Washtenaw Community College Comprehensive Report

MTH 293 Calculus III
Effective Term: Fall 2022

Course Cover
College: Math, Science and Engineering Tech
Division: Math, Science and Engineering Tech
Department: Math & Engineering Studies
Discipline: Mathematics
Course Number: 293
Org Number: 12200
Full Course Title: Calculus III
Transcript Title: Calculus III
Is Consultation with other department(s) required: No
Publish in the Following: College Catalog , Time Schedule , Web Page
Reason for Submission: Three Year Review / Assessment Report
Change Information:
    Consultation with all departments affected by this course is required.
    Course description
    Outcomes/Assessment
    Objectives/Evaluation
Rationale: Update course topics required in course credit transfer to other 4-year institutions.
Proposed Start Semester: Fall 2021
Course Description: In this course, students apply knowledge learned in the first two Calculus courses to functions of two or three variables, including parametric equations and polar coordinates vectors in the plane and space, partial differentiation, double and triple integrals, surface integrals, line integrals, Green's Theorem, Stokes' Theorem, Divergence, Curl and applications. This is the third course in the standard Calculus sequence.

Course Credit Hours
Variable hours: No
Credits: 4
Lecture Hours: Instructor: 60 **Student:** 60
Lab: Instructor: 0 **Student:** 0
Clinical: Instructor: 0 **Student:** 0

Total Contact Hours: Instructor: 60 **Student:** 60
Repeatable for Credit: NO
Grading Methods: Letter Grades
Audit
Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing
College-level Reading & Writing

College-Level Math
No Level Required

Requisites

Prerequisite
MTH 192 minimum grade "C"

General Education
Degree Attributes
Assoc in Applied Sci - Area 3
Assoc in Science - Area 3
Assoc in Arts - Area 3
MACRAO Science & Math
Michigan Transfer Agreement - MTA
MTA Mathematics

Request Course Transfer
Proposed For:
Eastern Michigan University
University of Michigan

Student Learning Outcomes

1. Perform basic operations of Vector Algebra.
   Assessment 1
   Assessment Tool: Outcome-related questions on the end-of-semester exam
   Assessment Date: Fall 2022
   Assessment Cycle: Every Two Years
   Course section(s)/other population: All course sections
   Number students to be assessed: 60 samples from Final Exams collected from all sections offered during the 2-year period.
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: 70% of students sampled will score an average of 70% or higher on each exam question that addresses Outcome 1.
   Who will score and analyze the data: Course lead instructor

2. Differentiate functions of two or three variables, including partial derivatives, chain rules and implicit differentiation.
   Assessment 1
   Assessment Tool: Outcome-related questions on the end-of-semester exam
   Assessment Date: Fall 2022
   Assessment Cycle: Every Two Years
   Course section(s)/other population: All course sections
   Number students to be assessed: 60 samples from Final Exams collected from all sections offered during the 2-year period.
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: 70% of students sampled will score an average of 70% or higher on each exam question that addresses Outcome 2.
   Who will score and analyze the data: Course lead instructor

3. Integrate and find limits of functions of two or three variables, using rectangular, cylindrical or spherical coordinates.
   Assessment 1
   Assessment Tool: Outcome-related questions on the end-of-semester exam
   Assessment Date: Fall 2022
   Assessment Cycle: Every Two Years
   Course section(s)/other population: All course sections

Number students to be assessed: 60 samples from Final Exams collected from all sections offered during the 2-year period.
How the assessment will be scored: Departmentally-developed rubric
Standard of success to be used for this assessment: 70% of students sampled will score an average of 70% or higher on each exam question that addresses Outcome 3.
Who will score and analyze the data: Course lead instructor

4. Perform calculations in Vector Calculus using Green's Theorem, the divergence theorem and Stokes' Theorem.

Assessment 1

Assessment Tool: Outcome-related questions on the end-of-semester exam
Assessment Date: Fall 2022
Assessment Cycle: Every Two Years
Course section(s)/other population: All course sections
Number students to be assessed: 60 samples from Final Exams collected from all sections offered during the 2-year period.
How the assessment will be scored: Departmentally-developed rubric
Standard of success to be used for this assessment: 70% of students sampled will score an average of 70% or higher on each exam question that addresses Outcome 4.
Who will score and analyze the data: Course lead instructor

5. Find relative and absolute extrema of functions of several variables using the second partial derivative test and Lagrange multipliers.

