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

**2. CATALOG – PREFIX/COURSE NUMBER/COURSE SECTION\*:** MATH 2222

**3. PREREQUISITE\*:**

MATH 2221 or equivalent

**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 is a continuation of Math 2221 Calculus I and includes applications of integration such as areas between curves, volumes of rotation, work, arc length, applications to physics and engineering; techniques of integration; parametric equations and polar coordinates; and infinite sequences and series.

**8. LEARNING OUTCOMES\*:**

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

1. model geometric measurements such as area, volume of solids of revolution, arc length, area of surfaces of revolution, and centroids with integration tools, including setting up an approximating Riemann sum and representing its limit as a definite integral.
2. model measurements within situations related to STEM fields.
3. approximate accumulation measurements.
4. use antiderivatives to evaluate definite integrals and employ a variety of integration techniques, including substitution, integration by parts, trigonometric substitution, and partial fraction decomposition.
5. identify indeterminate forms within limits. The student reasons on his/her own that an indeterminate form is present. The student chooses an appropriate action. The student executes his/her plan and explains the whole process.
6. identify and evaluate improper integrals, including integrals over infinite intervals and integrals in which the integrand becomes infinite in the interval of integration. The student deduces on his/her own that a given integral is improper. The student rephrases the integral precisely using limits and develops and executes a plan for calculation. The student presents the whole process.
7. critically analyze and discuss numerically, graphically, algebraically, verbally, and in other relevant ways a sequence or series of numbers. The student understands the difference between convergence and the limiting value and can determine convergence by using appropriate tests.
8. critically analyze and discuss numerically, graphically, algebraically, verbally, and in other relevant ways a sequence or series of functions, including Taylor and power series and associated error terms. The student understands the difference between convergence and the limiting function and can determine convergence by using appropriate tests. The student can apply the reasoning and techniques of Calculus with series representations.
9. think parametrically. The student interacts with graphs with different perspectives depending on the situation.
10. measure area of bounded planar regions. Given a planar region whose boundary curves are described by equations, the student describes the situation in terms of functions and accompanying integration setup.
11. solve basic first-order differential equations, including separable equations, and use direction fields to visualize and approximate solutions.

**9.       ADOPTED TEXT(S)\*:**

*Calculus*. Third Edition.

Briggs, Cochran, Gillett, Schulz

Pearson, 2019

ISBN # 978-0-13-476563-1

OR

*Calculus*. Volume 2.

Strang, Herman

OpenStax, 2016

Download for free at <https://openstax.org/details/books/calculus-volume-2>

**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)***

|  |  |  |
| --- | --- | --- |
| *Category* | ***EXAMPLE ONLY***  *Total Points* | *% of Grade* |
| Participation | 100 | 10% |
| Online Homework | 100 | 10% |
| Quizzes | 200 | 20% |
| Exams | 600 | 60% |
| Total | 1000 | 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)***

*Pearson*

**Chapter 6 Applications of Integration**

6.1 Velocity and Net Change – LO4

6.2 Regions Between Curves – LO10

6.3 Volume by Slicing – LO1

6.4 Volume by Shells – LO1

6.5 Length of Curves – LO1

6.6 Surface Area – LO1

6.7 Physical Applications – LO2

**Chapter 8 Integration Techniques**

8.1 Basic Approaches – LO4

8.2 Integration by Parts – LO4

8.3 Trigonometric Integrals – LO4

8.4 Trigonometric Substitutions – LO4

8.5 Partial Fractions – LO4

8.6 Integration Strategies (optional)

8.8 Numerical Integration – LO3

8.9 Improper Integrals – LO6

**Chapter 9 Differential Equations**

9.1 Basic Ideas – LO11

9.2 Direction Fields and Euler’s Method\* – LO11

9.3 Separable Differential Equations – LO11

\*Note to instructors: Students should know how to draw direction fields and use them to approximate the solution to a differential equation. Do not cover Euler’s method.

**Chapter 10 Sequences and Infinite Series**

10.1 An Overview – LO5

10.2 Sequences – LO5

10.3 Infinite Series – LO7

10.4 The Divergence and Integral Tests – LO7

10.5 Comparison Tests – LO7

10.6 Alternating Series – LO7

10.7 The Ratio and Root Tests – LO7

10.8 Choosing a Convergence Test – LO7

**Chapter 11 Power Series**

11.1 Approximating Functions with Polynomials – LO8

11.2 Properties of Power Series – LO8

11.3 Taylor Series – LO8

11.4 Working with Taylor Series – LO8

**Chapter 12: Parametric and Polar Curves**

12.1 Parametric Equations – LO9

12.2 Polar Coordinates – LO9

12.3 Calculus in Polar Coordinates – LO9

*OpenStax*

**Chapter 1: Integration**

1.4 Integration Formulas and the Net Change Theorem\* – LO4

\*Note to instructors: This section is already covered in Math 2221. Use it to review basic integration techniques and emphasize the fundamental idea that integration represents the accumulation of change.

