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

1.	**Course Title**	**Applied Mathematics-2**
2.	**Course Number**	0301702
3.	**Credit Hours (Theory, Practical)**	3
	Contact Hours (Theory, Practical)	3
4.	**Prerequisites/ Corequisites**	Applied Mathematics-1
5.	**Program Title**	Masters in Mathematics
6.	**Program Code**	
7.	**School/ Center**	Science
8.	**Department**	Mathematics
9.	**Course Level**	Elective specialization requirement
10.	**Year of Study and Semester (s)**	First year (semester-2) , Second year (all semesters)
11.	**Other Department(s) Involved in Teaching the Course**	None
12.	**Main Learning Language**	
13.	**Learning Types**	■Face to face learning ☐Blended ☐Fully online
14.	**Online Platforms(s)**	☐Moodle ■Microsoft Teams
15.	**Issuing Date**	15/12/2024
16.	**Revision Date**	15/12/2024

17. Course Coordinator:

Name: Mohammed Al-Horani Contact hours: Sun, Tue, (10-11)

Mon, Wed (11:30-12:30)

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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:

Review of Separation of Variables, Review of Transform Methods, Eigen Function Expansions, Green's Function, Perturbation Methods, Integral Equations

20. Program Student Outcomes (SO's):

(To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

SO-2) Analyze and apply different mathematical algorithms and theories and use modern techniques in both teaching and research

SO-4) Formulate mathematical and statistical problems by modeling real-life problems, and solve them theoretically and/or numerically using technological tools.

SO-6) Apply knowledge and mathematical tools and think creatively to solve real life problems and then verify and interpret the results correctly.

SO-7) Work effectively within work teams and communicate scientific knowledge and results with peers and experts in the field.

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

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

1. To solve nonhomogeneous PDEs using Eigenfunction expansion
2. To find a Green's function for a BVP of PDEs
3. To study the solvability of an integral equation (Fredholm and Volterra)
4. To apply perturbation methods on some PDEs

Course CLOs	The learning levels to be achieved					
	Remembering	Understanding	Applying	Analysing	evaluating	Creating
1	√	√	√		√	
2		√	√	√	√	
3	√	√	√	√	√	
4		√	√		√	

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

Program SO's / Course CLO's	SO (1)	SO (2)	SO (3)	SO (4)	SO (5)	SO (6)	SO (7)	SO (8)
1- To solve nonhomogeneous PDEs using Eigenfunction expansion		•		•		•		
2- To find a Green's function for a BVP of PDEs		•		•		•		
3- To study the solvability of an integral equation (Fredholm and Volterra)		•						
4- To apply perturbation methods on some PDEs		•					•	