Assessment 1

Assessment Tool: Outcome-related questions on the end-of-semester exam
Assessment Date: Fall 2022
Assessment Cycle: Every Two Years
Course section(s)/other population: All course sections
Number students to be assessed: 60 samples from Final Exams collected from all sections offered during the 2-year period.
How the assessment will be scored: Departmentally-developed rubric
Standard of success to be used for this assessment: 70% of students sampled will score an average of 70% or higher on each exam question that addresses Outcome 5.
Who will score and analyze the data: Course lead instructor

Course Objectives

1. Add and subtract vectors in plane and space.
2. Evaluate dot/cross products of vectors.
3. Solve application problems related to dot/cross products of vectors
4. Write equations of lines and planes.
5. Find limits and derivatives of functions of more than one independent variable.
6. Find limits and derivatives of vector-valued functions.
7. Use second order partial derivatives to determine if a critical point is a relative extrema.
8. Set up and solve optimization problems with constraints using method of Lagrange multipliers.
9. Write and solve multiple integrals using an appropriate coordinate system.
10. Find length, area and volume using an appropriate integral.
11. Apply length, area and volume, and find work and flux using an appropriate integral.
12. Solve multiple integrals by substitution method or changing coordinate system.
13. Demonstrate an understanding of the Fundamental Theorem for Line Integrals and the relationship between line integrals of conservative vector fields.
14. Demonstrate an understanding of the Fundamental Theorem for Line Integrals and Green's Theorem in Vector Calculus.
15. Demonstrate an understanding of the divergence theorem and Stokes' Theorem in Vector Calculus.

New Resources for Course

Course Textbooks/Resources

Textbooks

Larson, R., B. Edwards. *Calculus: Early Transcendental Functions*, 7th ed. Boston: Brooks Cole, 2015, ISBN: 9781285774770.

Manuals

Periodicals

Software

Equipment/Facilities

Level III classroom

Testing Center

Data projector/computer

Reviewer	Action	Date
Faculty Preparer:		
Yin Lu	*Faculty Preparer*	*Jul 12, 2021*
Department Chair/Area Director:		
Lawrence David	*Recommend Approval*	*Aug 09, 2021*
Dean:		
Victor Vega	*Recommend Approval*	*Aug 10, 2021*
Curriculum Committee Chair:		
Randy Van Wagnen	*Recommend Approval*	*Jun 16, 2022*
Assessment Committee Chair:		
Shawn Deron	*Recommend Approval*	*Jun 21, 2022*
Vice President for Instruction:		
Victor Vega	*Approve*	*Jul 08, 2022*

Washtenaw Community College Comprehensive Report

MTH 293 Calculus III
Effective Term: Spring/Summer 2020

Course Cover

Division: Math, Science and Engineering Tech
Department: Math & Engineering Studies
Discipline: Mathematics
Course Number: 293
Org Number: 12200
Full Course Title: Calculus III
Transcript Title: Calculus III
Is Consultation with other department(s) required: No
Publish in the Following: College Catalog , Time Schedule , Web Page
Reason for Submission: Three Year Review / Assessment Report
Change Information:
   Consultation with all departments affected by this course is required.
   Outcomes/Assessment
   Other:
Rationale: Three-year syllabus review.
Proposed Start Semester: Fall 2019
Course Description: This is the third course in the standard Calculus sequence. This course covers differential, integral and vector calculus for functions of more than one variable. To confirm transfer equivalency, consult a counselor or check the Web page of the college to which you are transferring. A graphing calculator is required for this course. See the time schedule for current brand and model.

Course Credit Hours

Variable hours: No
Credits: 4
Lecture Hours: Instructor: 60 **Student:** 60
Lab: Instructor: 0 **Student:** 0
Clinical: Instructor: 0 **Student:** 0

Total Contact Hours: Instructor: 60 **Student:** 60
Repeatable for Credit: NO
Grading Methods: Letter Grades
Audit
Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

No Level Required

Requisites

Prerequisite
MTH 192 minimum grade "C"

General Education
Degree Attributes
Assoc in Applied Sci - Area 3
Assoc in Science - Area 3
Assoc in Arts - Area 3
MACRAO Science & Math
Michigan Transfer Agreement - MTA
MTA Mathematics

Request Course Transfer
Proposed For:
Eastern Michigan University
University of Michigan

