جامعة الزيتونة الأردنية

Al-Zaytoonah University of Jordan

Course Syllabus

According to JORDAN National Qualification Framework (JNQF)

Course Name: Real Analysis (2)

Course Number: 0101353

General Course Information:

Course Title	Real Analysis (2)
Course Number	0101353
Credit Hours	3 credit hours
Education Type	Blended learning
Prerequisites/Co-requisites	Real Analysis (1)
Academic Program	Mathematics
Program Code	114
Faculty	Faculty of Information Technology
Department	Mathematics
Level of Course	4
Academic Year /Semester	2023/2024 1st Semester
Awarded Qualification	BS'c
Other Department(s) Involved in Teaching the Course	-
Language of Instruction	English
Date of Production	2021-2022
Date of Revision	October 2023

Course Coordinator:

Coordinator's Name	Dr. Haitham Qawaqneh
Office No.	229
Office Phone Extension Number	317
Office Hours	11-12:30 Sunday-Wednesday
E-mail	h.alqawaqneh@zuj.edu.jo

Other Instructors:

Instructor Name	
Office No.	
Office Phone Extension Number	
Office Hours	
Email	

Course Description *(English/Arabic)*:

English	*This course introduces to a good knowledge about Derivatives, Derivative rules, Chain rule, Local extrema, Monotonic functions, Rolle's theorem, Mean-value theorem, Generalized mean-value theorem, Taylor's theorem. Riemann integral and its properties, Upper and lower sums, Integration by parts, Fundamental theorems of calculus, Bounded functions, Pointwise and uniform convergence of sequences and series of functions, Power series.*
Arabic	يعرض هذا المقرر معرفة جيدة حول مفهوم الانحدارات، قواعد الانحدار، قاعدة السلسلة، النقاط البؤرية المحلية، الدوال الاتجاهية، مبرهنة رول، مبرهنة متوسط القيمة، مبرهنة متوسط القيمة المعممة، مبرهنة تايلور. التكامل ريمان وخصائصه، المجموعات العلوية والسفلية، التكامل بالأجزاء، المبرهنات الأساسية للتفاضل والتكامل، الدوال المحدودة، التقارب نقطي وموحد للتتابعات وسلاسل الدوال، السلاسل القوى.

Textbook: *Author(s), Title, Publisher, Edition, Year, Book website.*

Jiří Lebl, Introduction to Real Analysis. Creative Commons Attribution-Noncommercial-Share Alike 4.0 International License, 1st Edition, 2023.

References: *Author(s), Title, Publisher, Edition, Year, Book website.*

1. Introduction to Real Analysis. By: William F. Trench, 1st Edition, Trinity University, 2022.
2. Real Analysis. By: Gary Towsley, Milne Library, 2021
3. Introduction to Proof in Analysis. By: Steve Halperin. Elizabeth Hughes, 2020.
4. Introduction to Real Analysis". By: R. Bartle and D. Sherbert. John Wiley & Sons, Third Edition **(2000).**

Course Educational Objectives (CEOs):

CEO1	Students will enhance students' skills in rigorous mathematical proof and logic.
CEO2	Students will explore in-depth the properties and convergence of sequences and series, including power series.
CEO3	Students will introduce the analysis of functions of several variables.
CEO4	Students would be expected to understand and apply the principles areal analysis of derivatives and integration.

Intended Learning Outcomes (ILO's):

Intended learning outcomes (ILOs)		Relationship to CEOs	Contribution to PLOs	Bloom Taxonomy Levels*	JNQF Descriptors**
K	Knowledge and Understanding				
1. ILO1-k	Students will be know, understand and apply the definitions and theorems in Rolle's theorem, Mean-value theorem, Taylor's theorem.	CEO1, CEO2	PLO1-k	Remembering, Understanding,	k
2. ILO2-k	Students will be understand the basic facts about derivatives and Riemann integral.	CEO1, CEO2	PLO1-k	Understanding	K
S	Intellectual skills				
3. ILO3-s	Student is expected to understand the structure of functions on compact intervals of the real line in relation to differentiability and integrabilty.	CEO3	PLO6-s	Understanding Analysing	S
4. ILO4-s	Students will be comprehend the main theorems concerning continuity and differentibility: Extrem value theorem, intermediate value theorem, Mean value theorem, Rolls theorem, of the Fundamental Theorem of Calculus.	CEO3	PLO6-s	Analysing	S
C	Subject specific skills				
5. ILO5-c	Students will cooperate to work effectively in the group assignments.	CEO3, CEO4	PLO11-c	Applying, Evaluating	C
6. ILO6-c	Students will be able to think in mathematical analysis.	CEO3, CEO4	PLO12-c	Applying, Evaluating	C

***Bloom Taxonomy Levels:**

Level #	1	2	3	4	5	6
Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
** Descriptor (National Qualification Framework Descriptors): K: Knowledge, S: Skill, C: Competency.						

