METROPOLITAN STATE UNIVERSITY OF DENVER
Office of Academic and Student Affairs

REGULAR COURSE SYLLABUS

College of: Letters, Arts, and Sciences

Department: Mathematical and Computer Sciences

Prefix & Course Number: CSS 3000 **Crosslisted With*:**

Course Title: Computing for Advanced Manufacturing

Transcript Course Title (30 characters): Computing for Adv. Man.

Check All That Apply: Required for Major: ___ Required for Minor: ___ Specified Elective:

Required for Concentration: ___ Elective: ___ Service Course: X

To receive Title IV financial aid funds, all institutions of higher education must comply with the federal definition of a credit hour. The Higher Learning Commission requires institutions to maintain policies and procedures for verifying compliane with this definition.

> ***Federal Credit Hour Definition:*** *A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than:*
> *(1) one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time; or (2) at least an equivalent amount of work as required in paragraph (1) of this definition for other activities as established by an institution, including laboratory work, internships, practica, studio work, and other academic work leading toward to the award of credit hours. 34CFR 600.2 (11/1/2010)*

Credit Hours: 4 (4+0) **Schedule Type:** L **Grade Mode:** L

Face-to-Face or Equivalent Hours per course:

Lecture 60 Lab _____ Internship _____ Practicum _____ Other:

Additional Student Work Hours per course: 120

Variable topics umbrella course: **No** X **Yes** _____ If Yes, number of credit hours allowed

Specified repeatable course: **No** X **Yes**

APPROVED:

A. J. [illegible]	10/1/2015
Department Curriculum Committee	Date
L B Packer	10.1.2015
Department Chair **OR** Program Director	Date
Linda Hong-Sandra	10/28/15
Dean **OR** Associate Dean	Date
[illegible]	1-18-17
Associate VP, Academic Affairs	Date

*If crosslisted, attach completed Course Crosslisting Agreement Form

Prerequisite(s): ENG 1020, MTH 1120, PHY 2010, AMS 1010

Corequisite(s): None

Prerequisite(s) or Corequisite(s):

Banner Enforced Coding:
Prerequisite(s): ENG 1020, MTH 1120, PHY 2010, AMS 1010
Corequisite(s):
Prerequisite(s) or Corequisite(s):

Registration restrictions: Level UG **Class** _____ **Program/Major** _____ **Student attribute**

Catalog Course Description:
This course provides a broad overview of computing topics important to all Advanced Manufacturing disciplines. These topics include: algorithms and algorithmic thinking; computer programming; developing software to control robots and perform simulations; fundamental concepts in computer systems, networking, and hardware; human-computer interaction; legal, social and ethical implications of computing; and computer and data security.

This course will not count as an upper-division Computer Science elective for Computer Science majors.

Required Reading and Other Materials will be equivalent to:

1) Don Norman (2013). *The Design of Everyday Things: Revised and Expanded Edition*, Basic Books
2) Dale & Lewis (2014). *Computer Science Illuminated, Sixth Edition*, Jones & Bartlett

Current appropriate papers such as:
1) Phillip Guo, "Why Scientists and Engineers Must Learn Programming", http://cacm.acm.org/blogs/blog-cacm/166115-why-scientists-and-engineers-must-learn-programming/fulltext, July 2013 [accessed 11 September 2015]
2) ACM, "Software Engineering Code of Ethics and Professional Practice", https://www.acm.org/about/se-code [accessed 11 September 2015]
3) IEEE, "IEEE Code of Ethics", http://www.ieee.org/about/corporate/governance/p7-8.html [accessed 11 September 2015]
4) Bruce Schneier, "Sony's DRM Rootkit: The Real Story", Schneier on Security, 2005. https://www.schneier.com/blog/archives/2005/11/sonys_drm_rootk.html [accessed 11 September 2015]
5) Deborah G. Johnson, "Ethics Online", Communications of the ACM, Vol. 40, No. 1, January 1997. http://social.cs.uiuc.edu/class/cs598kgk-04/papers/p60-johnson.pdf, [accessed 11 September 2015]

Specific, *Measurable* Student Behavioral Learning Objectives:
Upon completion of this course the student should be able to (format: 1, a, i, ii, etc.):
1) Explain how the computer's CPU, memory, busses, and networks interact
2) Design and implement a program to control a robot
3) Design, implement and evaluate the results of a program to model a physical system
4) Critically analyze a user interface
5) Evaluate ethical considerations for a specific design decision
6) Evaluate the security of a specific system

Detailed Outline of Course Content (Major Topics and Subtopics; order and duration not indicative):

I. Computer Science Basics
   A. Algorithms and algorithmic thinking

B. Representing knowledge
C. Logic
D. Science, engineering and craft

II. Computer Programming Fundamentals
A. Variables and assignment
B. Loops
C. Conditionals
D. Collections (e.g., arrays, lists, sets)
E. Input & Output (console, file, device)

III. Robotics (e.g., Lego MindStorms, fischertechnik ROBO TX Automation Robots, Arduino kits)
A. System construction
B. Actuators
C. Sensors
D. Programming

IV. Data Analysis
A. Representing data
B. Scaling data
C. Graphing data
D. Modeling and simulation of physical systems

V. Computer Organization
A. CPU (instruction sets, registers, machine code)
B. Memory (internal memory models, external storage, caching, error correction)
C. Data transmission

VI. Operating Systems and Networking
A. Operating system fundamentals (scheduling, interrupt handling, resource sharing)
B. Networking (hardware interfaces, protocols, internet, secure transmission)

VII. Human-Computer Interaction
A. Human perception and behavior
B. User-centered design
C. Task-centered design
D. Prototyping (high and low fidelity)
E. Designing visual interfaces
F. Designing accessible interfaces

VIII. Legal, Social and Ethical Issues
A. Legal issues (intellectual property rights, privacy, liability)
B. Social issues (impact on people and the environment)
C. Ethical issues

IX. Security
A. Cybersecurity and cybercrime
B. Vulnerabilities and threat assessment
C. Protection and countermeasures — personal, organization, infrastructure
D. Cryptography-based protection

Evaluation of Student Performance (format: 1, a, i, ii, etc.):

At least three of the following:

1. Programming Assignments
2. Writing Assignments
3. Design Assignments
4. Quizzes and examinations
5. Final Exam