

Department: Computer Science and Mathematics

Course Code & Name	CSC447-Section 12 Parallel Programming for Multi-Core and Cluster Systems
Class Time and Location	TTR: 11:00 – 12:15; Online
INSTRUCTOR	Manal K. Jalloul
Credits Hours	3
Semester	Spring 2021

INSTRUCTOR

Manal K. Jalloul

Email: manal.jalloul@lau.edu.lb

Online Office: <https://lau.webex.com/lau/j.php?MTID=mec8f6bb18b753d5d182ee4631dc45088>

Office Hours: Friday: 10:00-12:00 (or by appointment)

CURRENT CATALOG DESCRIPTION

This course provides an introduction to parallel programming with a focus on multicore architectures and cluster programming techniques. Topics include relevant architectural trends and aspects of multicores, writing multicore programs and extracting data parallelism using vectors and SIMD, thread-level parallelism, task-based parallelism, efficient synchronization, program profiling, and performance tuning. Message-passing cluster-based parallel computing is also introduced. The course includes several programming assignments to provide students first-hand experience with programming, and experimentally analyzing and tuning parallel software.

PRE- OR CO-REQUISITE

CSC310: Algorithms and Data Structures; CSC326: Operating Systems

COURSE TYPE

Required



Major's Elective



General Elective



COURSE LEARNING OUTCOMES

A student completing this course should:

1. understand the challenges of as well as the motivations for using parallel programming;
2. demonstrate an ability to design, analyze, and implement shared-memory programming applications on multicore systems;
3. demonstrate an ability to design, analyze, and implement message-passing programming applications on a cluster of workstations;
4. Have the knowledge and hands-on experience in developing applications software for processors with massively parallel computing resources;
5. Have the ability of using NVIDIA processors and the CUDA™ programming tools;
6. demonstrate an ability to analyze the efficiency of a given parallel algorithm.

REFERENCES (NO SPECIFIC TEXTBOOK)

1. Wilkinson & Allen, Parallel Programming: Techniques & Applications using Networked Workstations & Parallel Computers, 2nd Edition, 2004.
2. M. Quinn, Parallel Programming in C with MPI and OpenMP, McGraw Hill, 2003.
3. Kirk and Hwu, Prog. Massively Parallel Processors: A Hands-on Approach, Morgan Kaufman, 2017.

TOPICS COVERED IN THE COURSE

- Introduction to parallel architectures and parallel programming



- Parallel algorithms design
- Performance measures and analysis
- Message-passing programming using MPI
- Shared-memory programming using OpenMP and/or POSIX threads
- Introduction to CUDA programming
- Case studies: algorithms and applications

TEACHING/LEARNING METHOD

- Lectures
- HW
- *Students will be asked to complete short quizzes at the end of some lectures*
- Projects, labs and lab quizzes
- Exams

COURSE GRADING AND PERFORMANCE CRITERIA

Labs/Quizzes:	20%
Exams:	60%
Project:	20%

STUDENT CODE OF CONDUCT - ACADEMIC VIOLATIONS

The following table defines the sanction(s) associated with each violation. In some cases and when the violation is too general, a range of sanctions is set for the pertinent committee to choose from depending on the specifics of each case. As for the second offense, the set sanctions apply regardless whether the violation has taken place in the same course or a different one, within the same semester or not.

Code #	Violation	First Offense	Second Offense
Cheating			
2.2.1	Using material or equipment (including mobile phones, electronic tablets, i-pads, calculators, and other devices) that is not authorized by the instructor in an examination, project, or graded assignment	zero on the deliverable with a warning	F on the course with a warning
2.2.2	Cheating, copying, collaborating with or aiding another Student in a manner not permitted by the instructor on an examination, project, or other graded assignment	zero on the deliverable with a warning	suspension
2.2.3	Distributing or aiding in the distribution of previous exams without authorization of the instructor	double warning – suspension	suspension – expulsion
2.2.4	Stealing, reproducing, or circulating an examination or other graded assignment before it has been administered	suspension	expulsion
2.2.5	Impersonating another Student or allowing another Student to impersonate one's self during an examination, presentation, or other graded assignment	suspension for both	expulsion
2.2.6	Impersonating an assistant, staff member, or faculty member for the purpose of (a) proctoring examinations without authorization or permission or (b) obtaining confidential information regarding coursework or examinations	suspension – expulsion	expulsion
2.2.7	Receiving, purchasing or selling a project, paper, or any academic document and presenting it as work other than that of the author	suspension – expulsion	expulsion
2.2.8	Submitting identical papers or coursework for credit in more than one class without the permission of the instructor	zero on the deliverable with a warning	F on the course with a warning
Plagiarism and Copyright Violations			



Code #	Violation	First Offense	Second Offense
2.2.9	Failing to attribute language or ideas to their original source by not crediting the original author with an appropriate acknowledgement or citation	zero on the deliverable with a warning	F on the course with a warning
2.2.10	Using photocopied or electronic copies of textbooks, compact disks, films, music, online course materials, and other content beyond the fair use policy within University Premises	warning	double warning
2.2.11	Using copyrighted materials, including in written research reports and papers, without obtaining required permission, if any, from the rights holder	warning	double warning
Unauthorized Sale, Distribution, or Use of Course Materials			
2.2.12	Recording any lecture or presentation for personal use or public distribution without the prior consent of the course instructor. This applies to the unauthorized use of any medium including but not limited to mobile phones, electronic tablets, i-pads recorders, films, and other devices	warning	double warning
2.2.13	Selling academic materials by any Student, club, or group. This includes but is not limited to lectures, course recordings, class notes, and previous exams	warning	double warning

UNIVERSITY ATTENDANCE POLICY

1. Students are expected to attend all classes.
2. For valid reasons, students may miss classes for a maximum that is equivalent to two regular weeks.
3. When exceeding the maximum number of absences, it is the instructor's prerogative to ask the concerned student to stop attending and drop the course. In this case, it is the student's responsibility to drop the course, otherwise a grade of "F" or "NP" will be given.
4. In exceptional justified cases (long illness, etc...), where absences exceed the maximum, the student has to petition to the department Chair to be allowed to stay in the course.
5. Students are held responsible for all the material presented in the classroom, even during their absence.

WITHDRAWAL POLICY

WI is equivalent to Early Withdrawal

WP is equivalent to Withdrawal/Pass

WF is equivalent to Withdrawal/Fail

1. A student who withdraws after the Drop/Add period and by the end of the 5th week of classes (10th day of classes for Summer Modules) will obtain a "WI" on that particular course.

The student may process such request directly through the Registrar's Office.

2. A student who withdraws from a course between the 6th week and the end of the 10th week of classes (18th day of classes for Summer Modules) will receive either a "WP" or a "WF". "WP" or "WF" will be determined by the instructor based on the achieved academic performance in that course till the time of withdrawal.

3. The "WI" and the "WP" will not count as a Repeat; whereas the "WF" will count as a Repeat.

4. "WI", "WP" and "WF" will not count towards the GPA calculation.

Deadline for the "WP" and "WF" withdrawal from courses: check university calendar (It is the student's responsibility to drop the course)

COURSE ONLINE EVALUATIONS

Completion of the online course evaluations is important for feedback and improvement. Students are highly encouraged to complete the course evaluations at the end of the semester.



TIPS FOR SUCCESS

- Study daily and come to class prepared.
- Make sure you solve all the lab problems during or after each lab.
- Consistent attentive attendance is key to success in this course.