# El Camino College

**COURSE OUTLINE OF RECORD - Official**

## I. GENERAL COURSE INFORMATION

**Subject and Number:** Mathematics 191
**Descriptive Title:** Single Variable Calculus and Analytic Geometry II

**Course Disciplines:** Mathematics

**Division:** Mathematical Sciences

**Catalog Description:** This course includes a study of methods and applications of integration, improper integrals, numerical integration, infinite sequences, infinite series and power series, parametric equations and polar equations.

**Conditions of Enrollment:**

**Prerequisite**

Mathematics 190 with a minimum grade of C

**Course Length:** [X] Full Term [ ] Other (Specify number of weeks):
**Hours Lecture:** 5.00 hours per week [ ] TBA
**Hours Laboratory:** 0 hours per week [ ] TBA
**Course Units:** 5.00

**Grading Method:** Letter
**Credit Status** Associate Degree Credit

**Transfer CSU:** [X] Effective Date: Prior to July 1992
**Transfer UC:** [X] Effective Date: Prior to July 1992

**General Education:**

**El Camino College:**

**4B – Language and Rationality – Communication and Analytical Thinking**
Term: Other:

**6 – Mathematics Competency**
Term: Other:

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**CSU GE:**

**B4 - Mathematics/Quantitative Thinking**
Term: Fall 2001 Other:

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**IGETC:**

**2A - Mathematical Concepts and Quantitative Reasoning**
Term: Fall 2001 Other:

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## II. OUTCOMES AND OBJECTIVES

### A. COURSE STUDENT LEARNING OUTCOMES (The course student learning outcomes are listed below, along with a representative assessment method for each. Student learning outcomes are not subject to review, revision or approval by the College Curriculum Committee)

1. UNDERSTANDING CONCEPTS: Students will explain and demonstrate advanced integration techniques and convergence of sequences and series.
2. SOLVING PROBLEMS: Students will use integrals to evaluate volumes, surface area and arc length.
3. GRAPHS: Students will use limits, derivatives and integration to analyze graphs of parametric equations, polar equations and conic sections.
4. PROOFS: Students will analyze and construct proofs to determine convergence and divergence of sequences and series.

The above SLOs were the most recent available SLOs at the time of course review. For the most current SLO statements, visit the El Camino College SLO webpage at http://www.elcamino.edu/academics/slo/.

### B. Course Student Learning Objectives (The major learning objective for students enrolled in this course are listed below, along with a representative assessment method for each)

1. Use integration to solve application problems involving: areas between curves; volumes of solids of known cross section; volumes of solids of revolution; work; arc length and areas of surfaces of revolution.

   Objective Exams
2. Evaluate integrals using integration/antidifferentiation techniques including: integration by parts; trigonometric substitutions; partial fraction decomposition and tables of integrals.

   Quizzes
3. Use numerical techniques (both with and without technology) to approximate the values of integrals.

   Laboratory reports
4. Determine the convergence or divergence of sequences, series and power series.

   Objective Exams
5. Solve problems using Taylor series, including differentiation and integration of power series.

   Objective Exams
6. Solve problems involving parametric equations, polar coordinates and conic sections. Examples include the graphing of parametric and polar curves and the calculation of the arc length of curves so defined. Additional problems involve the calculation of the area bounded by such curves.

   Other exams

## III. OUTLINE OF SUBJECT MATTER (Topics are detailed enough to enable a qualified instructor to determine the major areas that should be covered as well as ensure consistency from instructor to instructor and semester to semester.)

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|---|---|---|---|

| Lecture or Lab | Approximate Hours | Topic Number | Major Topic |
|---|---|---|---|
| Lecture | 16 | I | APPLICATIONS OF INTEGRATION<br>A. Areas between curves<br>B. Volumes of solids of known cross section<br>C. Volumes of solids of revolution<br>D. Work<br>E. Average value of a function<br>F. Arc length<br>G. Surface area of a surface of revolution |
| Lecture | 16 | II | TECHNIQUES OF INTEGRATION<br>A. Integration by parts<br>B. Trigonometric integrals<br>C. Trigonometric substitution<br>D. Partial Fractions<br>E. Numerical integration techniques, such as midpoint rule, trapezoid rule and Simpson's rule<br>F. Improper Integrals |
| Lecture | 42 | III | INFINITE SEQUENCES AND SERIES<br>A. Convergence/Divergence of infinite series<br>B. Relationship between an infinite series, the sequence of its terms, and the sequence of its partial sums.<br>C. Sum of a convergent geometric series and a convergent telescoping series.<br>D. Absolute and conditional convergence tests including the direct comparison, limit comparison, root, ratio, integral, p-series, nth-term and alternating series tests.<br>E. Radius and interval of convergence of a power series.<br>F. Power series and representations of functions as power series, including Maclaurin and Taylor series<br>G. Binomial series<br>H. Applications of power series |
| Lecture | 16 | IV | PARAMETRIC EQUATIONS AND POLAR COORDINATES<br>A. Curves defined by parametric equations, their graphs and tangent lines<br>B. Areas, arc lengths and surface areas involving parametric equations<br>C. Polar coordinates, polar equations, their graphs and tangent lines<br>D. Areas and arc lengths in polar coordinates<br>E. Conic sections using parametric equations and polar coordinates |
| **Total Lecture Hours** | | 90 | |
| **Total Laboratory Hours** | | 0 | |
| **Total Hours** | | 90 | |

