**Advanced Programming Techniques**

MET CS 622

Course Format (On Campus)

Reza Rawassizadeh

[rezar@bu.edu](mailto: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 session will be dedicated to shell scripting and Unix programming languages. Next, the course delves into build environments and professional settings in a large scale programming environment. Afterward, different database structures will be explained and examples with SQL (MySQL) and NOSQL (MongoDB) will be implemented 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.

**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 | Six days after Session 6 |
| Session 7 | Database Access, RDB and NoSQL I | NA |
| Session 8 | Database Access, RDB and NoSQL II | Six days after Session 8 |
| Session 9 | Source Control, Build Tools & Continuous Integration | Six days after Session 9 |
| Session 10 | Concurrency | Six days after Session 10 |
| Session 11 | Batch/Stream Processing | NA |
| Session 12 | Synchronous/ Asynchronous Messaging | NA |
| Session 13 | Project Presentations | NA |
| Session 14 | Review | NA |