**31.03.2020**

**Term Project Task “Scientific Parallel Computations”**

**For CMPE-523 “Parallel and Distributed Programming”**

**Spring-2020**

1. Develop a distributed application for at least two computers solving the problem of parallel matrix-matrix calculation. The work can be done individually or in teams. By April 2, 2020, teams shall be decided (send me e-mail)**. Later** team specification will be penalized **by 2 points** subtraction from the possible **maximum grade, 20,** for the project.
2. Conduct experiments with your application to estimate its **SpeedUp(p), Efficiency(p), fraction f of sequential work of your application, fraction of parallel part of your application**
3. Prepare (in Word) and printout **paper report** on the Term Project having:
4. outline,
5. task definition,
6. description of a parallel algorithm for solving the task,
7. description of the parallel facilities used for implementation and the way of their installation and preparation for usage
8. description of the developed program (parts of the program, ways of interaction, synchronization, etc.)
9. user guide (how to use your program – what and where should be installed, launched, how it should be interpreted)
10. description of conducted experiments and their results (estimated characteristics mentioned in item 3, their graphs)
11. conclusion
12. references on the used sources (books, articles, web-sites, etc.)
13. Supply the report with a **CD** with all materials related to the Term Project (doc-file with your report, sources and executables of your application, results of your experiments, instruction on how to use your program, etc.).
14. Submit the report to the lecturer and be ready to show your application working on at least 2 computers and to give necessary explanations about your implementation. Reports shall be submitted to the lecturer (CMPE-219) on **Monday, 18.06.2020, 16.00. Later submission will be penalized (2 points/day).**
15. Presentation of your working applications will be held in the period 19.05.2020-22.05.2020. Time will be specified on report submission. Report will be estimated out of 8 points, and the rest – for presentation of working application and its explanation
16. **Appendix** contains approaches to estimate desired characteristics mentioned in the item 2 above.

**Characteristics estimation**

1. Try to estimate the number of operations required for your algorithm/program (size) using “big O” notation (for example, O(N2))
2. Run your program on 1 processor for 3 different values of N (e.g.,1000, 2000, 3000) and record the time, T, of each execution. Find out whether these times are relevant to the estimation of 2.1.
3. Run your program on 2 (3,..) processors for the same values of N as in 2.1, record times, Tp, of execution.
4. Estimate fraction f of sequential part using Amdahl’s law



which implies

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1. Having measured times, we can estimate f for 3 different values of N. We can find out whether this fraction depends on the problem size, N. Try to express this dependence f(N) using “big O” notation.
2. Using T1, Tp, estimate speedup, S(p), and efficiency, E(p), for 3 different values of N, draw respective graphs (for p=1,2,..)