EASTERN MEDITERRANEAN UNIVERSITY
FACULTY OF ARTS AND SCIENCES – DEPARTMENT OF MATHEMATICS
2019-2020 FALL SEMESTER

COURSE CODE	MATH152		
COURSE TITLE	Calculus-II		
COURSE TYPE	University Core (UC)		
LECTURERS	Groups 1 & 4	Hüseyin Aktuğlu	Office AS261, Tel: 2447 huseyin.aktuglu@emu.edu.tr
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ECTS CREDITS (4,0,1) 4

PREREQUISITES Math 151 Calculus-I

WEB LINK http://brahms.emu.edu.tr/calculus

TEXTBOOK Calculus, Early Transcendentals, Metric Version, 7th Edition, by Ron Larson, Bruce Edwards. 2017.

REFERENCE BOOKS Students may also use any of the following reference textbooks

- Calculus, Early Transcendentals, 10th Edition, by Howard Anton, Irl Bivens and Stephen Davies, John Wiley & Sons Singapore Pte. Ltd.
- Calculus, Early Transcendentals, 5th Edition, by Ron Larson and Bruce H. Edwards, Brooks/Cole Cengage Learning.
- Calculus, Early Transcendentals, International Edition, by William L. Briggs and Lyle Cochran, Pearson Publishing Co.

TIME TABLE

Group 01	Lecture Hours:	Monday: 08.30–10.20, Wednesday: 14:30-16:20,
	Tutorial Hours:	Friday: 12:30 – 14:20, (CL104)
Group 02	Lecture Hours:	Monday: 08.30–10.20, Wednesday: 14.30–16.20,
	Tutorial Hours:	Friday: 12:30-14:20, (CLA 11- CLA 24- CL 115)
Group 03	Lecture Hours:	Tuesday: 08.30–10.20, Thursday: 08.30–10.20,
	Tutorial Hours:	Friday: 08.30–10.20 (CLA 12 – CLA 12 – CLA 11)
Group 04	Lecture Hours:	Wednesday 08.30–10.20, Thursday: 12.30–14.20,
	Tutorial Hours:	Friday: 12:30-13:20 (CLA 22 – CLA 13 -CL 105)
Group 05	Lecture Hours:	Monday: 08.30–10.20, Wednesday: 14:30-16:20,
	Tutorial Hours:	Friday: 12:30 – 14:20, (ASG 15 – ASG 14 – ASG15)
Group 06	Lecture Hours:	Wednesday 08.30–10.20, Thursday: 12.30–14.20,
	Tutorial Hours:	Friday: 14:30-16:20 (ASG 15 – CLA 11- CL 113)

OFFICE HOURS To be decided in the first lecture, by the instructor and the students of each group, to fit the

course schedule of the students. Will be announced at the web site of the course.

AIM & OBJECTIVES

Calculus was first invented to meet the mathematical needs of scientists of the sixteenth and seventeenth centuries, needs that mainly mechanical in nature. Nowadays it is a tool used almost everywhere in the modern world to describe change and motion. Its use is widespread in science, engineering, medicine, business, industry, and many other fields. Calculus also provides important tools in understanding functions and has led to the development of new areas of mathematics including real and complex analysis, topology, and non-euclidean geometry. The objective of this course is to introduce the fundamental ideas of the differential and integral calculus of functions of several variables.

CATALOGUE DESCRIPTION

Power series, Taylor & Maclaurin series, Lines and planes, Vectors, Dot and Cross Product, Lines and Planes, Vector Valued Functions, Differentiation and Integration of Vector Valued Functions, Functions of several variables, Limits and Continuity, Partial Differentiation, Chain Rule, Tangent plane, Critical points, Global and Local Extrema, Directional Derivatives, Gradient, Divergence and Curl, Multiple integrals with applications, Triple integrals with applications, Triple integrals in Cylindrical and Spherical coordinates, Line-, Surface- and Volume Integrals, Independence of path, Green's Theorem, Conservative Vector Fields, Divergence Theorem, Stokes' Theorem.

GRADING CRITERIA

Midterm-I	30%	PERIOD: November 11 –23, 2019 TBA by the University Exam Committee
Midterm-II	30%	PERIOD: December 2019 TBA by the University Exam Committee
Final Examination	40%	PERIOD: January 2 –17, 2020 TBA by the University Exam Committee

METHOD OF ASSESSMENT

85–100 (A); 80–84 (A-);
75–79 (B+); 70–74 (B); 66–69 (B-);
63–65 (C+); 59–62 (C); 56–58 (C-);
53–55 (D+); 50–52 (D);
35–49 (D- /FAIL); 0-34 (F/FAIL)

TEACHING METHOD

Knowledge and understanding are acquired by lecturing in classes with written course texts, by guides to study, assignments, examination papers, multimedia material, and feedback from tutors on the assignments. Written tutor feedback on assignments provides you with individual tuition and guidance. The teaching method will include lecture with discussion, computer projections (power point), answering and asking questions.

