CDS 130-001 Computing for Scientists

Final Exam Review

Dec. 08, 2011

The following is a complete list of topics that will be covered in the final exam.

Tool: Introduction to MATLAB (MT) (PPT/PDF Slides 1- 156)
CH-1: Prologue
CH-2: The MATLAB Environment
CH-3: Assignments, Variables and Intrinsic Functions
CH-4: Vectors and Vector Operations
CH-5: Matrics (Arrays) and Matrix Operations
CH-6: Iteration 1: For Loops
CH-7: Write a Program
CH-8: Basic Graphs and Plots
CH-9: Iteration II: Double Nested FOR Loops (DNFL)
CH-10: Conditionals: IF Statements

Section I: Computer Fundamentals (CF) (PPT Slides, all from 1-131)
CF-1: Binary Representation
- Binary Positional Notation
- Binary to Decimal Conversion: Template Method
- Decimal to Binary Conversion: Template Method
- Decimal to Binary Conversion: Long Division Method
- Octal Numeral System; Hexadecimal Numeral System

CF-2: Binary Operation
- Binary Addition
- Binary Subtraction
- Binary Multiplication

CF-3: Data Storage and Binary Encoding
- Devices Storing Binary Data
- Bits, Bit Pattern, Bytes
- ASCII Code, ASCII Table
- Encoding ASCII Characters to Binary Sequences
- Decoding Binary Sequences to ASCII Characters

CF-4: Logic Circuits and Logic Tables
- Transistor: the building block
- AND gate, AND table
- OR gate, OR table
- NOT gate, NOT table
- NAND gate, NAND table
- NOR gate, NOR table
- XOR gate, XOR table

- Logic Circuits with Three Inputs
- Binary Number Adding Machine

Section II: Scientific Simulation (SS) (PPT Slides, from 1-132)

SS-1: Introduction
SS-2: Mathematical Model
- The Pipeline of Scientific Model, Mathematical Model and Computational Model
- Converting Scientific Model to Mathematical Model
- Computational Model Implementation Using MATLAB: FOR LOOP
- Predator-Prey Model: two unknowns

SS-3: Computational Model
- Algorithm, Iteration, Interval and Subinterval
- Differentiation
- Integration

SS-4: Scientific Methods

Section III: Visualization (VI) (PPT Slides, from 1-101)

VI-1: Introduction
VI-2: 2-D Array
- Double Nested For Loop, and IF Statement

VI-3: Color, Colormap and Image
- RGB system
- "imagesc" method
- "colormap"

VI-4: Height Plot
- "surf" method

Section IV: Data Analysis (DA) (PPT Slides, from 1-62)

DA-1: Introduction
DA-2: Statistical Measures
- minimum, maximum, median, mean, variance and standard deviation

DA-3: Histogram
- Bin and Frequency
- "hist" method

DA-4: Linear Regression
- "polyfit" method
- "corrcoef" method
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Section V: Ethics (ET) (PPT Slides, from 1-15)