



<b>Form: Course Syllabus</b>	<b>Form Number</b>	EXC-01-02-02A
	<b>Issue Number and Date</b>	2/3/24/2022/2963 05/12/2022
	<b>Number and Date of Revision or Modification</b>	02/11/2024
	<b>Deans Council Approval Decision Number</b>	2/3/24/2023
	<b>The Date of the Deans Council Approval Decision</b>	23/01/2023
	<b>Number of Pages</b>	06

1.	<b>Course Title</b>	<b>Advanced Calculus</b>
2.	<b>Course Number</b>	0331301
3.	<b>Credit Hours (Theory, Practical)</b>	3
	<b>Contact Hours (Theory, Practical)</b>	3
4.	<b>Prerequisites/ Corequisites</b>	Calculus III (0301201)
5.	<b>Program Title</b>	B.Sc. in Mathematics
6.	<b>Program Code</b>	
7.	<b>School/ Center</b>	Science
8.	<b>Department</b>	Mathematics
9.	<b>Course Level</b>	Obligatory specialization requirement
10.	<b>Year of Study and Semester (s)</b>	3 <sup>rd</sup> year, 1 <sup>st</sup> and 2 <sup>nd</sup> semesters
11.	<b>Other Department(s) Involved in Teaching the Course</b>	None
12.	<b>Main Learning Language</b>	English
13.	<b>Learning Types</b>	<input checked="" type="checkbox"/> Face to face learning <input type="checkbox"/> Blended <input type="checkbox"/> Fully online
14.	<b>Online Platforms(s)</b>	<input type="checkbox"/> Moodle <input checked="" type="checkbox"/> Microsoft Teams
15.	<b>Issuing Date</b>	02/11/2024
16.	<b>Revision Date</b>	02/11/2024

**17. Course Coordinator:**

Name: Prof. Baha Alzalg	Contact hours: TBA
Office number: 204 Math Bldg	Phone number: +962 6-535-5000 Ext. 22079
Email: b.alzalg@ju.edu.jo	



#### 18. Other Instructors:

Name: Prof. Banan Maayah	Contact hours:
Office number:	Phone number:
Email: b.maayah@ju.edu.jo	

#### 19. Course Description:

Vector differential calculus: gradient, divergence, curl; curvilinear coordinates; vector integral calculus: line integral, surface integral, volume integral, Green's theorem, Stoke's theorem, divergence theorem; implicit and inverse function theorems; Leibnitz theorem; calculus of variations (functionals of one variable).

#### 20. Program Student Outcomes (SO's):

- SO1.** Identify, formulate, and solve broadly-defined technical or scientific problems by applying knowledge of Mathematics and Science and/or technical topics to areas relevant to the discipline.
- SO5.** Reflect the impact of technical and/or scientific solutions in economic, environmental, and societal contexts.

#### 21. Course Intended Learning Outcomes (CLO's):

Upon completion of the course, the student will be able to achieve the following intended learning outcomes.

- CLO1.** Apply appropriate theories, principles and concepts relevant to Advanced Calculus.
- CLO2.** Learn about scalar fields and vector fields and look at real life quantities that are scalar fields or vector fields such as the temperature of an object in space, the force, and the velocity.
- CLO3.** Learn the famous differential operators: Gradient, Divergence, Curl and Laplacian, and explain the importance of these operators.
- CLO4.** Study six main theorems and their applications: Greens Theorem, Stokes Theorem, Divergence Theorem, Implicit Function Theorem, Inverse mapping Theorem, and Leibnitz Theorem.
- CLO5.** Be able to select a reasoned argument to the solution of familiar and unfamiliar problems relevant to variational calculus.
- CLO6.** Plan practical activities using procedures appropriate to Advanced Calculus.



Course CLOs	The learning levels to be achieved					
	Remembering	Understanding	Applying	Analysing	evaluating	Creating
CLO (1)	•	•	•			
CLO (2)	•	•	•		•	
CLO (3)	•	•	•	•		
CLO (4)		•	•	•		
CLO (5)		•		•	•	
CLO (6)		•	•		•	•

22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

Course CLO's	Program SO's							
	SO (1)	SO (2)	SO (3)	SO (4)	SO (5)	SO (6)	SO (7)	SO (8)
CLO (1)	•							
CLO (2)	•				•			
CLO (3)	•							
CLO (4)	•				•			
CLO (5)					•			
CLO (6)					•			