RELATION TO OTHER COURSES

This course provides the mathematical background for engineering students and is very important, for instance, for advanced courses on partial differential equations or numerical analysis.

GENERAL LEARNING OUTCOMES

On succesful completion of the course, the students should be able to:

- **understand** how to approximate functions with polynomials**;**
- **explain** the properties of power series;
- **find** the radius and the interval of convergence of a power series, indicating at which points the series converges absolutely/conditionally;
- **construct** Taylor and Maclaurin series for a given function;
- **use** Taylor and Maclaurin series for approximation of functions and estimate the error;
- **use** power series to calculate limits;
- **understand and apply** two and three dimensional Cartesian coordinate system;
- r**ecognize and classify** the equations and shapes of quadratic surfaces;
- **use** the properties of vectors and operations with vectors;
- **recognize and construct** the equations of lines and planes;
- **operate** with vector functions, find their derivatives and integrals, find the arc length;
- **understand and use** the concept of a function of several variables, find it's domain;
- **calculate** the limits of multivariable functions and prove the nonexistence of a limit;
- **find** partial derivatives using the properties of differentiable multivariable functions and basic rules;
- **apply** partial derivatives for finding equations of tangent planes, normal lines, and for extreme values;
- **evaluate** double integrals in Cartesian and polar coordinates and triple integrals in Cartesian and cylindrical coordinates;
- **apply** multiple integrals for computing areas and volumes;
- **understand** and use integration in vector fields;
- **find** line integrals and flux using Green's Theorem;
- **find** circulation of a vector field using Stoke's theorem;
- **use** Divergence Theorem to find the flux of a vector field.

COURSE OUTLINE

Week 1 4 hours	Introducing the course to the students (1hour) Revision of Convergence Tests for Infinite Series (1 hour)
	POLYNOMIAL APPROXIMATION OF FUNCTIONS: Linear and Quadratic Approximation, Taylor and Maclaurin Polynomials, Approximation with Taylor Polynomials (1hour) POWER SERIES: Definition, Center and Radius, Interval of Convergence, Endpoint Convergence, Operations with Power Series, Differentiating and Integrating Power Series (1hour)
Week 2 4 hours	TAYLOR AND MACLAURIN SERIES: Taylor/Maclaurin Series for a Function, Convergence of Taylor/Maclaurin Series, Limits using Taylor/Maclaurin Series, Taylor/Maclaurin Series for Composite Functions, Differentiating Taylor/Maclaurin Series to Find Taylor/Maclaurin Series of the Derivative, Using Taylor/Maclaurin Series for Approximating Integrals. (2hours)
	PARAMETRIC EQUATIONS: Basic Ideas, Plane Curves and Parametric Equations, Parametric Parabola, Parametric Circle, Parametric Lines, Eliminating the Parameter. (2hours)
Week 3 4 hours	2D and 3D CARTESIAN COORDINATE SYSTEM: Distance Between Two Points, Equation of a Circle and a Sphere. (1hour) VECTORS: Basic Vector Operations, Scalar Multiplication, Vector Addition and Subtraction, Component Form of a Vector, Magnitude, Vector Operations in Terms of Components, Unit Vectors, Unit Vector in the Direction of a Vector, Properties of Vector Operations, Parallel Vectors. (1hour)
	DOT PRODUCT OF VECTORS: Two Forms of the Dot Product, Properties of Dot Products, Orthogonal Vectors, Angle Between Two Vectors, Direction Cosines, Orthogonal Projections. (2hours)
Week 4 hours	CROSS PRODUCT OF VECTORS: The Cross Product, Properties of the Cross Product, Geometric Properties of Cross Product, Triple Scalar Product, Volume by the Triple Scalar Product. (2hours)
	LINES AND PLANES IN SPACE: Parametric and Symmetric Equations of Lines in Space. Parametric Equation of a Line Segment. Distance Between a Point and a Line in Space. Standard and General Form of a Plane in Space, Parallel and Orthogonal Planes, Angle Between Two Planes, Line of Intersection of Two Planes, Distance Between a Point and a Plane, Distance Between Two Parallel Planes. (2hours)
Week 5 4 hours	VECTOR – VALUED FUNCTIONS: Space Curves and Definition of Vector-Valued Functions, Orientation of Curves, Limit of a Vector – Valued Function, Differentiation of Vector – Valued Functions, Higher Derivatives, Integration of Vector – Valued Functions. (2hours)
	VECTOR – VALUED FUNCTIONS: Tangent Vectors, Definition of Unit Tangent Vector, Normal Vectors, Principal Unit Normal Vector. (1hour) ARC LENGTH OF CURVES: Arc Length. (1hour)
Week 6 4 hours	FUNCTIONS OF SEVERAL VARIABLES: Functions of Two Variables, Graph of Function of Two Variables, Level Curves, Contour Maps, Functions of More Than Two Variables, Level Surfaces. Limit of a Function of Two Variables, Limits at Boundary Points, Two-Path Test for Nonexistence of Limits. (2hours)
	PARTIAL DERIVATIVES: Partial Derivatives of a Function of Two Variables, Slopes of a Surface in the x- and y-Directions, Higher Order Partial Derivatives, Partial Derivatives of Functions of Three or More Variables. (1hour) CHAIN RULE FOR FUNCTION OF SEVERAL VARIABLES: The Chain Rule with One Independent Variable, The Chain Rule with Several Independent Variables, Implicit Partial Differentiation. (1hour)
Week 7 4 hours	DIRECTIONAL DERIVATIVES AND THE GRADIENTS: Directional Derivatives, The Gradient of a Function of Two Variables, Definition of Directional Derivative Using Gradient, Interpretations of the Gradient, The Gradient and Level Curves, The Gradient and Directional Derivative for Three Variables. (2hours)
Week 8-9	**MIDTERM EXAMINATIONS PERIOD 11 - 23 NOVEMBER 2019**
Week 9 4 hours	TANGENT PLANES AND NORMAL LINES TO A SURFACE: Tangent Planes: Tangent Planes for F(x,y,z)=0, Tangent Planes for z=f(x,y), Angle of Inclination of a Plane. (2hours)
	EXTREMA (MAXIMUM / MINIMUM) OF A FUNCTION OF TWO VARIABLES: Absolute Extrema and Relative Extrema, Critical Points, Second Derivative Test for Relative Extrema. (2hours)
Week 10 4 hours	DOUBLE INTEGRALS: Iterated Integrals, Area of a Plane Region, Volume of Solids, Changing the Order of Integration, Fubini's Theorem, Polar Coordinates, Conversion Between Cartesian and Polar Coordinates, Double Integrals in Polar Coordinates. (2hours)
Week 11 4 hours	TRIPLE INTEGRALS: Triple Integrals in Rectangular Coordinates, Volumes of Solids Using Triple Integrals, Changing the Order of Integration, Cylindrical Coordinates, Triple Integrals in Cylindrical Coordinates. (2hours)
Week 12 4 hours	VECTOR ANALYSIS: Vector Fields in Two and Three Dimension, Gradient Fields and Potential Functions, Conservative Vector Fields, Curl of a Vector Field, Divergence of a Vector Field. (2hours)
Week 13 4 hours	LINE INTEGRALS: Integrals of Scalar Functions in the Plane and in Space, Line Integrals of Vector Fields, Work Integrals, Line Integrals in Differential Form, Conservative Vector Fields,

