# SCHOOL OF STEM SYLLABUS

**TERM:**

**INSTRUCTOR:**

**COURSE CODE:** MAT-211

**OFFICE HOURS:**

**COURSE TITLE:** Calculus III

**OFFICE LOCATION:**

**DAY(S) AND TIME(S):**

**EMAIL:**

**LOCATION:**

**PHONE:**

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**COURSE PREREQUISITE:** Complete MAT-111

**CREDITS:** 4

**COURSE DESCRIPTION:**
This course considers the limits, continuity, theory, and techniques of differentiation and integration, with applications of both processes to science/engineering. The use of mathematical software in problem-solving is emphasized.

**STUDENT LEARNING OUTCOMES:**
Upon successful completion of this course, students will be able to:

1. Graph parametric equations
2. Use Time as a parameter in parametric equations
3. Convert rectangular equations to parametric equations
4. Find the Equation of the tangent line at a point on a plane curve and the arc length of a plane curve or a curve represented by polar equations
5. Convert between rectangular and polar coordinates
6. Identify and graph polar equations
7. Use properties of vectors
8. Find the scalar and vector product of vectors
9. Find the angle between two vectors and the projection of vectors
10. Find the vector equation and parametric equations of a line in Space
11. Determine whether two lines are skew, parallel or intersecting.
12. Find an equation of a plane
13. Determine whether two planes are intersecting or parallel.
14. Find the distance between two points
15. Analyze a vector function: domain, graph, limits, continuity, derivatives
16. Find the unit tangent vector, the principal unit normal vector of a smooth curve
17. Find the arc length of a curve traced out by a vector function
18. Find the curvature of a plane curve given by

19. Find an osculating circle
20. Find the velocity, acceleration, and speed of a moving particle
21. Express the acceleration vector using tangential and normal components
22. Work with functions of several variables: level curves, level surfaces, limits and continuity, partial derivatives, second-order derivatives
23. Interpret partial derivatives as a rate of change
24. Find the change in
25. Find the differential of a function of three or more variables
26. Find the directional derivatives and Gradient of a function of three
27. variables
28. Find a tangent plane to a surface
29. Find a normal line to the tangent plane
30. Find Critical Points, the absolute extrema of two variables and apply to solving optimization problems
31. Find Riemann sums of over-closed defined on a closed rectangular region
32. Find the volume under a surface and over a rectangular region.
33. Use Fubini's theorem for x- and y- simple regions
34. Apply properties of double integrals and Find areas and volumes.
35. Find double integrals using polar coordinates
36. Find Area and volume using polar coordinates
37. Find surface areas above a region R.
38. Find Triple integrals over closed region and more general solid
39. Find the volume of a solid
40. Find triple integrals over xy-simple and yz-simple solids.
41. Find triple integrals using cylindrical and spherical coordinates.
42. Describe a vector field
43. Define a line integral in the p[lane and determine its value along a smooth curve
44. Find integrals of the form
45. Find line integrals along a piece-smooth curve and in space
46. Familiar with a conservative vectors and its potential function
47. Use the fundamental theorem of Line integrals
48. Reconstruct a function from its gradient: Finding the potential function for a conservative field
49. Use Green's theorem to find a line integral
50. Use Green's theorem to find area
51. Use Green's theorem with multiply-connected Regions.
52. Describe surfaces parametrically
53. Find parametric representation of a surface
54. Find equations for a tangent plane and a normal line
55. Find the surface area of a parametrized surface
56. Find the surface integrals using double integral
57. Determine the orientation of a surface
58. Find the flux of a vector field across a surface application: Electric Flux
59. Find the divergence of a vector field
60. Use the divergence theorem
61. Interpret the divergence of
62. Find the Curl of

63. Verify Stokes' theorem
64. Use Stokes' theorem to find an integral
65. Use Stokes' theorem with conservative vector fields
66. Interpret the Curl of

**TEXTBOOK AND SUPPLEMENTAL MATERIALS:**

**Textbook:** Calculus, Early Transcendental functions, 8th edition,
**Author**: Larson, Bruce Edwards

Supplemental Materials:

- The online homework is obligatory and due by the next class meeting.
- Students are required to purchase the access code. Codes are available at the bookstore.

**GRADING POLICY:**

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| 3 In Class Exams | 70% |
| Final Exam | 30% |

**SAMPLE COURSE SCHEDULE:**

| Week | Section number | Section name | Homework |
|---|---|---|---|
| 1 | 10.2 | Plane Curve and Parametetirc equations | 1, 3, 5, 13,15,17,31,57,59, 61, 63 ,79, |
| 1 | 10.4 | Parametric equations and Calculus | 1, 3, 5, 7,9, 11,13,14,45,47,49, |
| 1 | 10.4 | Polar Coordinates and Polar Graphs | 1, 3, 7,3,33, 37,39,43, 49,51,23,27,31,77.79, 83, 85,87,104,105,107,109 |
| 2 | 10.5 | Area and Arc Length in Polar coordinates | 1, 3,5, 9,11,13,15, 17,19, 21,29,33,35,37,39,41,45,47, |
| 2 | 11.1 | Vectors in the Plane | 5, 7,9,11, 13,49,51,53,61, 63,67, 71,87, 89,91, 93,95, |
| 2 | 11.2 | Space coordinates and Vectors in space | 1,3,5,7,9,11,15,19,21,27,29,41,43,49,51,53,55,57,59,61,63, 65,67,71,75,65,67,91,92,99,1100,03,104 |
| 3 | 11.3 | The Dot product | 1,3,5,9,12,13,17,19,23,25,27,35, 37,59,61,63, |
| | | Exam 1 | |