**Chapter 2: Applications of Integration**

2.1 Regions between Curves – LO10

2.2 Determining Volumes by Slicing – LO1

2.3 Volumes of Revolution: Cylindrical Shells – LO1

2.4 Arc Length of a Curve and Surface Area – LO1

2.5 Physical Applications – LO2

**Chapter 3: Techniques of Integration**

3.1 Integration by Parts – LO4

3.2 Trigonometric Integrals – LO4

3.3 Trigonometric Substitution – LO4

3.4 Partial Fractions – LO4

3.6 Numerical Integration – LO3

3.7 Improper Integrals – LO6

**Chapter 4: Introduction to Differential Equations**

4.1 Basics of Differential Equations – LO11

4.2 Direction Fields and Numerical Methods\* – LO11

4.3 Separable Equations – LO11

\*Note to instructors: Students should know how to draw direction fields and use them to approximate the solution to a differential equation. Do not cover Euler’s method.

**Chapter 5: Sequences and Series**

5.1 Sequences – LO5

5.2 Infinite Series – LO7

5.3 The Divergence and Integral Tests – LO7

5.4 Comparison Tests – LO7

5.5 Alternating Series – LO7

5.6 Ratio and Root Tests – LO7

**Chapter 6: Power Series**

6.1 Power Series and Functions – LO8

6.2 Properties of Power Series – LO8

6.3 Taylor and Maclaurin Series – LO8

6.4 Working with Taylor Series – LO8

**Chapter 7: Parametric Equations and Polar Coordinates**

7.1 Parametric Equations – LO9

7.2 Calculus of Parametric Curves – LO9

7.3 Polar Coordinates – LO9

7.4 Area and Arc Length in Polar Coordinates – LO9

Recommended calendar (*Pearson*):

Week 1: 6.1, 6.2, 6.3

Week 2: 6.3, 6.4, 6.5

Week 3: 6.5, 6.6, 6.7

Week 4: 6.7, 8.1, 8.2

Week 5: 8.3, 8.4

Week 6: 8.3, 8.4

Week 7: 8.5, 8.6

Week 8: 8.7, 8.8, 8.9

Week 9: 10.1, 10.2, 10.3

Week 10: 10.4, 10.5, 10.6

Week 11: 10.7, 10.8

Week 12: 11.1, 11.2

Week 13: 11.3, 11.4

Week 14: 12.1, 12.2

Week 15: 12.3

Week 16: **Finals**

Recommended calendar (*OpenStax*):

|  |  |  |
| --- | --- | --- |
| **Week** | **Sections** | **Learning**  **Outcomes** |
| Week 1: | 1.4, 2.1 | 4, 10 |
| Week 2: | 2.2, 2.3, 2.4 | 1 |
| Week 3: | 2.5, 3.1 | 2, 4 |
| Week 4: | 3.2 | 4 |
| Week 5: | 3.3, 3.4 | 4 |
| Week 6: | 3.6, 3.7, 4.1 | 3, 6, 11 |
| Week 7: | 4.2, 4.3 | 11 |
| Week 8: | 5.1 | 5 |
| Week 9: | 5.2, 5.3 | 7 |
| Week 10: | 5.4, 5.5 | 7 |
| Week 11: | 5.6, 6.1 | 7, 8 |
| Week 12: | 6.2 | 8 |
| Week 13: | 6.3, 6.4 | 8 |
| Week 14: | 7.1, 7.2 | 9 |
| Week 15: | 7.3, 7.4 | 9 |

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

**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. Accommodations:\***

Students requesting accommodations may contact Ryan Hall, Accessibility Coordinator at [rhall21@sscc.edu](mailto:rhall21@sscc.edu) or 937-393-3431 X 2604.

Students seeking a religious accommodation for absences permitted under Ohio’s Testing Your Faith Act must provide the instructor and the Academic Affairs office with written notice of the specific dates for which the student requires accommodation and must do so no later than fourteen (14) days after the first day of instruction or fourteen (14) days before the dates of absence, whichever comes first. For more information about Religious Accommodations, contact Ryan Hall, Accessibility Coordinator at [rhall21@sscc.edu](mailto:rhall21@sscc.edu) or 937-393-3431 X 2604.

**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.