Development of the Course Materials (Handbook) for MATH/PHYS 2510 –Computational Science and Engineering

Gurdial Arora and Anderson Sunda-Meya

Main Goal

- Select carefully a set of homework assignments and examples from disciplines (Physics/Engineering/ Mathematics)
- Have a better understanding in writing computer programs using software MATLAB
- To make computer programming more accessible
- To develop a Handbook

History of the Course

- This course was approved by the academic council in the academic year 2015-2016.
- This course was offered for the first time in Spring 2017 and was team taught by Dr. Gurdial Arora and Dr. Anderson Sunda-Meya

Rationale of the Project

- The students (physics/engineering and math majors) use matrices extensively in their disciplines.

- It is imperative that the students are exposed to programming in MATLAB software that is an ideal programming environment for these disciplines

Rationale of the project

- This proposal will help students to have a better understanding of the programming concepts with the help of MATLAB and its applications to their respective disciplines.

Rationale of the project

- The material developed for this course will help the students make connections seamlessly between the topics and concepts learned in the course.

Programming Languages

- First high-level language: FORTRAN(1954)
- To make programming easier, especially to solve numerical problems
- Today's Languages: 1970s-
- For commercial, C, C++, Java, C#, etc.
- To make programming easier and to solve numerical problems: MATLAB

MATLAB History

- Invented by Prof. Cleve Moler to make programming easy for his students
- Late 1970s
- University of New Mexico
- The MathWorks, Inc. was formed in 1984
- By Moler and Jack Little
- One Product: MATLAB

MATLAB History(contd)

- Today
- 100 products
- Over 1,000,000 users
- Taught in 5,000 universities

Impact

- In 2012, IEEE gave Cleve Moler its annual Pioneer Award (For improving the quality of mathematical software, making it more accessible, and creating MATLAB)

Current State

- Course was offered for the first time in Spring 2017
- Currently Math/Physics/Engineering Majors take CPSC 1710 as a required course in their disciplines
- This course will serve a dual purpose
  - Teach programming concepts
  - Help students solve problems in the disciplines that they are majoring in

Current State

- Eight Conceptual quizzes were created
- Six Projects were developed
- One Lab was developed

Content

- Handbook
  - Learning Objectives and goals
  - Detailed solved examples
  - Supplemental Problems with Solutions
  - Projects
  - Labs
  - Variety of exercises including homework problems

Assessment of the Project

- Student Survey
- Informal and formal feedback from students about the projects selected for the course
- Course Passing rate for three years
- Final Exam Passing Rate for next three years

Future Plans

- Continue Monitoring the course
- Develop more projects
- Develop 10 more labs
- Develop more conceptual quizzes
- Make changes to the handbook based on student feedback
- Incorporate student evaluation

Future Plans (Cont.)

- Research other books
- Select more homework problems

Plans for Dissemination

- Publications
- Presentations at professional meetings