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 15th 2013: **Introduction**.
* Description of the class (Format of class, 35 min lecture/ 50 min exercise)
* Login for computers
* Check Matlab
* Questionnaires
* Examples of problems addressed via computation in Geosciences (CIG)

January 17th: 2013: MATLAB INTRODUCTION (Variables, Vectors and Arrays)

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

January 22th 2013: MATLAB INTRODUCTION (Kevin)

January 24th 2013: MATLAB INTRODUCTION (Scripts and functions and plotting)

Second Homework (Write scripts).

January 29th 2013: Richter-Gutenberg law (IF statements Load data)

January 31st 2013: Ground motion (FOR loops)

Third Homework (Ground motion homework)

February 5th 2013: Heat diffusion 1D steady state (Script for equation solver)

February 7th 2013: 1D diffusion (Energy conservation lecture, discretization, FTCS)

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

February 12th 2013: 1D and 2D diffusion

February 14th 2013: Explicit methods to solve the diffusion problem.

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

February 19th 2013: Matrices Arrays lecture (Inversion, decomposition)

February 21st 2013: Crank-Nicholson for Diffusion.

Sixth Homework (Diffusion in 2D, Implicit)

February 26th 2013: 1D transport – Wave equation in finite difference

February 28th 2013: 2D transport- Implicit method for our geosciences problems

Seventh Homework (transport schemes)

March 5th 2013: Example of transport (fluid advection)

March 7th 2013: Midterm exam (Take home starting in class)? Or transport equation in 2D

SPRING BREAK
CHOOSE PROJECT ASSIGNEMENT
Choose day and time of presentation

March 19th 2013: Midterm exam (Take home starting in class)? Or transport equation in 2D

March 21st 2013: 2D advection-diffusion.

March 27th 2013: FINAL PROJECT ASSIGNEMENT

April 2nd 2013: FINAL PROJECT ASSIGNEMENT
April 4th 2013: FINAL PROJECT ASSIGNEMENT

April 9th 2013: FINAL PROJECT ASSIGNEMENT
April 11th 2013: FINAL PROJECT ASSIGNEMENT

April 16th 2013: FINAL PROJECT ASSIGNEMENT
April 18th 2013: FINAL PROJECT ASSIGNEMENT

April 23rd 2013: FINAL PROJECT ASSIGNEMENT
April 25th 2013: FINAL PROJECT PRESENTATION (AGU style:12 min each)

April 30th 2013: FINAL PROJECT PRESENTATION (12 min each)
May 2nd 2013: FINAL PROJECT PRESENTATION (12 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)

Grade is 45 % homework, 15% Take home midterm and 40 % final project

Homework policy. 2% off for each additional day late.