The University of Jordan

Accreditation & Quality Assurance Center

COURSE Syllabus

Course Name:
Partial Differential Equations II
16. Course Coordinator:

Office numbers, office hours, phone numbers, and email addresses should be listed.

Dr. Ahmad Alawneh

17. Other instructors:

Office numbers, office hours, phone numbers, and email addresses should be listed.

18. Course Description:

As stated in the approved study plan.

First order differential equation in two independent variables; semilinear and quasilinear equations; first order non-linear equations; second order linear equations; canonical forms; Green’s function method; transforms method.
19. Course aims and outcomes:

A- Aims:
1. classify PDEs as linear, semi-linear, quasilinear and nonlinear,
2. solve first-order PDEs in two independent variables,
3. find the canonical forms of PDEs of second order,
4. solve second-order PDEs by characteristics method,
5. use transform methods for solving PDEs,

B- Intended Learning Outcomes (ILOs): Upon successful completion of this course students will be able to ...

Successful completion of the course should lead to the following outcomes:

A. Knowledge and Understanding Skills: Student is expected to
   A1) solve Pfaffian differential equations,
   A2) use the method of characteristics,
   A3) find compatible system of first-order partial differential equations
   A4) find canonical forms,
   A5) use transform method
   A6) use Green's function method.

B. Intellectual Analytical and Cognitive Skills: Student is expected to
   B1) use mathematical methods (method of characteristics, integral transforms, Green's function method ) to describe, solve and interpret real- world problems.

C. Subject- Specific Skills: Student is expected to
   C1) classify partial differential equations,
   C2) reduce partial differential equations to canonical form,
   C3) use method of characteristics,
   C4) use Laplace, Fourier and Mellin transforms for solving partial differential equations,
   C5) compute Green's function.

D. Creativity /Transferable Key Skills/Evaluation: Student is expected to
   D1) Use partial differential equations to model real-world problems.
   D2) Provide basic knowledge in the theory of partial differential equations.
20. Topic Outline and Schedule:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Week</th>
<th>Instructor</th>
<th>Achieved ILOs</th>
<th>Evaluation Methods</th>
<th>Reference</th>
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<tr>
<td>1. Review: surfaces and curves in space. Orthogonal trajectories.</td>
<td>1-3</td>
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<tr>
<td>2. Ordinary differential equations.</td>
<td>4-6</td>
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<tr>
<td>(a) Ordinary differential equations in more than two variable.</td>
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<tr>
<td>(b) Method of solution of ( \frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R} )</td>
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<td>(c) Solution of Pfaffian differential equation in three variables.</td>
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<td>3. Partial differential equations of first order.</td>
<td>7-9</td>
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<tr>
<td>(a) Cauchy's problem of first-order equations.</td>
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<td>(b) Linear and quasi-linear first-order partial differential equations.</td>
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<td>(c) Nonlinear first-order partial differential equations.</td>
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<td>(d) Method of characteristics.</td>
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<td>(e) Compatible system of first-order partial differential equations.</td>
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<td>(f) Special types of first-order partial differential equations.</td>
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<td>(g) Solutions satisfying given conditions.</td>
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<td>4. Second order linear partial differential equations in two variables.</td>
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<td>(a) Linear partial differential equations with constant coefficients.</td>
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<td>(b) Equations with variable coefficients.</td>
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<td>(c) Characteristic curves of second-order partial differential equations.</td>
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<td>(d) Canonical forms.</td>
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<td>5. Transform methods.</td>
<td>13-14</td>
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<tr>
<td>(a) Review of Laplace and Fourier Transforms.</td>
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<td>(b) Mellin transform.</td>
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<tr>
<td>(c) Application of transform for solving ordinary and partial differential equations with variable coefficients.</td>
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<td>(a) Free space Green's function for Laplace equation.</td>
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<td>(b) Method of Images.</td>
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21. Teaching Methods and Assignments:

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

In order to succeed in this course, each student needs to be an active participant in learning – both in class and out of class.
- The instructor will spend most of the class time on presenting the new material as well as on discussing homework problems.
- Group work in this class is encouraged.
- You should be prepared to discuss your homework at each class meeting.
- You are encouraged to work together with other students and to ask questions and seek help from your professor, both in and out of class.

22. Evaluation Methods and Course Requirements:

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

<table>
<thead>
<tr>
<th>ILOs</th>
<th>Learning Methods</th>
<th>Evaluation Methods</th>
<th>Related ILOs to the program</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Lectures</td>
<td>Exam</td>
<td></td>
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</table>

23. Course Policies:

1. 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.
2. 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.
3. 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.
4. Test papers shall be returned to students after correction. His/her mark is considered final after a lapse of one week following their return.
5. Cheating is prohibited. The University of Jordan regulations on cheating will be applied to any student who cheats in exams or on home works.

24. Required equipment:

Data Shows
25. References:

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


B- Recommended books, materials, and media:

(4) W.E. Williams, Partial Differential Equations, (1980), Oxford University Press
(8) W.O. Bray, A Journey into PDEs, (2012), Jones & Bartleit Learning.

26. Additional information:

Name of Course Coordinator: Dr. Ahmad Alawneh Signature: ------------------- Date: 8.2.2017
Head of curriculum committee/Department: Dr. Hisham M. Hilow Signature: -------------------------------
Head of Department: Dr. Baha Alzalg Signature: -------------------------------
Head of curriculum committee/Faculty: Dr. Amal Al-Aboud Signature: -------------------------------
Dean: Dr. Sami Mahmood Signature: -------------------------------

Copy to:
Head of Department
Assistant Dean for Quality Assurance
Course File