



مركز الاعتماد  
وإضمان الجودة  
ACCREDITATION & QUALITY ASSURANCE CENTER



**The University of Jordan**

**Accreditation & Quality Assurance Center**

## **Course Syllabus**

**Course Name:**

**Partial Differential Equations I**

## Course Syllabus

1	Course title	Partial Differential Equations I	
2	Course number	(0331321)	
3	Credit hours	3	3
	Contact hours (theory, practical)	3	
4	Prerequisites/corequisites	(0301221)	
5	Program title	B.Sc.	
6	Program code		
7	Awarding institution	The University of Jordan	
8	School	Science	
9	Department	Mathematics	
10	Course level	Department requirement	
11	Year of study and semester (s)	2 <sup>nd</sup> and 3 <sup>rd</sup> Semesters	
12	Other department (s) involved in teaching the course	None	
13	Main teaching language	English	
14	Delivery method	<input checked="" type="checkbox"/> Face to face learning <input type="checkbox"/> Blended <input type="checkbox"/> Fully online	
15	Online platforms(s)	<input checked="" type="checkbox"/> Moodle <input checked="" type="checkbox"/> Microsoft Teams <input type="checkbox"/> Skype <input type="checkbox"/> Zoom <input type="checkbox"/> Others.....	
16	Issuing/Revision Date		

### 17 Course Coordinator:

Name: Prof. **Mohammed Al Horani**

Contact hours: Sun-Thurs (11-12)

Office number: 225

Phone number: 22109

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**18 Other instructors:**

Name:

Office number:

Phone number:

Email:

Contact hours:

Name:

Office number:

Phone number:

Email:

Contact hours:

**19 Course Description:**

Classification; some physical models (heat, wave, Laplace equations); separation of variables; Sturm-Liouville BVP; Fourier series, integrals and transforms; Homogeneous and nonhomogeneous problems, Infinite domain problems, BVP involving rectangular and circular regions; special functions (Bessel and Legendre); BVP involving cylindrical and spherical regions.

## 20 Course aims and outcomes:

### A- Aims:

1. Classify linear second order PDEs
2. Use separation of variables method for solving BVPs.
3. Use Transform method for solving BVPs.
- 4- Formulate physical problems using PDEs
- 5- Analyze (comment) the solution of PDEs theoretically or graphically
- 6- Utilize modern scientific tools such as mathematical packages, graphing calculators, and online resources to illustrate the solutions of BVPs.

### B- Students Learning Outcomes (SLOs):

Upon successful completion of this course, students will be able to:

SLOs SLOs of the course	SLO (1)	SLO (2)	SLO (3)	SLO (4)
1-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.	To solve some PDEs using common approaches.	To solve some PDEs using separation of variables	To solve some PDEs using Fourier transform	To solve some PDEs using Laplace transform
2- Formulate or design a system, process, procedure or program to meet desired needs.	Formulate physical problems using PDEs			
3-Utilize research methods, critical and creative thinking skills to assess and analyze information) to solve problems properly, then draw valid reasoning and logical conclusions leading to true consequences.	Analyze (comment on) the solutions of PDEs theoretically or graphically			
4- Utilize techniques, skills, and modern scientific tools such as mathematical packages, statistical software, graphing calculators, and online resources necessary for professional practice	Utilize modern scientific tools such as mathematical packages, graphing calculators, and online resources to illustrate the solutions of BVPs.			

## 21 . Topic Outline and Schedule:

Week	Lecture	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
<b>1. Linear Partial Differential Equations</b>								
1-2	1.1	Review of ordinary differential equations: linear differential equations with constant coefficients and Euler's equations	(1)1	Face to Face			Exams, Quizzes & Assignments	
	1.2	Linear PDEs.		Face to Face				
	1.3	Classification of a linear PDE of second order.		Face to Face				
	1.4	Boundary value problems with PDEs		Face to Face				
	1.5	Second order linear PDEs with constant coefficients.		Face to Face				
	1.6	Separation of variables		Face to Face				
<b>2. Sturm-Liouville Theory and Orthogonal Sets of Functions</b>								
3-4	2.1	Orthogonal functions	(4)1	Face to Face			Exams, Quizzes & Assignments	
	2.2	Additional concepts of orthogonality		Face to Face				
	2.3	Regular and periodic Sturm – Liouville problems)		Face to Face				
	2.4	Series of orthogonal functions.		Face to Face				
<b>3. Fourier series</b>								
5-7	3.1	Piecewise continuous functions.	(1)2	Face to Face			Exams, Quizzes & Assignments	
	3.2	A basic Fourier series.		Face to Face				

Week	Lecture	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
	3.3	Fourier sine and cosine series.		Face to Face			Exams, Quizzes & Assignments	
	3.4	Complex Fourier series the given.		Face to Face				
	3.5	Differentiation and integration of Fourier series						
<b>4. Fourier Integrals and Transforms</b>								
8-10	4.1	A generalization of Fourier series.	(1)3	Face to Face			Exams, Quizzes & Assignments	
	4.2	Series solution near an ordinary point. Prob. 1-19		Face to Face				
	4.3	Fourier sine and cosine integrals.		Face to Face				
	4.4	exponential Fourier integral		Face to Face				
<b>5. Boundary Value Problems</b>								
11-15	5.1	Derivation of the three most important PDEs: the heat equation, the wave equation and Laplace's equation	(1)2, (1)3, (1)4, (2)1, (3)1  (4)1	Face to Face			Exams, Quizzes & Assignments	
	5.2	Homogeneous boundary-value problems		Face to Face				
	5.3	Nonhomogeneous boundary value problems.		Face to Face				

## 22 Evaluation Methods:

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

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
Midterm exam	30	1, 2 ,3		8	
Assignments	10	3		6	Moodle
Quizzes	10	1, and 2		2, 4	
Final exam	50	All topics			

## 23 Course Requirements

**(e.g: students should have a computer, internet connection, webcam, account on a specific software/platform...etc):**

Data Shows  
Computers  
Internet  
Tablet with pin

## 24 Course Policies:

### A- Attendance policies:

Attendance is 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 homework.

### E- Grading policy:



Solutions for the exams questions and marks will be announced at the webpage of the instructor, 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:

## 25 References:

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

J. Ray Hanna, John H. Rowland. Fourier series, transforms, and boundary value problems.(2008), 2-nd edition, Dover Publications, Inc., USA.

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

- (1) Richard Haberman, Applied Partial Differential Equations with Fourier Series and Boundary Value Problems,(2013), 5-th edition, Pearson.
- (2) W. Boyce and R. DiPrima, Elementary Differential Equations and Boundary Value Problems.(2012), 10-th edition, J. Wiley & Sons, Inc., USA.
- (3) S.J. Farlow,(1993), Partial Differential Equations for Scientists and Engineers, (reprint), J. Wiley & Sons, Inc., USA.
- (4) Tyn Myint-U and L. Debnath, Linear Partial Differential Equations for Scientists and Engineers, (2006), 4-th edition, Birkhauser, Boston.

## 26 Additional information:

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Name of Course Coordinator: **Prof. Mohammed Al Horani**-----Signature:----- Date: -29-10-2022-----

Head of Curriculum Committee/Department: Prof. Ahmad Al Zghoul-- Signature: -----

Head of Department: -Prof. Manal Ghanem - Signature: -M. Ghanem

Head of Curriculum Committee/Faculty: ----- Signature: ----

Dean: Mahmoud Jaghoub Signature: -----