LEWIS UNIVERSITY
A Catholic and Lasallian University

Introduction to Research in Computer Science

CPSC-59700

Syllabus

Spring Semester 2022

I. Instructor Information

Instructor's name: Dr. L. Ngalamou

Lewis office location: AS-111A

Office hours: MWF 11:00 am – 2 pm

How to make appointments outside of office hours:

- Make an appointment by emailing me
- I have an open-door policy – feel free to stop by my office any time if my door is open

Lewis office phone number: 815-836-5958

Lewis email address: ngalamlu@lewisu.edu

II. Course Information

Course Name, Number, & Section:

- Research in Computer Science
- CPSC-59700
- Course Credit Hours: 3

Course description:

In this course, you will learn how to conduct research in Computer Science. Topics include literature review, verification, proofs, and automated debugging of hardware design, software, network protocols, etc. Additionally, the research process will be presented, including design, methodology and ethics.

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Prerequisite: Completion of Foundation coursework or consent of instructor

Course meeting times, days, and location:

- Wednesday 6:00 PM –
- Online
- Zoom Link : https://lewisu-edu.zoom.us/j/89063962751
- **Zoom Meeting ID: 890 6396 2751**

Student Learning Outcomes:

Course student learning outcomes:

On the successful completion of this course, the student will be able to demonstrate the following:

1. Analyze the efficiency of an algorithm.
2. Use proof techniques to evaluate the effectiveness of a proposed problem solution.
3. Analyze and critique Computer Science research articles.
4. Identify open problems in Computer Science.
5. Design a Computer Science-based research project.

Program student learning outcomes:

1. Analyze and critique current research in Computer Science.
2. Present research techniques and methodologies.
3. Illustrate the use of mathematical proofs to evaluate solutions to problems.
4. Apply algorithm analysis techniques to evaluate the efficiency of proposed solutions

Baccalaureate Characteristics/Graduate Student Learning Outcomes:

1. Essential Skills

2. Major Approaches to Knowledge

6. Critical Thinking

III. University Mission Statement

Lewis University, guided by its Catholic and Lasallian heritage, provides to a diverse student population programs for a liberal and professional education grounded in the interaction of knowledge and fidelity in the search for truth.

Lewis promotes the development of the complete person through the pursuit of wisdom and justice. Fundamental to its Mission is a spirit of association, which fosters community in all teaching, learning and service.

How this course connects to the University Mission: This course promotes the mission value of knowledge, as students will study computer organization in order to write efficient and performant software.

IV. Required Course Materials

Textbook(s): None

Useful links:

- http://spinroot.com/spin/whatispin.html
- https://www.key-project.org/
- https://frama-c.com/
- http://prosecco.gforge.inria.fr/personal/bblanche/proverif/
- http://prosecco.gforge.inria.fr/personal/bblanche/cryptoverif/
- http://www.cs.utexas.edu/~moore/acl2/
- http://www.cl.cam.ac.uk/research/hvg/HOL/
- http://www.cl.cam.ac.uk/research/hvg/Isabelle/
- http://pvs.csl.sri.com/
- http://nusmv.fbk.eu/

- http://why3.lri.fr/
- http://alt-ergo.lri.fr/
- http://libre.adacore.com/tools/spark-gpl-edition/
- https://fstar-lang.org/

References:

- Logic in Computer Science: Modelling and Reasoning about Systems, Micheal Huth and Mark Ryan, Cambridge Press
- Formal Methods for Industrial Critical Systems: A Survey of Applications, Stefania Gnesi, Tiziana Margaria, Wiley-IEEE Computer Society Press

V. Instructional Methods and Activities

- ***Modality of Instruction:*** *online via Zoom*
- Course Project

An important part of the course is the course project proposed only by the instructor. A list of projects will be posted at the beginning of the second week. The Intellectual property of these projects belong to Lewis University. You are welcome to work individually or in groups of up to three people. Expectations for project outcomes are associated with group size. Projects are required to have final written reports of approximately 8 to 15 pages per group member.

VI. Course Schedule

Below is a tentative schedule of when topics are covered in the class, as well as when assignments and machine problems are *assigned*. The due dates of these deliverables will be announced when they are assigned.

Week	Topic	Assignment	Readings
1	Introduction	Assignment 1: General Knowledge in Computer Science,	Selected research papers posted on BB
2	Research trends in Computer Science, Research Methodology and Ethics.	Research projects posted – Selection due the same week	Selected research papers posted on BB
3	Reasoning and Verification, Propositional and Predicate Logic		Selected research papers posted on BB
4	Model Checking	Assignment 2	Selected research papers posted on BB
5	Theorem Proving		Selected research papers posted on BB
6	Review of Formal Methods Tools	Assignment 3	Selected research papers posted on BB
7	Case Study: Frama-C		Selected research papers posted on BB
8	Project Presentation	Final Report	

Schedule Changes: *The instructor reserves the right to modify, change, or waive any part of*

the schedule for this course. The instructor will provide prior notification of any modifications via in-class and Blackboard announcement and/or email.

