**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 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 |