INTRO GEOSCIENCE COMPUTATION

Luc Lavier

PROJECTS:
- Intro to Matlab
- **Calculating Gutenberg-Richter laws for earthquakes.**
- **1D-2D diffusion equation.**
- **1D-2D transport equation.**
- **1D-2D advection-diffusion equation.**
- **Wave propagation in 1D-2D.**

January 18th 2012: **Introduction**.
* Description of the class (Format of class, 55 min lecture/ 55 min exercise)
* Login for computers
* Check Matlab
* Questionnaires
* Examples of problems addressed via computation in Geosciences (CIG)

January 17th: 2012: Class Introduction

January 19th 2012: MATLAB INTRODUCTION (Variables)

First Homework (MATLAB INTRO PROBLEMS (always due next Thursday).

January 24th 2012: MATLAB INTRODUCTION (Vectors and Arrays)

January 26th 2012: MATLAB INTRODUCTION (Scripts and functions and plotting)

Second Homework (Write scripts).

January 31st 2012: Richter-Gutenberg law (IF statements)

February 2nd 2012: Ground motion (FOR loops)

Third Homework (Ground motion homework).

February 7th 2012: Heat diffusion 1D steady state (Script for equation solver)

February 9th 2012: 1D diffusion (Energy conservation lecture, discretization, FTCS)

Fourth Homework (1D non-steady state Heat flow, Mars, Moon)

February 14th 2012: 1D and 2D diffusion

February 16th 2012: Explicit methods to solve the diffusion problem.

Fifth Homework (Diffusion in 2D, Cook steak).

February 21st 2012: Matrices Arrays lecture (Inversion, decomposition)

February 23rd 2012: Crank-Nicholson for Diffusion.

Sixth Homework (Diffusion in 2D, Implicit)

February 28th 2012: 1D transport – Wave equation in finite difference

March 1st 2012: 2D transport- Implicit method for our geosciences problems

Seventh Homework (transport schemes)

March 6th 2012: Example of transport (fluid advection)

March 8th 2012: Midterm exam (Take home starting in class)? Or transport equation in 2D

SPRING BREAK
CHOOSE PROJECT ASSIGNEMENT

March 20th 2012: Midterm exam (Take home starting in class)? Or transport equation in 2D

March 22nd 2011: 2D advection-diffusion.

March 27th 2012: Convection of mantle in 2D (plumes, mantle convection) from Taras Gerya (ETH Zurich)

April 3rd 2012: FINAL PROJECT ASSIGNEMENT
April 5th 2012: FINAL PROJECT ASSIGNEMENT

April 10th 2012: FINAL PROJECT ASSIGNEMENT
April 12th 2012: FINAL PROJECT ASSIGNEMENT

April 17th 2012: FINAL PROJECT ASSIGNEMENT
April 19th 2012: FINAL PROJECT ASSIGNEMENT

April 24th 2012: FINAL PROJECT ASSIGNEMENT
April 27th 2012: FINAL PROJECT PRESENTATION (AGU style:15 min each)

May 1st 2012: FINAL PROJECT PRESENTATION (15 min each)
May 3rd 2012: FINAL PROJECT PRESENTATION (15 min each), project paper due.

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Midterm: Take home.

Final project: 5 pages summary + Appendix
I INTRO: problem statement with equations
II METHODS
III RESULTS AND UNCERTAINTIES
IV DISCUSSION
V APPENDIX WITH CODE AND PLOTTED RESULTS

15 min presentation with Powerpoint or Pdf includes 10 slides no more (AGU format)