Student Learning Outcomes

1. Perform basic operations of Vector Algebra.
   ### Assessment 1
   Assessment Tool: End of semester exam
   Assessment Date: Winter 2020
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All course sections
   Number students to be assessed: A random sample of 20% of students enrolled or a minimum of 30 students
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: 70% of students sampled will score an average of 70% or higher on each exam question that addresses Outcome 1
   Who will score and analyze the data: Department

2. Differentiate functions of several variables.
   ### Assessment 1
   Assessment Tool: End of semester exam
   Assessment Date: Winter 2020
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All course sections
   Number students to be assessed: A random sample of 20% of students enrolled or a minimum of 30 students
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: 70% of students sampled will score an average of 70% or higher on each exam question that addresses Outcome 2
   Who will score and analyze the data: Department

3. Integrate and find limits of functions of several variables.
   ### Assessment 1
   Assessment Tool: End of semester exam
   Assessment Date: Winter 2020
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All course sections
   Number students to be assessed: A random sample of 20% of students enrolled or a minimum of 30 students
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: 70% of students sampled will score an average of 70% or higher on each exam question that addresses Outcome 3
   Who will score and analyze the data: Department

4. Perform calculations in Vector Calculus.
     Assessment 1
         Assessment Tool: End of semester exams
         Assessment Date: Winter 2020
         Assessment Cycle: Every Three Years
         Course section(s)/other population: All course sections
         Number students to be assessed: A random sample of 20% of students enrolled or a minimum of 30 students
         How the assessment will be scored: Departmentally-developed rubric
         Standard of success to be used for this assessment: 70% of students sampled will score an average of 70% or higher on each exam question that addresses Outcome 4
         Who will score and analyze the data: Department

5. Find relative and absolute extrema of functions of several variables.
     Assessment 1
         Assessment Tool: End of semester exam
         Assessment Date: Winter 2020
         Assessment Cycle: Every Three Years
         Course section(s)/other population: All course sections
         Number students to be assessed: A random sample of 20% of students enrolled or a minimum of 30 students
         How the assessment will be scored: Departmentally-developed rubric
         Standard of success to be used for this assessment: 70% of students sampled will score an average of 70% or higher on each exam question that addresses Outcome 5
         Who will score and analyze the data: Department

Course Objectives

1. Add and subtract vectors in plane and space.
2. Evaluate dot/cross products of vectors and solve related application problems.
3. Write equations of lines and planes in space.
4. Find limits and derivatives of functions of more than one independent variable.
5. Find limits and derivatives of vector-valued functions.
6. Use second order partial derivatives to determine if a critical point is a relative extrema.
7. Set up and solve optimization problems involving several variables, with or without constraints.
8. Set up and solve optimization problems using method of Lagrange Multipliers.
9. Write and solve multiple integrals using an appropriate coordinate system.
10. Find length, area, volume, work and flux using an appropriate integral.
11. Solve multiple integrals by changing variables.
12. Demonstrate an understanding of the major theorems (Green's, Gauss' and Stokes').
13. Perform basic operations and selected applications of vector calculus, including divergence and curl.
14. Demonstrate an understanding of the Fundamental Theorem of Line integrals and the relationship between line integrals of conservative vector fields and the values of the potential function at the endpoints of the curve.
15. Perform calculations using the tangential form and normal form of Greens theorem.

New Resources for Course

Course Textbooks/Resources

Textbooks
     Larson, R., B. Edwards. *Calculus: Early Transcendental Functions*, 7th ed. Boston: Brooks Cole, 2015, ISBN: 9781285774770.
Manuals
Periodicals
Software

Equipment/Facilities
Level III classroom
Testing Center

Reviewer	Action	Date
Faculty Preparer:		
Yin Lu	*Faculty Preparer*	*Jun 04, 2019*
Department Chair/Area Director:		
Lisa Manoukian	*Recommend Approval*	*Jun 09, 2019*
Dean:		
Kimberly Jones	*Recommend Approval*	*Jul 02, 2019*
Curriculum Committee Chair:		
Lisa Veasey	*Recommend Approval*	*Nov 12, 2019*
Assessment Committee Chair:		
Shawn Deron	*Recommend Approval*	*Nov 15, 2019*
Vice President for Instruction:		
Kimberly Hurns	*Approve*	*Nov 19, 2019*

