5)
6. Determine when the Mean Value Theorem can be applied and use it in proofs of other theorems such the Fundamental Theorem of Calculus. (TMM005 – Outcome 6)
7. Use differentials and linear approximations to analyze applied problems. (TMM005 – Outcome 7)
8. Determine antiderivatives, indefinite and definite integrals, use definite integrals to find areas of planar regions, use the Fundamental Theorems of Calculus, and integrate by substitution. (TMM005 – Outcome 8)

**9.       ADOPTED TEXT(S)\*:**

*Calculus*. Third Edition.

Briggs, Cochran, Gillett, Schulz

Pearson, 2019

ISBN # 978-0-13-476563-1

**9a: SUPPLEMENTAL TEXTS APPROVED BY FULL TIME DEPARTMENTAL FACULTY (INSTRUCTOR MUST NOTIFY THE BOOKSTORE BEFORE THE TEXTBOOK ORDERING DEADLINE DATE PRIOR TO ADOPTION) \*\*\*.**

**10. OTHER REQUIRED MATERIALS: (SEE APPENDIX C FOR TECHNOLOGY REQUEST FORM.)\*\***

A scientific calculator is required; a graphing calculator is strongly recommended. Symbolic manipulator calculators (e.g., TI–89 or TI-Nspire) are prohibited on tests.

**11. GRADING SCALE\*\*\*:**

Grading will follow the policy in the catalog. The scale is as follows:

A: 90 – 100

B: 80 – 89

C: 70 – 79

D: 60 – 69

F: 0 – 59

**12. GRADING PROCEDURES OR ASSESSMENTS: (*Course Syllabus – Individual Instructor Specific)***

|  |
| --- |
| *Example 1 - By Percent* |
| Homework 10%  Quizzes/Tests 90%  Total 100% |

|  |  |  |
| --- | --- | --- |
| *Example 2* | | |
| *Category* | *By Total Points* | *% of Grade* |
| Homework (20x10) | 200 | 10% |
| Quizzes/Tests  (5x360) | 1800 | 90% |
| Total | 2000 | 100% |

|  |  |  |
| --- | --- | --- |
| *Example 3* | | |
| *Category* | *By Total Points* | *% of Grade* |
| Online Quizzes | 400 | 100% |
| Online Tests  (6x100) | 600 | 15% |
| Notebook  (2x500) | 1000 | 25% |
| Midterm | 1000 | 25% |
| Final | 1000 | 25% |
| Total | 4000 | 100% |

**13. COURSE METHODOLOGY: *(Course Syllabus – Individual Instructor Specific)***

The course design provides instruction and materials to support the course objectives.  Classes may consist of a variety of means to accomplish this including but not limiting to: lectures, class discussions, small group projects, supplemental materials, and outside assignments.  Practice is an important part of the learning process.  For every one hour of class time, two additional hours of study time should be expected.

**14. COURSE OUTLINE: *(Course Syllabus – Individual Instructor Specific)***

OTM Summary: This outline covers all TMM 005 Learning Objectives.

**Chapter 1: Functions**

1.1 Review of Functions (optional review)

1.2 Representing Functions (optional review)

1.3 Trigonometric Functions (optional review)

**Chapter 2: Limits (TMM 005 – Outcomes 1 and 2)**

2.1 The Idea of Limits

2.2 Definitions of Limits

2.3 Techniques for Computing Limits

2.4 Infinite Limits

2.5 Limits at Infinity

2.6 Continuity

2.7 Precise Definitions of Limits

**Chapter 3: Derivatives (TMM 005 – Outcomes 3 and 4)**

3.1 Introducing the Derivative

3.2 The Derivative as a Function

3.3 Rules of Differentiation

3.4 The Product and Quotient Rules

3.5 Derivatives of Trigonometric Functions

3.6 Derivatives as Rates of Change

3.7 The Chain Rule

3.8 Implicit Differentiation

3.9 Related Rates

**Chapter 4 Applications of the Derivative (TMM 005 – Outcomes 5, 6 and 7)**

4.1 Maxima and Minima

4.2 Mean Value Theorem

4.3 What Derivatives Tell Us

4.4 Graphing Functions

4.5 Optimization Problems

4.6 Linear Approximation and Differentials

4.7 L’Hôpital’s Rule

4.8 Newton’s Method

4.9 Antiderivatives

**Chapter 5 Integration (TMM 005 – Outcomes 8)**

5.1 Approximating Areas under Curves

5.2 Definite Integrals

5.3 Fundamental Theorem of Calculus

5.4 Working with Integrals

5.5 Substitution Rule

**Chapter 7 Logarithmic and Exponential Functions (TMM005 – Outcomes 3, 8)**

7.1 Inverse Functions

7.2 The Natural Logarithmic and Exponential Functions

7.3 Logarithmic and Exponential Functions with Other Bases

7.4 Exponential Models

7.5 Inverse Trigonometric Functions

7.6 L’Hôpital’s Rule and Growth Rates of Functions

7.7 Hyperbolic Functions

**15. SPECIFIC MANAGEMENT REQUIREMENTS\*\*\*:**

Suggested pace for the course, by section numbers:

Week 1: 2.1, 2.2, 2.3

Week 2: 2.4, 2.5

Week 3: 2.6, 2.7

Week 4: 3.1, 3.2, 3.3

Week 5: 3.4, 3.5, 3.6

Week 6: 3.7, 3.8, 3.9

Week 7: 4.1, 4.2, 4.3

Week 8: 4.4, 4.5

Week 9: 4.5, 4.6, 4.7, 4.8

Week 10: 4.9, 5.1, 5.2

Week 11: 5.3, 5.4

Week 12: 5.5, 7.1

Week 13: 7.2, 7.3

Week 14: 7.4, 7.5

Week 15: 7.6, 7.7

Week 16: **Finals**

**16. FERPA:\***

Students need to understand that your work may be seen by others. Others may see your work when being distributed, during group project work, or if it is chosen for demonstration purposes. Students also need to know that there is a strong possibility that your work may be submitted to other entities for the purpose of plagiarism checks.

**17. DISABILITIES:\***

Students with disabilities may contact the Disability Services Office, Central Campus, at 800-628-7722 or 937-393-3431.

**18. OTHER INFORMATION\*\*\*:**

**SYLLABUS TEMPLATE KEY**

**\*** Item cannot be altered from that which is included in the master syllabus approved by the Curriculum Committee.

**\*\*** Any alteration or addition must be approved by the Curriculum Committee

\*\*\*Item should begin with language as approved in the master syllabus but may be added to at the discretion of the faculty member.