Foundations of Parallel, Concurrent, and Multithreaded Programming

Course Number: CSYE7215
Term: Spring 2018
CRN: 11176
Time: 6:00 PM – 9:30 PM on Thursdays
Location: 130 Hurtig Hall

Instructor: Prof. Mieczyslaw Kokar
Office Hours: Thursday 3pm – 5pm, or by appointment.
E-mail: m.kokar@neu.edu

Recommended or Required Text(s): Brian Goetz et al. "Java Concurrency in Practice." Addison-Wesley, Upper Saddle River, NJ, 2006. ISBN 9780321349606.

Course Description: Covers all aspects of concurrent program design, development, and implementation utilizing the Java multithreading API/facilities. Topics covered include thread safety and lifetime issues, block structured versus explicit synchronization, intrinsic versus explicit locking, thread pools, liveness issues, deadlock, livelock, race conditions, atomicity, performance and scalability, execution policies, test strategies. Major Java multithreading API/facilities covered include synchronized blocks, wait sets, intrinsic locks and condition variables, synchronized and concurrent collections, executor framework. **Prerequisites:** *CSYE 6200 or equivalent; engineering students only.*
4.000 Credit hours
4.000 Lecture hours

Course Objectives: The learning objectives of this course are:

1. The pitfalls of programming in Java without an in-depth knowledge of the impact of concurrency on program correctness.
2. The mechanisms provided by Java to deal with concurrency.
3. Patterns to follow in order to ensure that the program behavior is correct.

Grading Breakdown: The grade for this course will be based on the following:

1. Homeworks (50%)
2. Midterm exam (20%)

3. Final exam (30%).

Homeworks: The homeworks will include programming assignments and some problems.

1. Homeworks will be evaluated on the scale of 100 points. The homeworks and the due dates for the homeworks will be posted on Blackboard.
2. Homeworks uploaded to Blackboard after the deadline will not be graded and thus will count for zero points.

Project Information: N/A

Course Schedule: (Subject to change)

Week 1	01/11/2018	Course overview, Introduction, Testing
Week 2	01/18/2018	Thread safety
Week 3	01/25/2018	Sharing objects
Week 4	02/01/2018	Composing objects
Week 5	02/08/2018	Concurrent collections and synchronizers
Week 6	02/15/2018	Task execution and applying thread pools
Week 7	02/22/2018	Cancellation and shutdown
Week 8	03/01/2018	Midterm exam
Week 9	03/08/2018	Spring Break – no class
Week 10	03/15/2018	Parallelizing algorithms
Week 11	03/22/2018	Forks and joins
Week 12	03/29/2018	Akka: Actors and Java Programming
Week 13	04/05/2018	The Java memory model
Week 14	04/12/2018	New concurrency features in Java 9
Week 15	04/19/2018	Non-blocking algorithms. RMI, MapReduce/Hadoop
Week 16	04/26/2018	Final Exam

Academic Honesty:

The Northeastern University academic integrity policy applies to your work in this course. All students are expected to adhere to this policy. For more information on academic integrity policy, please visit website: http://www.northeastern.edu/osccr/

Facilitating academic dishonesty – Examples may include inaccurately listing someone as co-author of paper who did not contribute, sharing a take-home exam, or taking an exam or writing a paper for another student.

Attendance policy

The Information Systems Department has a strict class attendance policy. Students who miss two or more classes will automatically receive one letter grade lower in their final grade. Students who miss three classes will receive an automatic F for the class. No exceptions are allowed for this rule.