	Independence of Path, Fundamental Theorem of Line Integrals. (2hours)
	GREEN'S THEOREM: Circulation Form of Green's Theorem, Flux Form of Green's Theorem. (2hours)
Week 14 4 hours	SURFACE INTEGRALS: Surface Integrals of Scalar-Valued Functions, Surface Integrals on Explicitly Defined Surfaces, Surface Integrals of Vector Fields, Flux Integrals (2hours)
	DIVERGENCE THEOREM (GAUSS'S THEOREM) for Surface Integrals. (1 hours) STOKES' THEOREM for Line Integrals. (1 hours)
Week 15-16-17	FINAL EXAMINATIONS PERIOD

ACADEMIC HONESTY

Copying from others or providing answers or information (written or oral) to others is cheating. Copying from another student's paper or from another text without written acknowledgement is plagiarism. According to University's bylaws **cheating and plagiarism** are serious offences resulting in a failure from exam or project and disciplinary action (which includes an official warning or/and suspension from the university for up to one semester).

NG Policy

Attendance will be taken every lecture hour by the lecturer. Any student who has poor interest in the course, with poor attendance (less than 50%), or missing more than one exam during the semester will be given **NG** (nil grade). This rule will be followed strictly.

IMPORTANT NOTES

- Attendance to the classes is compulsory. Students, who has attendance less than 50%, or missing more than one exam will be given "NG" grade. This rule will be followed strictly
- Final Examination will include all topics of the lecture.
- It is compulsory to show student identification card in order to be able to attend examinations. Those who will not be able to show identification card will not be allowed to attend the examination.
- Students are obligated to attend the examinations in the scheduled room. They will not be allowed to attend the examination in a room which is not scheduled for them.
- Students may check their examination papers within a pre-announced period of time. Information about this matter will be given in the instructions of each of the examinations.
- Only those students, who didn't sit for the Midterm Examination, may attend the Midterm Make-up Examination which will be held in the last week of lectures. Exact date will be announced later.
- Make-up examination for the Final Examination is the RESIT examination. RESIT examination requires online application via students portal.