

CSC 3210 Computer Organization and Programming

Assignment #4

Spring 2019

due Friday, March 29th, 11:59 pm

Learning Objectives: 1) Use Slack, GitHub, and Word processor and create Videos to develop your soft skills—verbal and written communication, cooperation, decisions making, tasks identifications, planning, and scheduling, conflict resolution. 2) Identify and analyze the basics of parallel computing architectures and programming using OpenMP and C language. 3) Write ARM assembly programs.

Important Note: (read this carefully please)

As you will find out, group work isn't always easy—team members sometimes cannot prepare for or attend group sessions because of other responsibilities, and conflicts often result from differing skill levels and work ethics. When teams work and communicate well, however, the benefits more than compensate for the difficulties. One way to improve the chances that a team will work well is to agree beforehand on what everyone on the team expects from everyone else. Reaching this understanding is the goal of the assignment.

Team Policies:

- Rotate the coordinator role for each assignment.
- You are all expected to cooperate.
- Do the required individual preparation.
- Agree on a common meeting time and what each member should have done before the meeting (readings, taking the first cut at some or all of the assigned work, etc.)
- A team coordinator:
 - interfaces between the instructor and the team.
 - turning in the documents with the names on it of every team member who participated actively in completing it. **Only the team coordinator is responsible for submitting the project assignment.**
 - review returned assignments and make sure everyone understands why points were lost and how to correct errors.
 - bringing team questions to the instructor coordinator
 - receiving and returning the Raspberry PI
 - checks with other team members before the meeting to remind them of when they will meet and what they are supposed to do.
 - **with the help of the team members, identifying, assigning, and scheduling tasks to the team members**
 - monitoring and reporting the progress of the assigned tasks
 - coordinator team members
- Consult with your instructor if a **conflict** arises that can't be worked through by the team.
 - Dealing with **non-cooperative team members**: If a team member refuses to cooperate on an assignment, her/ his name **should be included in the tasks table with “she/he did not do or partially did the assigned task”** on the note column and as a team you should assign **0%, 25%, 50%, 75%, 100%** grade based on her/his contribution for the given assignment.
 - **No show (0%)**: No participation at all;
 - **Unsatisfactory (25%)**: Consistently failed to show up or complete assignments, unprepared;
 - **Marginal (50%)**: Sometimes failed to show up or complete assignments, rarely prepared.;
 - **Very good (75%)**: Usually did what he/she was supposed to do, acceptably prepared and cooperative;
 - **Excellent (100%)**: Consistently did what he/she was supposed to do, very well prepared and cooperative.
 - If the problem persists, the team should meet with the instructor so that the problem can be resolved, if possible, otherwise, grade of zeroes will be assigned for the remaining assignments.

TASKS:

Task1: (13p) Planning and Scheduling:

- (6p) Choose a new team coordinator.
 - The team coordinator should contact the team members and discuss when and where to meet to discuss the following tasks.
 - The new elected team coordinator must send an email to the TA (Kexin Ding: kding3@student.gsu.edu) having her/his: first and last name, group name, section (M/W or T/Th)
 - The coordinator role will be rotated for each assignment.
- (7p) Create a table and have every member's name, assigned task or tasks, etc. **Ex.:**

Work Breakdown Structure

Assignee Name	Email	Task	Duration (hours)	Dependency	Due date	Note
Awad Mussa	amussa@gsu.edu	Technical writing (getting the report ready) as described in the assignment	5 hours	Slack, GitHub, and the video (these have to be done first)	02/22/18	Must be ready 30 hours before the due date
James Siemen (coordinator)	exmple@gsu.edu	Creating the slack account as described in the assignment	2 hours	none	02/19/18	Please send everybody the link and ask them to login and write their member introduction: name, interest, expectation from this project
Michael Jorden	exmple@gsu.edu	Did not do the assigned task	Did not do the assigned task	Did not do the assigned task	Did not do the assigned task	Mike did it. 0% grade.
Alex Brian	exmple@gsu.edu	Partial Contribution	0.30 minutes	none	02/20/18	James did the rest. 25% grade.

Task2: (5p) Collaboration:

- **Slack:**
 - Please use slack as your main medium of communication. Your TA will check up on you so make sure it is used.
- **GitHub:**
 - (5p) Using the project you created in A1, identify new To do; In progress; and Done columns for A3. Under these columns, create your own cards and have the assigned tasks and their status (in progress and done) written there as a list. Submit a screen shoot of your project page.

