1.	COURSE TITLE	CE271 Computer Organization
2.	COURSE DURATION	1 Semester
3.	ECTS CREDITS	6 ECTS
4.	DISTRIBUTION OF HOURS	**Contact Hours: 62 hours** Lectures – 28 hours Practical Work – 30 hours Midterm Exam – 2 hours Final Exam – 2 hours **Independent Work: 88 hours**
5.	INSTRUCTOR	**Amiran Malania,** Invited Lecturer E-mail: amiran.malania@iliauni.edu.ge *Note: Office hours for consultation can be agreed with the instructor in advance in person or over email.*
6.	PREREQUISITES	CS50 Introduction to Programming
7.	INSTRUCTION METHODS	● Lecture; ● Practical Works; ● Demonstration method; ● Discussion; ● Practical work; ● Laboratory work.
8.	AIMS OF THE COURSE	By studying machine level programming, data representation and memory hierarchies this course aims to provide students with a solid understanding of computer organization. Moreover, the course aims to equip students with skills necessary to describe the full cycle of program compilation and write robust, safe and reliable programs that take advantage of underlying hardware.
9.	MAJOR TOPICS	● Representing and manipulating information; ● Machine-level representations of programs; ● Optimizing program performance. ● The memory hierarchy.

10.	COURSE OBJECTIVES: LEARNING OUTCOMES AND COMPETENCES	**_Upon successful completion of this course, students will acquire the following competencies:_**

Upon successful completion of this course, students will acquire the following competencies:

1. Student describes mechanisms of data manipulation and processing;
2. Student describes the architecture of machine language instruction;
3. Student performs performance analysis of a given program from the perspective of a memory system.

The following table shows the relationship between course learning outcomes and Student Outcomes (SOs):

PLO#	1	2	3	4	5	6	7
Correlation	X	X				X	

11.	EVALUATION AND GRADING	

Assessment is based on a **100-point** scale. Points in the assessment system are distributed in the following way:
(A) 91 – 100 Excellent
(B)   81 – 90 Very good
(C) 71 – 80 Good
(D) 61 – 70 Satisfactory
(E)   51 – 60 Sufficient
(FX) 41 – 50 Unsatisfactory, a student needs more efforts to pass an examination and is given an extra chance to pass an additional examination through independent work
(F) 0 – 40   Failure, student's effort is not sufficient and s/he has to retake a course

Assessment	Thresholds	Contributing to Final Grade
Midterm Exam	**10%**	**20%**
Lab Work Assignments	**25%**	**50%**
Final Exam	**15%**	**30%**
Total		**100%**

FINAL and MidTerm EXAM IS MANDATORY FOR EVERY STUDENT!

1. **Midterm Exam - 20 points**
*Throughout the course, there is **one midterm exam** graded with a maximum of **71 points** contributing 20% of final grade.   The mid-term includes programming **problems, multiple-choice** and **open** questions of varying difficulty.*

Assessment criteria for Multiple–Choice Questions:

Correct answer	Wrong answer
1	0

Assessment criteria for Open Questions:

	1	2	3
Understanding of the concept	Student **vaguely** explains a concept, **but** cannot correctly answer qualitative questions, (e.g. wrong theoretical facts are considered a supporting argumentation of the answer).	Student **correctly** explains a concept, **but** cannot correctly answer qualitative questions, (e.g. theoretical statements are correct, however not sufficient for argumentation of answer).	Student **correctly** and briefly explains a concept **and** correctly answers qualitative questions, (e.g. all theoretical facts are provided correctly for argumentation of the correct answer on the question).

Assessment criteria for Problems:

	1	2	3	4	5
Student correctly solves assigned problem	The answer is technically correct, but the overall logic of arrival to the solution is missing.	Overall logic of arrival to the solution is partially present, but has one or more major or conceptual mistakes.	Overall logic of arrival to the solution is partially present and correct.	Has at most two minor mistakes and the overall logic of arrival to the solution is correct.	The solution is correct, the overall logic of arrival to the solution is correct.

2. Lab Work Assignments – 50 points

Labs	Weight
Data Lab	12.5 %
Bomb Lab	12.5%
Attack Lab	12.5%
Cache Lab	12.5%

*Completion of 4 lab work assignments – each evaluated with maximum 12.5 points. Overall labs – which will be submitted as a small project – **contribute***

50% to the final grade. The instructor will provide students with the descriptions of the assignments and guidelines before the lab. Each lab will be assessed by checking:

Meeting the requirements of the assignments

0%-10%	10%-30%	30%-60%	60%-90%	90%-100%
Poor/Not Submitted	With Major Mistake	Average	With Minor Mistakes	Good

3. Final Exam
The final exam is a written exam based on all the materials covered during the semester. The Exam paper consists of programming **problems, multiple-choice** *and* **open** *questions of varying difficulty . The exam is graded with a* **maximum of 100 points** *and* **contributes 30% to final grade.**

Assessment criteria for Multiple-Choice Questions:

Correct answer	Wrong answer
1	0

Assessment criteria for Open Questions:

	1	2	3
Understanding of the concept	Student **vaguely** explains a concept, **but** cannot correctly answer qualitative questions, (e.g. wrong theoretical facts are considered a supporting argumentation of the answer).	Student **correctly** explains a concept, **but** cannot correctly answer qualitative questions, (e.g. theoretical statements are correct, however not sufficient for argumentation of answer).	Student **correctly** and briefly explains a concept **and** correctly answers qualitative questions, (e.g. all theoretical facts are provided correctly for argumentation of the correct answer on the question).