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|---|---|---|---|
| 3 | 11.4 | The cross-product of two vectors in Space | 1,2,3,5,7,9,11,13,15,21,23,25,27,29,31,37,39,33,35,37, 39,41,43,45,47,47,1,53,55,59,79,85,89,91,93,102,107,108,1 09,110,111,112,113,114, |
| 3 | 11.5 | Lines and Planes in Space | 1-6,7,11,13,21,35,37,39,41,43,47,51,53, |
| 4 | 11.6 | Surface in space in space | 1,3,5,7,11,13,15,17,19,21,23,25,27,31,33,63,65,67,71,73,75 ,91,93,95,97,101,103,105,107,109, |
| 4 | 11.7 | Cylindrical and spherical coordinates | 1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,49,41,53,57-62,35,37,39,63,65,67,71,73,75,77,83,85,87,91,93,99-104 |
| 4 | 12.1 | Vector-Valued functions | 1,3,5,7,9,11,13,15,19—22,23,27,31, |
| 5 | 12.3 | Velocity and acceleration | 1,3,5,7.9,11,13,15,17,19,31,33,37,25,27,43,47,49,51,53,55, |
| 5 | 12.4 | Tangent vectors and normal vectors' curvature | 1,3,5,7,9,11,13,15,29,31,37,39,41,51,53,55,49,69,71, |
| 5 | 12.5 | Arc length and Curvature | 3,5,9,11,13,29,31,33,37,39,49,51,55,67,73,79,91,93,83,91,9 3, |
| 6 | 13.1 | Introduction to functions of several variables | 1,2,3,5,7,9,11,13,15,17,23,25,27,29,31,45— 48,47,49,51,53,78. |
| 6 | 13.2 | Limits and continuity | 23,25,27,29,321,33,35,37,38,39,40,41,42,69—72,73,74 |
| | | Exam 2 | |
| 7 | 13.3 | Partial Derivatives | 7—38,51,53,55,59,51,63,65,67,69,83,87,89,112,113 |
| 7 | 13.4 | Differentials’ | |
| 7 | 13.5 | Chaine Rules for Functions of several variables | 1,3,5,7,13,15,36,32,33,35,38,39,43,1,3,5,7,9,11,13,15,41,49 ,51,53,55 |
| 8 | 13.6 | Directional derivatives and gradient | 1,3,5,7,9,11,13,15,17,27,29,31,37,39,40,43,46,69--73, |
| 8 | 13.7 | Tangent Planes and normal lines n | 1,3,5,7,9,11,13,15,17,19,31,33,35,37,39,41,43,45,49,51, |
| 8 | 13.8 | Extrema of Functions of two variables | 1,3,5,7,9,11,13,15,17,19,17,41,43,45,47, |

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| 9 | 14.1 | Iterated integrals and Area in The Plane | : 1,2,3,4,5,6,7,8….63, |
| 9 | 14.2 | Double integrals | 1 ,2,3,4,5,6,7…55 |
| 9 | 14.3 | Change of Variables: Polar Coordinates | 1,2,3,4,5,6,7…..43, |
| 11 | 14.5 | Surface Area | 1,2,3,4,5,6,7….13 |
| 10 | 14.6 | Triple integrals and Applications | 1,3,5,7,11,12,13,14,15,1525,27,6,17,18,19,21,22,23,24,25,27,29,31,33,39,41, |
| 10 | 14.7 | Triple integrals in Other Coordinates | 1,3,5,9,13,15,17, |
| | | Exam 3 | |
| 11 | 15.1 | Vector Field | 1—4,15,17,23,33,37,41,43,45,47,49,51,53,57—60,63, |
| 11 | 15.2 | Line integrals | 1—5,15,17,7.9,11,13,19,23,25,27,29,41,42,55,57,59 |
| 12 | 15.3 | Conservative vector fields | 1,3,5,9,7,9,15,17,19,21,23,25,27,29,35,43, |
| 12 | 15.4 | Greens theorem | 1,3,5,7,9,13,15,17,19,21,23,33,35,41,45,47, |
| 13 | 15.5 | Parametric Surfaces | 1,3,5,13,17,21,23,25,27,39,31,43,37,51,17,19,29,31, |
| 13 | 15.6 | Surface integrals | 1,3,5,7,9,11,17 |
| 14 | 15.7 | Divergence theorem | 5,7,9,11,13,15 |
| 14 | 15.8 | Stokes's theorem | 5,7,9,11,13,15,17 |
| 15 | | Final exam | |

**HCCC POLICIES, STATEMENTS, AND SERVICES:**
https://www.hccc.edu/administration/academic-affairs/syllabus-addendum.html