Task3: (108p) Parallel Programming Skills:

a) (68p) Foundation (reading material for this section is available at iCollege, Week8, Project: Assigenmnt4 folder, Introduction_to_Parallel_Computing_4.pdf).

Note: It is expected that you answer the questions using your own words (paraphrasing).

- (15p) Race condition:
 - (2p) What is race condition?
 - (5p) Why race condition is difficult to reproduce and debug?
 - (8p) How can it be fixed? Provide an example from your Project_A3 (see spmd2.c)

- (15p) Summarize the Parallel Programming Patterns section in the “Introduction to Parallel Computing_3.pdf” (two pages) in your own words (one paragraph, no more than 150 words).
- (12p) In the section “Categorizing Patterns” in the “Introduction to Parallel Computing_3.pdf” **compare** the following:
 - o Collective synchronization (barrier) with Collective communication (reduction)
 - o Master-worker with fork join
- (26p) Dependency: Using your own words and explanation, answer the following:
 - (3p) Where can we find parallelism in programming?
 - (6p) What is dependency and what are its types (provide one example for each)?
 - (3p) When a statement is dependent and when it is independent (Provide two examples)?
 - (3p) When can two statements be executed in parallel?
 - (3p) How can dependency be removed?
 - (8p) How do we compute dependency for the following two loops and what type/s of dependency?

```

for (i=0; i<100; i++)      for (i=0; i<100; i++) {
    S1: a[i] = i;           S1: a[i] = i;
                           S2: b[i] = 2*i;
                           }

```

b) (40p) Parallel Programming Basics

These instructions assume that you have a Raspberry Pi up and running.

- See the Tasks description in Parallel Programming Task file (available at iCollege, Week6, Project: Assigenmnt3 folder, Parallel_Programming_Task_A3.pdf)
 - o You need to submit a detailed lab report to describe:
 - **(40p)** What you have done and what you have observed, including screenshots and code snippets. Simply attaching screenshots and code snippets without any explanation will not receive credits.

Task4: (40P) ARM Assembly Programming

These instructions assume that you have a Raspberry Pi up and running.

- See the Tasks description in ARM Assembly Programming file (available at iCollege, Week6, Project: Assigenmnt3 folder, ARM_Assembly_Programming_A3.pdf)
 - o You need to submit a detailed lab report to describe:
 - **(40p)** What you have done and what you have observed, including screenshots and code snippets. Simply attaching screenshots and code snippets without any explanation will not receive credits. You also need to provide explanation to the observations that are interesting or surprising.

Task5: (21p) Report (written communication):

- (5p) A title page (first page) has:
 - (2p) project title: **Developing Soft and Parallel Programming Skills Using Project-Based Learning**,
 - (3p) semester (Spring-2019), group name, group members' names,
- (6p) Text format should be:
 - (3p) Font size 12, Font type is times new roman, single space between lines.
 - (1p) All paragraphs must Text Justified.
 - (2p) Pages are numbered except for the title page.
- (3p) Report sections:
 - Planning and Scheduling
 - Parallel Programming Skills

- ARM Assembly Programming
- Appendix: have the links (slack, GitHub and video links and screenshot) here
- (2p) All text must be produced on a word processor and convert it to PDF format.
- (5p) You (the team coordinator for this assignment) will also print out a copy of the report and submit it in person to the instructor during the **Monday** office hours: (the one after the submission due date)

Note:

You will submit the document electronically through iCollege as a PDF file:

- The file you submit should be named coordinatorName_Groupname.pdf
- **Only the team coordinator should submit the report**
 - Individuals will only get points if they are in a group that has been submitted.

Task6: (29p) Presentation (verbal communication):

- **Video:**
 - **Rules:** **You will lose a lot of points if you ignore the following rules**
 - The video must be shot in the same place and the video must include all members in a group discussion setting.
 - Every team member must participate in this video.
 - This video must be 3-8 minutes.
 - (14p) What to do:
 - (2p) Introduce yourself.
 - (2p) Identify your task for this assignment.
 - (3p) What have you learned from this assignment (2-3 key things)?
 - (4p) How will you apply what you learned in your next assignment, academic life (future classes), and in the future (job)?
 - (3p) What was the best/most challenging/worst experience you encountered?
 - (15p) How to do it:
 - (5p) Use your smart phone camera. Make sure the voice and picture are clear.
 - **Note: The video must include all members in a group discussion setting.**
 - (5p) Once ready, upload the video to your channel you created in A1.
 - (4p) This video must be 3-8 minutes. You will lose points if it is more than 8m.
 - (1p) Include the link to this channel with your report.