VII. Grading Criteria and Course Policies

Grading Policy

Class Contribution (Discussions on BB)	15%
Assignments (3)	35%
Course Project (Presentation 15%, Project 35%)	50%

Each graded course component has a rubric that contains performance indicators and definitions of emerging/developing/satisfactory/exemplary work.

- Letter grades will be assigned according to the following scale
  - ≥ 95%..... A
  - ≥ 90% and below 95%..... A-
  - >85% and below 90%..... B+
  - = 85% .....B
  - ≥ 80% and below 85%..... B-
  - >75% and below 80%..... C+
  - = 75% C
  - ≥ 70% and below 75%..... C-
  - ≥ 60% and below 70%..... D
  - Below 60% .....F

Course Policies:

- *Students are expected to regularly check Blackboard at least once a day for course announcements, course materials, due dates and any additional instructions.*
- *For engineering programs, it widely expected that you are to spend at least 3 hours of study outside the classroom for every hour of lecture.*

Changes to Course Assignments or Grades: *The instructor reserves the right to modify, change, or waive any part of requirements or grading policies. The instructor will provide prior notification of any modifications via in-class and Blackboard announcement and/or email.*

VIII. Information for Students

Responsiveness to Change

Understanding that the COVID-19 pandemic could influence the course of this semester, Lewis University will be guided by our Lasallian mission and the well-being of our community of students, faculty, and staff in respond and adapting to any sudden changes or circumstances. Based on the guidance of the State of Illinois and the Centers for Disease Control, it may be necessary to change the planned modality this course.

Flexibility, Accommodations, and Student Absences
Because we are committed to student success, the University community is committed to academic standards while maintaining flexibility and empathy. Absences relating to the Coronavirus crisis will be recognized as excused. Students experiencing disruptions in their lives related to the Coronavirus that impact class attendance and participation should contact their instructor and/or college Dean's Office for assistance.
Students directly impacted by Coronavirus will have the ability to request alternative grading this semester. Requests will be evaluated on a case by case basis and will require documentation.

Students who require academic accommodations due to disability caused by COVID-19, or to limit risk of exposure to Coronavirus, can engage in an interactive process with the Learning Access Coordinator to exploreall avenues for accommodations. Students can contact the Academic Services office at 815-836-5593 or learningaccess@lewisu.edu to request an appointment.

Face Coverings, Physical Distancing, and Surface Cleaning

Face coverings are required in classrooms. Students will be expected to maintain physical distancing in the classroom (6 ft minimum) and to keep their nose and mouth covered at all times. Faculty will require students without face covering to obtain a disposable mask at the nearest University office providing them. While the University will disinfect classrooms and common spaces throughout the day, cleaning supplies will be providedin classrooms and offices so that students and faculty can wipe down work surfaces before class begins.

Requests for Reasonable Accommodations
Lewis University is committed to providing equal access and opportunity for participation in all programs, services and activities. If you are a student with a disability who would like to request a reasonable accommodation, please speak with the Learning Access Coordinator at the Center for Academic Success and Enrichment (CASE). Please make an appointment by calling 815-836-5593 or emailing learningaccess@lewisu.edu. Since accommodations require early planning and are not provided retroactively, itis recommended that you make your request prior to or during the first week of class. It is not necessary to disclose the nature of your disability to your instructor. For more information about academic support services, visit the website at: www.lewisu.edu/CASE.

Sanctified Zone
Guided by its Catholic and Lasallian heritage, Lewis University is firmly committed to fostering a campus atmosphere that is permeated by its Mission values of Fidelity, Wisdom, Knowledge, Justice, and Association. Accordingly, we have declared the University campus to be a Sanctified Zone, a place and a people United in Diversity. The active promotion of diversity and the opposition to all forms of prejudice and bias are a powerful and healing expression of our desire to be Signs of Faith (Signum Fidei) to each other. To learn more about the Sanctified Zone, please visit: http://www.lewisu.edu/sanctified zone

Academic Integrity
Scholastic integrity lies at the heart of Lewis University. Plagiarism, collusion and other forms of cheating or scholastic dishonesty are incompatible with the principles of the University. Students engaging in such activities are subject to loss of credit and expulsion from the University. Cases involving academic dishonesty are initially considered and determined at the instructor level. If the student is not satisfied with the instructor's explanation, the student may appeal at the department/program level. Appeal of the department /program decision must be made to the Dean of the college/school. The Dean reviews the appeal and makes the final decision in all cases except those in which suspension or expulsion is recommended, and in these cases the Provost makes the final decision.

University Student Complaint Policy
The University Student Complaint Policy can be found at lewisu.edu/studentcomplaints

University Grade Appeal Policy
The University Grade Appeal Policy can be found at lewisuedu/studentcomplaints

Center for Health & Counseling Services
To support student success, all Lewis students are eligible for free health and mental health services on the Romeoville campus. This includes commuters and those living on campus, part-time and full-time students,

graduate and undergraduate students, and those taking Lewis classes at other locations. For more information, visit the Center for Health & Counseling website at www.lewisu.edu/studentservices/health or call (815)836-5455.