PHY 712 Electrodynamics
9-9:50 AM MWF Olin 105

Plan for Lecture 5:

Reading: Chapter 1 & 2 in JDJ

Introduction to numerical methods

1. **Finite difference methods with 2-dimensional example (Section 1.13 of your textbook)**
2. **Finite element methods with 2-dimensional example (Section 2.12 of your textbook)**

PHY 712 Electrodynamics

MWF 9-9:50 AM | OPL 105 | http://www.wfu.edu/~natalie/s18phy712/

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Course schedule for Spring 2018

(Preliminary schedule -- subject to frequent adjustment.)

	Lecture date	JDJ Reading	Topic	HW	Due date
	Wed: 01/17/2018	No class	Snow		
1	Fri: 01/19/2018	Chap. 1 & Appen.	Introduction, units and Poisson equation	#1	01/26/2018
2	Mon: 01/22/2018	Chap. 1	Electrostatic energy calculations	#2	01/26/2018
3	Wed: 01/24/2018	Chap. 1	Poisson's equation and Green's theorem	#3	01/26/2018
4	Thu: 01/25/2018	Chap. 1 & 2	Poisson's equation in 2 and 3 dimensions		
5	Fri: 01/26/2018	Chap. 1 & 2	Brief introduction to numerical methods	#4	02/02/2018
6	Mon: 01/29/2018				
7	Wed: 01/31/2018				

PHY 712 – Problem Set #4

Continue reading Chaper 1-3 in **Jackson**

1. Consider a two-dimensional charge distribution of the form:

$$\rho(x) = \rho_0 \sin\left(\frac{\pi x}{a}\right) \sin\left(\frac{2\pi y}{a}\right),$$

where ρ_0 represents a density constant and a represents a length constant. In the problem, you are asked to determine the electrostatic potential $\Phi(x, y)$ for $0 \le x \le a$ and $0 \le y \le a$, which satisfies the Poisson equation for the charge density $\rho(x, y)$. and statisfies the boundary conditions $\Phi(0, y) = \Phi(a, y) = \Phi(x, 0) = \Phi(x, a) = 0$.

   (a) Find the analytic form of the electrostatic potential $\Phi(x, y)$ for $0 \le x \le a$ and $0 \le y \le a$.

   (b) Using the finite difference method for the two grids discussed in class, find $\Phi(x, y)$ on the grid points.

   (c) Using the finite element method for the two grids discussed in class, find $\Phi(x, y)$ on the grid points.

   (d) Compare the accuracy of the numerical solutions for this example.