جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Weak Solutions of PDE - AMCS 232

Division	Computer, Electrical and Mathematical Sciences & Engineering
Course Number	AMCS 232
Course Title	Weak Solutions of PDE
Academic Semester	Spring
Academic Year	2017/2018
Semester Start Date	01/28/2018
Semester End Date	05/24/2018
Class Schedule (Days & Time)	02:30 PM - 04:00 PM | Wed Thu

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Alexander Stephan Richard Lorz	alexander.lorz.1@kaust.edu.sa			appointments by email confirmation

Teaching Assistant(s)

Name	Email
none	none

Course Information

Comprehensive Course Description	weak solutions of linear elliptic, hyperbolic and parabolic PDE, theory of Schwartz and tempered distributions, fundamental solutions, semigroups and groups of strongly continuous operators, smoothing properties and transport of singularities
Course Description from Program Guide	This is a first course on weak solutions of partial differential equations. The course begins with a brief introduction to distributions and weak derivatives. Next, we consider Sobolev spaces and fundamental results: extension and trace theorems, Sobolev and Morrey theorem, Poincare's inequality and Rellich-Kondrachov theorem. Then, we examine weak solutions of elliptic equations through Lax-Milgram theorem. The course ends with a discussions of weak solutions of linear evolution equations - second-order linear parabolic equations, linear hyperbolic systems and semigroup methods.
Goals and Objectives	understanding of basic linear PDE through the viewpoint of weak solution theory, particularly the Poisson, heat and wave equation
Required Knowledge	previous courses in ODE and PDE
Reference Texts	Lawrence Craig Evans, Partial Differential Equations, Graduate Studies in Mathematics, Vol 19
Method of evaluation	**100.00**% - Presentation
Nature of the assignments	reading and paper presentation
Course Policies	to be discussed in the first classroom meeting
Additional Information	The instructor reserves the right to make changes to this syllabus as necessary.

Tentative Course Schedule *(Time, topic/emphasis & resources)*		
Week	**Lectures**	**Topic**
1	Wed 01/31/2018 Thu 02/01/2018	distribution theory
2	Wed 02/07/2018 Thu 02/08/2018	distribution theory
3	Wed 02/14/2018 Thu 02/15/2018	distribution theory
4	Wed 02/21/2018 Thu 02/22/2018	Lax-Milgram Lemma
5	Wed 02/28/2018 Thu 03/01/2018	Lax-Milgram Lemma
6	Wed 03/07/2018 Thu 03/08/2018	fundamental solutions
7	Wed 03/14/2018 Thu 03/15/2018	fundamental solutions
8	Wed 03/21/2018 Thu 03/22/2018	Sobolev Spaces
9	Wed 03/28/2018 Thu 03/29/2018	Sobolev Spaces
10	Wed 04/04/2018 Thu 04/05/2018	Sobolev spaces, imbeddings
11	Wed 04/11/2018 Thu 04/12/2018	semigroups
12	Wed 04/18/2018 Thu 04/19/2018	semigroups
13	Wed 04/25/2018 Thu 04/26/2018	stationary solutions
14	Wed 05/02/2018 Thu 05/03/2018	convergence to equilibrium
15	Wed 05/09/2018 Thu 05/10/2018	groups of linear operators, wave equations
16	Wed 05/16/2018 Thu 05/17/2018	groups of linear operators
17	Wed 05/23/2018 Thu 05/24/2018	transport of singularities
18		energy methods

Note

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