Philadelphia University

Department of Basic Sciences and Mathematics

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| First Semester |  |  | Course Syllabus | 2023/2024 |  |
|  |  |  |  |  |  |  |  |  |
|  | Course Title | Partial Differential Equations |  |  |
|  | Course Code | 250305 |  |  |  |  |
|  | Lecturer | Dr. Khaled Hyasat |  |  |
|  | Office Room | Room 1014 |  |  |
|  | Office Hours | Sat. to Mon. from 12:30 to 13:30Sun. to Tue. 8:30 to 9:30 |  |  |
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Course Description

This module is a first course in Elementary Partial Differential Equations covering topics such as first order equations and their solutions, second order equations and

classification into canonical forms (parabolic, elliptic, and hyperbolic), characteristics, solution of second order equation using differential operators, Fourier series, solution of BVP's in rectangular coordinates using separation of variables.

Topics by the Week

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| Week | Topics |
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| 1 | Partial Differential Equations and Fourier Series: Two-Point Boundary |
|  | Value Problems. |
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| 2 | Fourier Series. |
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| 3 | The Fourier Convergence Theorem. |
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| 4 | Even and Odd Functions. |
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| 5 | Separation of Variables; Heat Conduction in a Rod |
| 6 | Separation of Variables; Heat Conduction in a Rod. |
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| 7 | Other Heat Conduction Problems. |
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| 8 | The Wave Equation: Vibrations of an Elastic String. |
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| 9 | Laplace's Equation. |
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| 10 | Boundary Value Problems: The Occurrence of Two-Point Boundary Value |
|  | Problems. |
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| 11 | SturmLiouville Boundary Value Problems. |
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| 12 | Nonhomogeneous Boundary Value Problems. |
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| 13 | Singular SturmLiouville Problems. |
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| 14 | Further Remarks on the Method of Separation of Variables: A Bessel Series |
|  | Expansion. |
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| 15 | Series of Orthogonal Functions: Mean Convergence. |
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| 16 | Final Exams |
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Course Objectives Upon completion of the course, the student will be able to:

Solving initial boundary value problems using Separation of Variables Method. Solving initial boundary value problems using Eigenfunction Expansion Method.

Introducing the Sturm Liouville Eigenvalue Problems to students. Solving initial boundary value problems using Integral Transforms.

Solving first-order Linear and Quasi linear wave equations using Method of Charac-teristics.

Learning Outcomes:

 The student will have the knowledge and understanding of how to:

* Solve initial boundary value problems using Separation of Variables Method.
* Solve initial boundary value problems using Eigenfunction Expansion Method.
* Solve initial boundary value problems using Integral Transforms.
* Solve first order Linear wave equations using Method of Characteristics

Assessment Distribution

Students will be assessed based on a 100 total marks, which are distributed as follows.

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| --- | --- | --- |
| Exam Type | Expected Time | Points Allocated |
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| Mid Trem | TBA | 30% |
| Homeworks, Quizzes | 3 at least | 30% |
| Final |  | 40% |

Textbook and Supporting Materials

William E. Boyce and Richard C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, John Wiley and Sons 2010. Call number in PU library: 515.35 BOY.

Dennis G. Zill and Michael R. Cullen, Differential Equations with Boundary Value Problems, 7th Edition, Brooks/ Cole 2009. Call number in PU library: Not Available.

Class Attendance

Attendance is expected of every student. Being absent is not an excuse for not knowing about any important information that may have been given in class. Under the University's regulations, a student whose absence record exceeds 15% of total class hours will automat-ically fail the course. Students who in any way disrupt the class will be expelled from the classroom and will not be allowed to return until the problem has been resolved.

Project Assignments

Students are allowed to work together on a project assignment; however, the work that

is turned in by each student must be his own. For instance, a mere copy of another student's work will not be graded. A written project must be properly presented to receive full credit. A late project is penalized one point per day after its due date. A project sent by email will not be accepted.

Late Exams

Late (make-up) exams will be given only to students who have a valid excuse and are able to provide a written document for its verification. The level of difficulty of a late exam is about 50% higher than that of the corresponding regular exam. All late exams will be conducted during the last week of the semester. Each student is allowed only one make-up in a semester, either for the rst exam or the second, but not both. There is no make-up for a late exam.

Dishonesty

Any form of dishonest conduct will be strictly punished. A student who is caught cheating, or attempting to do so in an exam will be given a zero for the exam and a report will be written to the Dean for further action. A student who helps another student or is seen communicating with another student in an exam will be given the same penalty stated in the previous point. Students with different exam forms are not exempt from the above rules. Repeat offenders will be expelled permanently and banned from future courses.

Khaled Hyasat

Page 3