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 / Asynchronous Lecturing	Evaluation Methods	Learning Resources
1	1.1	Review of separation of variables	2	FF	Teams	S	Exams	Text Book
	1.2	Review of Transform Methods	2	FF	Teams	S	Exams	Text Book
2	2.1	Review of Transform Methods	2	FF	Teams	S	Exams	Text Book
	2.2	Eigenfunction Expansion (Introduction)	2	FF	Teams	S	Exams	Text Book
3	3.1	Nonhomogeneous Heat Equation	2	FF	Teams	S	Exams	Text Book
	3.2	Nonhomogeneous Heat Equation	2	FF	Teams	S	Exams	Text Book
4	4.1	Nonhomogeneous Wave Equation	2	FF	Teams	S	Exams	Text Book
	4.2	Nonhomogeneous Wave Equation	2	FF	Teams	S	Exams	Text Book
5	5.1	Nonhomogeneous Laplace Equation	2,7	FF	Teams	S	Exams	Text Book
	5.2	Nonhomogeneous Laplace Equation	2,7	FF	Teams	S	Exams	Text Book
6	6.1	Green's Functions (Introduction)	2,7	FF	Teams	S	Exams	Text Book
	6.2	Green's Functions for Heat Equation	2,7	FF	Teams	S	Exams	Text Book
7	7.1	Green's Functions for Wave Equation	2,7	FF	Teams	S	Exams	Text Book
	7.2	Green's Functions for Laplace Equation	2,7	FF	Teams	S	Exams	Text Book
8	8.1	Perturbation Method (Introduction)	2	FF	Teams	S	Exams	Text Book
	8.2	Regular Perturbation	2	FF	Teams	S	Exams	Text Book
9	9.1	Regular Perturbation	2	FF	Teams	S	Exams	Text Book
	9.2	Singular Perturbation	2	FF	Teams	S	Exams	Text Book
10	10.1	Singular Perturbation	2	FF	Teams	S	Exams	Text Book
	10.2	Integral Equations (Basic concepts)	2	FF	Teams	S	Exams	Text Book
11	11.1	Separable (Degenerate) kernel	2	FF	Teams	S	Exams	Text Book
	11.2	Reduction to system of algebraic equations	2	FF	Teams	S	Exams	Text Book
12	12.1	Reduction to system of algebraic equations (Examples)	2	FF	Teams	S	Exams	Text Book
	12.2	Resolvent kernal	2	FF	Teams	S	Exams	Text Book
13	13.1	Fredholm Alternative Theoerm	2	FF	Teams	S	Exams	Text Book
	13.2	Method of successive approximations	2,4,6	FF	Teams	S	Exams	Text Book

14	14.1	Volterra Integral equation	2,4,6	FF	Teams	S	Exams	Text Book
	14.2	Volterra Integral equation (Laplace and Differentiation Method)	2,4,6	FF	Teams	S	Exams	Text Book
15	15.1	Applications to ODEs (IVP)	2	FF	Teams	S	Exams	Text Book
	15.2	Applications to ODEs (BVP)	2	FF	Teams	S	Exams	Text Book

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
Assignments	30	Chap 1-4	2,4,6,7	week 1-14	On campus
Mid Term	30	Chap 1-2	2	9th week	On campus
Final Exam	40	Chap 1-4	2,4,6,7	16th week	On campus

25. Course Requirements:

Each student must have:

- Computer
- Account on Microsoft Teams

26. Course Policies:

Class attendance of students at the beginning of the lecture is recoded.

Assignment is given to the students at regular intervals for them to solve and submit.

Late or no submission of assignments carries penalties or loss of grade points.

Absences recorded in each lecture with making excuses, if any.

Exiting during the lecture since Formal justification or excuse forces.

Mobile phone use in the classroom is Forbidden.

27. References:

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

(1) Tyn Myint-U, Partial Differential Equations for Scientists and Engineers, Science Publishing Co. Inc., New York (1987).
(2) Ram P. Kanwal , Linear Integral Equations: Theory and Technique, Academic Press, New York (1971).
(3) A. H. Nayfeh, Perturbations Methods, New york (1973).

B- Recommended books, materials, and media:

(4) J. Ray Hanna, John H. Rowland, Fourier Series, Transforms, and Boundary Value Problems: Second Edition, Dover Publications, Inc., New York (2008).
(5) Lawrence C. Evans, Partial Differential Equations, American Mathematical Society (2010).

(6) Differential equations with boundary value problems, Zill D., Cullen M.

28. Additional information:

Name of the Instructor or the Course Coordinator: **Prof. Mohammed Al-Horani**	Signature: ……	Date: 15-12-2024
Name of the Head of Quality Assurance Committee/ Department: **Prof. Manal Ghanem**	Signature: ……	Date: ……
Name of the Head of Department: **Prof. Baha Alzalg**	Signature: ……	Date: ……
Name of the Head of Quality Assurance Committee/ School of Science: **Prof. Emad A. Abuosba**	Signature: ……	Date: ……
Name of the Dean or the Director: **Prof. Mahmoud I. Jaghoub**	Signature: ……	Date: ……