Assessment criteria for Problems:

	1	2	3	4	5

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Student correctly solves assigned problem	The answer is technically correct, but the overall logic of arrival to the solution is missing.	Overall logic of arrival to the solution is partially present, but has one or more major or conceptual mistakes.	Overall logic of arrival to the solution is partially present and correct.	Has at most two minor mistakes and the overall logic of arrival to the solution is correct.	The solution is correct, the overall logic of arrival to the solution is correct.

12.	TEXTS AND ADDITIONAL RESOURCES	**Required Reading:** ● Randal E. Bryant, David R. O'Hallaron Computer Systems: A Programmer's Perspective, 3/E(CS:APP3e), 2015, ISBN-13: 978-0134092669. **Recommended:** ● Robert C. Seacord, Effective C: An Introduction to Professional C Programming, 2020, ISBN-13: 978-1-71850-104-1 ● Michael Kerrisk, The Linux Programming Interface: A Linux and UNIX System Programming Handbook, No Starch Press; 1st edition (October 28, 2010), ISBN-13: 978-1593272203. http://index-of.es/OS/The%20Linux%20Programming%20Interface.pdf
13.	COURSE SCHEDULE	

Week	Instruction Method	Topic/Activities
1	Lecture 1 - 2 Hours (Chp 1)	**Introduction;** The course syllabus and evaluation system; Class overview and brief summary of labs;
	Practical Work 1 – 2 Hours	**How to succeed in the course;** Learn how to learn!
2	Lecture 2 - 2 Hours	**Tools used;** Introduction to Linux, VS Code, Git
	Practical Work 2 – 2 Hours	Setting up environment for the labs; Introduction to Linux CLI;
3	Lecture 3 - 2 Hours (Chp 2.1)	**Bits, Bytes and Integers(Part 1)**
	Practical Work 3 – 2 Hours	Practice problems on lecture material

4	Lecture 4 - 2 Hours (Chp 2.2 – 2.3)	**Bits, Bytes and Integers(Part 2)**;
	Practical Work 4 – 2 Hours	Practice problems on lecture material; **Data Lab Out**;
5	Lecture 5 - 2 Hours (Chp 3.1 – 3.5)	**x86-64:** Basics
	Practical Work 5 – 2 Hours	Practice problems on lecture material
6	Lecture 6 - 2 Hours (Chp 3.6)	**x86-64:** Control;
	Practical Work 6 – 2 Hours	Practice problems on lecture material; Recitation on **Bomb Lab;** Feedback on **Data Lab;**
7	Lecture 7 - 2 Hours (Chp 3.7)	**x86-64:** Procedures; Practice problems on lecture material
	Practical Work 7 – 2 Hours	Practice problems on lecture material
8	**Midterm Exam - 2 Hours**	
	Practical Work 8 – 2 Hours	Discussion of Exam problems
9	Lecture 9 - 2 Hours (Chp 3.8 – 3.9)	**x86-64: Data**;
	Practical Work 9 – 2 Hours	Practice problems on lecture material; Recitation on Debugging, Address Sanitizes and Valgrind
10	Lecture 10 - 2 Hours (Chp 3.10)	**x86-64: Advanced**; Practice problems on lecture material
	Practical Work 10 - 2 Hours	Practice problems on lecture material
11	Lecture 11 - 2 Hour (Chp 5)	**Code Optimization**; Practice problems on lecture material; Recitation on **Attack Lab;** Feedback on Bomb Lab

		Practical Work 11 – 2 Hours	Practice problems on lecture material; Recitation on **Attack Lab;** Feedback on Bomb Lab
	12	Lecture 12 – 2 Hours (Chp 6.1–6.3)	**Memory Hierarchy**; Part 1
		Practical Work 12 - 2 Hours	Practice problems on lecture material
	13	Lecture 13 - 2 Hours (Chp 6.1–6.3)	**Memory Hierarchy**; Part 2
		Practical Work 13 - 2 Hours	Practice problems on lecture materia
	14	Lecture 14 – 2Hours (Chp 6.4 - 6.7)	**Cache Memories**; Part 1
		Practical Work 14 - 2 Hours	Practice problems on lecture material; Recitation on C Programming and Cache Lab; **Cache Lab Out;** Feedback on **Attack Lab**
	15	Lecture 15 – 2 Hours (Chp 6.4 - 6.7)	**Cache Memories**; Part 2
		Practical Work 15 – 2 Hours	Practice problems on lecture material
Final Exam 2 hours			

Information for students:

Plagiarism – It's absolutely unacceptable to use somebody's work, idea or thought in homework, presentation or any other kind of written task, without indicating the source. In this case, the lecturer is obliged to leave the work of a student without assessment.

Cheating – This kind of action is forbidden during any type of activity (homework, exam, presentation, etc.) In this case, the lecturer is obliged to leave the student without assessment.

A Student can retake the mid-term exam in case he/she misses the exam due to reasonable excuse (illness, business trip, necessity to be at work at a given time). In order to retake the midterm exam, the student must apply to the Faculty of Business, Technology and Education administration. The lecturer fixes the time and date of the retake examination. Involvement in discussions/debate can't be recovered.