## 23. Topic Outline and Schedule:

Week	Lecture	Topic	CLO/s Linked to the Topic	Learning Types Face to Face (FF) Blended (BL) Fully Online (FO)	Platform Used	Synchronous (S) Asynchronous (A)	Evaluation Methods	Learning Resources
1	1.1	Introduction and syllabus discussion		FF	Boards	S		Textbook
	1.2	Functions of several variables: Review	1	FF	Boards	S		Textbook
2	2.1	Gradient	1,2,3	FF	Boards	S		Textbook
	2.2	Divergence	1,2,3	FF	Boards	S		Textbook
3	3.1	Curl	1,2,3	FF	Boards	S		Textbook
	3.2	Parametric surfaces	1	FF	Boards	S		Textbook
4	4.1	Line integral of a scalar field	1,3,4	FF	Boards	S		Textbook
	4.2	Line integral of a vector field	1,3,4	FF	Boards	S		Textbook
5	5.1	Line integral of a vector field	1,3,4	FF	Boards	S		Textbook
	5.2	Double integral: Review	1	FF	Boards	S		Textbook
6	6.1	Green's theorem		FF	Boards	S		Textbook
	6.2	Surface integral of a scalar field	1,3,4	FF	Boards	S		Textbook
7	7.1	Surface integral of a vector field	1,3,4	FF	Boards	S		Textbook
	7.2	Review of Midterm Exam	1	FF	Boards	S		Textbook
8	8.1	<b>Midterm Exam</b>		FF		S		
	8.2	Triple integral: Review	1	FF	Boards	S		Textbook
9	9.1	Divergence theorem	1,3,4	FF	Boards	S		Textbook
	9.2	Stokes' theorem	1,3,4	FF	Boards	S		Textbook
10	10.1	Jacobian and Hessian	1,3,4	FF	Boards	S		Textbook
	10.2	Implicit function theorem	1,3,4	FF	Boards	S		Textbook
11	11.1	Implicit function theorem	1,3,4	FF	Boards	S		Textbook
	11.2	Inverse function theorem	1,3,4	FF	Boards	S		Textbook
12	12.1	Leibnitz theorem	1,3,4	FF	Boards	S		Textbook
	12.2	Review of Second Exam	1	FF	Boards	S		Textbook
13	13.1	<b>Second exam</b>		FF		S		
	13.2	Calculus of variations	1,5	FF	Boards	S		Textbook



14	14.1	Sufficient conditions for optimality	1,5	FF	Boards	S		Textbook
	14.2	Necessary conditions for optimality	1,5	FF	Boards	S		Textbook
15	15.1	Lagrange multipliers	1,5,6	FF	Boards	S		Textbook
	15.2	Review of Final Exam	1	FF	Boards	S		Textbook
16		<b>Final Exam</b>						

#### 24. Evaluation Methods:

Opportunities to demonstrate achievement of the CLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	CLO/s Linked to the Evaluation activity	Period (Week)	Platform
Midterm exam	% 30	TBA	1, 2, 3	Monday 25/11/2024	On Campus
Second exam	% 20	TBA	3, 4, 5	Monday 30/12/2024	On Campus
Final exam	% 50	All topics	1 - 6	15/1/25 - 27/1/25	On Campus

#### 25. Course Requirements:

Each student must have:

- Account on Microsoft Teams.

#### 26. Course Policies:

- A.** Attendance policies: Attendance is absolutely essential to succeed in this course. You are expected to attend every class; please notify your instructor if you know you are going to be absent. All exams must be taken at the scheduled time. Exceptions will be made only in extreme circumstances, by prior arrangement with the instructor.
- B.** Absences from exams and submitting assignments on time: If a student is absent for more than 10% of lectures without an excuse of sickness or due to other insurmountable difficulty, then he/she shall be barred from the final examination also he/she will get a failing grade in this course.
- C.** Health and safety procedures: Medical certificates shall be given to the University Physician to be authorized by him. They should be presented to the Dean of the Faculty within two weeks of the student's ceasing to attend classes.
- D.** Honesty policy regarding cheating, plagiarism, misbehavior: Cheating is prohibited. The University of Jordan regulations on cheating will be applied to any student who cheats in exams or on home works.



- E. Grading policy: Test papers shall be returned to students after correction. His/her mark is considered final after a lapse of one week following their return.
- F. Available university services that support achievement in the course: Math library, Computer lab.

## 27. References:

### A- Required book(s), assigned reading and audio-visuals:

- Calculus: Early Transcendental. Author: James Stewart, 7th edition, Publisher: Cengage Learning.
- Advanced Calculus. Author: Wilfred Kaplan, 5th edition, Publisher: Pearson.

### B- Recommended books, materials, and media:

- Calculus: Early Transcendental. Author: Howard Anton, Irl C. Bivens, Stephen Davis, 12th edition, Publisher: Wiley.
- Advanced Calculus. Author: R. Creighton Buck, 3rd edition, Publisher: Waveland Pr Inc.

## 28. Additional information:

Name of the Instructor or the Course Coordinator: <b>Prof. Baha Alzalg</b>	Signature: .....	Date: 02/11/2024
Name of the Head of Quality Assurance Committee/ Department of Mathematics: <b>Prof. Manal Ghanem</b>	Signature: .....	Date: .....
Name of the Head of Department: <b>Prof. Baha Alzalg</b>	Signature: .....	Date: .....
Name of the Head of Quality Assurance Committee/ School of Science: <b>Prof. Emad A. Abuosba</b>	Signature: .....	Date: .....
Name of the Dean or the Director: <b>Prof. Mahmoud I. Jaghoub</b>	Signature: .....	Date: .....