## IV. PRIMARY METHOD OF EVALUATION AND SAMPLE ASSIGNMENTS

### A. PRIMARY METHOD OF EVALUATION:

Problem solving demonstrations (computational or non-computational)

### B. TYPICAL ASSIGNMENT USING PRIMARY METHOD OF EVALUATION:

Find the volume of the solid generated by rotating the region bounded by $y=4x-x^2$ and $y=0$ about the line $x=-2$. Use disks, washers, or cylindrical shells, whichever is most appropriate.

### C. COLLEGE-LEVEL CRITICAL THINKING ASSIGNMENTS:

1. Determine the radius and interval of convergence for the following power series:

   $\sum[(x-2)^n/(4^n)]$

2. Calculate the slope of the tangent line to the given polar curve at the point specified:

   $r = \cos(\Theta) + \sin(\Theta)$, $\Theta = \Pi/4$

### D. OTHER TYPICAL ASSESSMENT AND EVALUATION METHODS:

Objective Exams
Other exams
Quizzes
Written homework
Homework Problems
Other (specify):
Computer assisted problem assignments.

## V. INSTRUCTIONAL METHODS

Demonstration
Discussion
Lecture
Other (please specify)
Computer software demonstrations.

**Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instruction delivery shall provide access, full inclusion, and effective communication for students with disabilities.**

## VI. WORK OUTSIDE OF CLASS

Study
Answer questions
Skill practice
Required reading
Problem solving activities
Written work
Observation of or participation in an activity related to course content
Other (specify)
Problem solving using computer software.

**Estimated Independent Study Hours per Week:** 10

## VII. TEXTS AND MATERIALS

A. **UP-TO-DATE REPRESENTATIVE TEXTBOOKS**
James Stewart. CALCULUS, EARLY TRANSCENDENTALS. 8th ed. Brooks/Cole Publishing, 2015.

B. **ALTERNATIVE TEXTBOOKS**

C. **REQUIRED SUPPLEMENTARY READINGS**

D. **OTHER REQUIRED MATERIALS**

## VIII. CONDITIONS OF ENROLLMENT

### A. Requisites (Course and Non-Course Prerequisites and Corequisites)

| Requisites | Category and Justification |
|---|---|
| Course Prerequisite<br>Mathematics-190 | Sequential |

### B. Requisite Skills

| Requisite Skills |
|---|
| 1. Differentiate algebraic, trigonometric, exponential and logarithmic functions using all available rules of differentiation. MATH 190 -<br>Calculate derivatives of algebraic and transcendental functions symbolically using rules and using the definition of the derivative, as well as estimating derivatives graphically and numerically. |
| 2. Determine tangent lines to the graphs of algebraic, trigonometric, exponential and logarithmic functions and specified points. MATH 190 -<br>Calculate derivatives of algebraic and transcendental functions symbolically using rules and using the definition of the derivative, as well as estimating derivatives graphically and numerically. |
| 3. Solve application problems using differential calculus. MATH 190 - |

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|---|
| Relate features of a function (increasing/decreasing, extrema, concavity, infection points) to its derivatives.<br>MATH 190 -<br>Solve application problems using differential calculus. |
| 4. Antidifferentiate polynomials and other functions using substitution. MATH 190 -<br>Anti-differentiate functions, using the method of substitution when appropriate. |

### C. Recommended Preparations (Course and Non-Course)

| Recommended Preparation | Category and Justification |
|---|---|

### D. Recommended Skills

| Recommended Skills |
|---|

### E. Enrollment Limitations

| Enrollment Limitations and Category | Enrollment Limitations Impact |
|---|---|

**Course created by V. Skinner on 03/14/2013.**

**BOARD APPROVAL DATE:**

**LAST BOARD APPROVAL DATE: 12/18/2017**

**Last Reviewed and/or Revised by Gregory Fry on 03/14/2013**

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