Washtenaw Community College Comprehensive Report

MTH 293 Calculus III
Effective Term: Fall 2017

Course Cover

Division: Math, Science and Engineering Tech
Department: Mathematics
Discipline: Mathematics
Course Number: 293
Org Number: 12200
Full Course Title: Calculus III
Transcript Title: Calculus III
Is Consultation with other department(s) required: No
Publish in the Following: College Catalog , Time Schedule , Web Page
Reason for Submission: Three Year Review / Assessment Report
Change Information:
    Course description
    Outcomes/Assessment
    Objectives/Evaluation
Rationale: three year review
Proposed Start Semester: Fall 2017
Course Description: Math 293 is the third course in the standard Calculus sequence. This course covers differential, integral and vector calculus for functions of more than one variable. To confirm transfer equivalency, consult a counselor or check the Web page of the college to which you are transferring. A graphing calculator is required for this course. See the time schedule for current brand and model.

Course Credit Hours

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Credits: 4
Lecture Hours: Instructor: 60 **Student:** 60
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Grading Methods: Letter Grades
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Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

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College-Level Math

No Level Required

Requisites

Prerequisite
MTH 192 minimum grade "C"

General Education
Degree Attributes
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Student Learning Outcomes

1. Perform basic operations of Vector Algebra.
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   Who will score and analyze the data: Department

2. Differentiate functions of several variables.
   Assessment 1
   Assessment Tool: End of semester exam
   Assessment Date: Winter 2017
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All course sections
   Number students to be assessed: A random sample of 20% of students enrolled or a minimum of 30 students
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: 70% of students sampled will score an average of 70% or higher on each exam question that addresses Outcome 2.
   Who will score and analyze the data: Department

3. Integrate functions of several variables.
   Assessment 1
   Assessment Tool: End of semester exam
   Assessment Date: Winter 2017
   Assessment Cycle: Every Three Years
   Course section(s)/other population: All course sections
   Number students to be assessed: A random sample of 20% of students enrolled or a minimum of 30 students
   How the assessment will be scored: Departmentally-developed rubric
   Standard of success to be used for this assessment: 70% of students sampled will score an average of 70% or higher on each exam question that addresses Outcome 3.
   Who will score and analyze the data: Department

4. Perform calculations in Vector Calculus.
      Assessment 1
        Assessment Tool: End of semester exams
        Assessment Date: Winter 2017
        Assessment Cycle: Every Three Years
        Course section(s)/other population: All course sections
        Number students to be assessed: A random sample of 20% of students enrolled or a minimum of 30 students
        How the assessment will be scored: Departmentally-developed rubric
        Standard of success to be used for this assessment: 70% of students sampled will score an average of 70% or higher on each exam question that addresses Outcome 4
        Who will score and analyze the data: Department

Course Objectives

1. Add and subtract vectors in plane and space.
2. Evaluate dot/cross products of vectors and solve related application problems.
3. Write equations of lines and planes in space.
4. Find limits and derivatives of functions of more than one independent variable.
5. Find limits and derivatives of vector-valued functions.
6. Use second order partial derivatives to determine if a critical point is a relative extrema.
7. Set up and solve optimization problems involving several variables, with or without constraints.
8. Set up and solve optimization problems using method of Lagrange Multipliers.
9. Write and solve multiple integrals using an appropriate coordinate system.
10. Find length, area, volume, work and flux using an appropriate integral.
11. Solve multiple integrals by changing variables.
12. Demonstrate an understanding of the major theorems (Green's, Gauss' and Stokes') and perform basic operations and selected applications of vector calculus, including divergence and curl.
13. Demonstrate an understanding of the Fundamental Theorem of Line integrals and the relationship between line integrals of conservative vector fields and the values of the potential function at the endpoints of the curve.
14. Make calculations using the tangential form and normal form of Greens theorem.

New Resources for Course

Course Textbooks/Resources

Textbooks
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Manuals
Periodicals
Software

Equipment/Facilities

Level III classroom

Reviewer	Action	Date
Faculty Preparer:		
Frank Gerlitz	*Faculty Preparer*	*Dec 05, 2016*
Department Chair/Area Director:		
Lisa Rombes	*Recommend Approval*	*Dec 13, 2016*
Dean:		
Kristin Good	*Recommend Approval*	*Dec 14, 2016*

Curriculum Committee Chair:

David Wooten   *Recommend Approval*   *Mar 21, 2017*

Assessment Committee Chair:

Ruth Walsh   *Recommend Approval*   *Mar 22, 2017*

Vice President for Instruction:

Kimberly Hurns   *Approve*   *Mar 23, 2017*