Boston University Metropolitan College

Advanced Programming Techniques

MET CS 622

Course Format (On Campus)

Reza Rawassizadeh
rezar@bu.edu
Office hours: by appointment

Course Description

This course starts by describing object-oriented concepts, including abstraction, encapsulation, and polymorphism in the context of Java programming languages. Next, the focus of the course will be shifted to the explanation of in-memory Java data structures, especially collections and efficient disk data storage and file access, including SSTables, LSM Trees, bit-level compression, sliding window, inverted index, hash structures, and trees impact on file search.

To enable students to install and configure professional development and programming environments, one or two sessions will be dedicated to shell scripting and Unix programming languages. Next, the course delves into building environments and professional settings in large-scale programming. Afterward, different database structures will be explained, and examples of SQL (MySQL) and NoSQL (MongoDB) will be provided in the class. One session will be dedicated to concurrency, and next, students will learn about asynchronous and synchronous messaging environments, including TCP, Socket, HTTP, and Web Services.

Course Requirements

Students who attend this course are required to be familiar with Java programming language.

Books

There is no specific book required for this course, slides and in class presence are enough. Nevertheless, for students who are interested in external materials following books are recommended:

- "OCA / OCP Java SE 8 Programmer Certification Kit" from Boyarsky and Selikoff
- "Designing Data Intensive Applications" from Klepmann.
- "UNIX and Linux System Administration Handbook: UNIX Linux Syste Admin Handbook" from Nemeth et al.
- "Machine Learning & Artificial Intelligence: Concepts, Algorithms, and Models", from Rawassizadeh.

Class Policies

1) **Attendance & Absences** – Class attendance is not mandatory but highly recommended.

2) **Assignment Completion & Late Work** – About 40% of final grade is coming from assignment delivery. Late submission of homework is associated with a penalty of 10% grade reduction for any single day.
3) **Academic Conduct Code** – "Cheating and plagiarism will not be tolerated in any Metropolitan College course. They will result in no credit for the assignment or examination and may lead to disciplinary actions. Please take the time to review the Student Academic Conduct Code: http://www.bu.edu/met/metropolitan_college_people/student/resources/conduct/code.html.

Grading Criteria

40% of the final grade is coming from assignments, 30% from final project delivery which is a scientific report about assignments and the last 30% are from final exam. Students who might require assistive grade could do a scientific presentation in the class and this can provide up to 10% additional credit on their final grade.

Class Meetings, Lectures & Assignments

List in a legible format all of the class meetings, lectures, and assignments. One example, based on a computer science course:

Lectures, Readings, and Assignments subject to change, and will be announced in class as applicable within a reasonable time frame.

Date	Topic	Assignments Due
Session 1	Object Oriented Concepts	Six days after Session 1
Session 2	Errors, Exceptions, I/O and File Management	Six days after Session 2
Session 3	Collections	Six days after Session 3
Session 4	Generics and Lambdas	NA
Session 5	Memory, Search and Indexing	Six days after Session 5
Session 6	Unix/Linux Shell Scripting I	Six days after Session 6
Session 7	Unix/Linux Shell Scripting II	NA
Session 8	Database Access, RDB and NoSQL I	Six days after Session 8
Session 9	Database Access, RDB and NoSQL II	Six days after Session 9
Session 10	Source Control, Build Tools & Continuous Integration	Six days after Session 10
Session 11	Concurrency	NA
Session 12	Batch/Stream Processing	NA
Session 13	Asynchronous/Synchronous Messaging	NA
Session 14	Containers and Web Services	NA