Program Learning Outcome (PLOs):

(PLOs)		JNQF Descriptors**		
		K	S	C
1.	Knowledge of the main concepts in pure mathematics.	√		
2.	Knowledge of the main concepts in applied mathematics.	√		
3.	Explain concepts, principles and theories in the fields of probability and statistics.	√		
4.	Possession of technological culture related to the fields of mathematics and its applications.	√		
5.	Making use of mathematical logic in practical life.		√	
6.	Engaging scientific methodology as a way of thinking and as a tool in facing problems.		√	
7.	Applying mathematical software packages in problem solving.		√	
8.	Being capable of data analysis.		√	
9.	Capability of teaching according to modern educational techniques.		√	
10.	Develop creative and innovative methods of teaching mathematics.		√	
11.	Showing the ability to work under ethical and professional standards within teams.			√
12.	Gaining critical thinking and scientific research skills.			√

**** Descriptors according to the national qualifications framework (K: knowledge, S: skill, C: Competency)**

Weekly Schedule *(please choose the type of teaching)*

- ☐ **Face to Face (F2F)**
- ☒ **Hybrid** *(One – To - One)*
- ☐ **Online**

Schedule of Simultaneous and their Topics:

Week	First Lecture (F2F)	Activity	ILOs	PLOs	JNQF Descriptors*
1	Preliminaries, Continuous Functions	Activity: Solving suggested exercises and proving some suggested theories	ILO1-k	PLO1-k	K
2	The derivative	Activity: Solving suggested exercises	ILO1-k	PLO1-k PLO5-k	K
3	Rolle's Theorem, Mean Value	Activity: Proving some suggested	ILO2-k	PLO1-k PLO5-k	K

	Theorem	theories			
4	Further Applications of the Mean Value Theorem	Activity: Solving suggested exercises. Read suggest link	ILO3-s	PLO6-s	S
5	L'Hospital's Rules	Activity: Solving suggested exercises and proving some suggested theories	ILO4-s	PLO6-s	S
6	Taylor's Theorem, Applications of Taylor's Theorem	Activity: Solving suggested exercises	ILO4-s	PLO6-s	S
7	Partitions and Tagged Partitions	Activity: Proving some suggested theories	ILO4-s	PLO6-s	S
Midterm Exam (30%)					
9	Riemann Integral	Activity: Solving suggested exercises and proving some suggested theories	ILO3-s, ILO4-s	PLO6-s	S
10	Riemann Integrable Functions	Activity: Solving suggested exercises	ILO4-s	PLO6-s	S
11	Fundamental Theorem of Calculus (1^{st} +2^{nd} Form)	Activity: Proving some suggested theories	ILO4-s	PLO6-s	S
12	Substitution Theorem	Activity: Solving suggested exercises. Read suggest link	ILO4-s	PLO6-s	S
13	Sequences of functions	Activity: Solving suggested exercises and proving some suggested theories	ILO5-c	PLO10-c	C
14	Uniform Convergenc	Activity: Solving suggested exercises	ILO6-c	PLO12-s	C
15	**Projects Discussion**				
16	**Final Exam**				

* **K: Knowledge, S: Skills, C: Competency**

Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

- Lecture.
- flipped learning.
- learning through projects.
- learning through problem solving.

- participatory learning

Course Policies:

A- Attendance policies:
The maximum allowed absences is 15% of the lectures.
B- Absences from exams and handing in assignments on time:
Midterm exam can be retaken based on approval of excuse by the instructor's discretion.
Not handing assignment on time will incur penalties.
C- Academic Health and safety procedures
D- Honesty policy regarding cheating, plagiarism, and misbehaviour:
Cheating, plagiarism, misbehaviour will result in zero grade and further disciplinary actions may be taken.
E- Grading policy:

- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Online Activities (Course Videos, Practice labs, Discussion Forums, Quizzes) **20%**
- Midterm 30**%**
- Final Exam 50**%**

F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

Required Equipment:

- PC / Laptop with webcam and mic
- Internet Connection
- Access to the ZUJ E-Learning Platform at https://exams.zuj.edu.jo/
- E-learning plan
- Satisfaction questionnaires for online and face-to-face learning
- Software for e-learning
- Training

Assessment Tools Implemented in the Course:

- Final Exam
- Midterm Exam
- Quizzes
- Homework
- Discussion Forums
- Improvement plans for online or face-to-face teaching.

Responsible Persons and their Signatures:

Course Coordinator	Haitham Qawaqneh	**Completed Date**	**October 2023**
		Signature	

Received by (Department Head)		**Received Date**	/ /
		Signature	