High Performance Computing Advanced

I N S T R U C T I O N S F O R U S A G E

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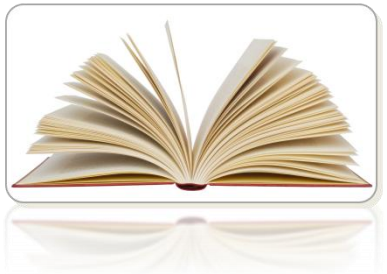
SCIENTIFIC &
DATA-INTENSIVE COMPUTING

2024-2025 @ Università di Trieste

Outline



What you will learn & Calendar

How it works

Some common rules & principles

What you will learn - HPC

The course is split in two different parts

HPC - ~ 28 to 32 h L. Tornatore + M.Poggi + V. Flouris	**GPU - ~16 to 20h** S. Cozzini
In this part, you'll learn some more advanced concepts in the two parallelism paradigm you have already seen: shared mem and distributed mem 1) more advanced concepts in OpenMP, the usage of tasks 2) thread without OpenMP (teacher: Matteo Poggi from exact-lab) 3) inter-process shared memory and remote memory access using MPI A lecture on code and platform characterization using the roof-line model will be given by Vassilis Flouris from FORTH	In this part, you'll learn how to offload calculations on GPU using OpenACC

Calendar

The course amounts to 48h, the lectures consists in 2h slots
Hence, we'll have 24 lectures

The actual calendar is still under construction

Outline

What you will learn

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How it works

The baseline is:

1) **lectures + hands-on**: we prepare slides and examples and we expose them.
Possibly, every lecture will also have an hands-on session

The pdfs that we will use and the example codes will be put in a GitHub repository (the exact details are still to be defined).

How it works

The baseline is:

1) **lectures+hands-on**: we prepare slides and examples and we expose them.

2) **questions**: you ask what you want whenever you want; if we say something wrong or stupid, you notice that and you raise your hand.

How it works

The baseline is:

1) **lectures**: we prepare slides and examples

2) **questions**: you ask what you want whenever you want

3) **discussions**: you ask to discuss much deeper some aspects or topics from previous/future lectures; you read other materials and bring them into the discussions.

How it works

The baseline is:

1) **lectures**: we prepare slides and examples

2) **questions**: you ask what you want whenever you want

3) **discussions**: you ask to discuss much deeper

4) **Office hours:** each of us will be available weekly an hour (we'll communicate which one). However, we are ready for chatting, Q&A or alike upon appointment

Outline

What you will learn

How it works

Some common rules & principles

Common rules & principles

1) **Don’t be shy**, every question is legitimate and useful; ask what you do not understand (or we explain poorly), comment what you want to explore.
2) Our main focus is that you **learn**, not to grade you.
3) Learning is a **process**, not a result; we’re interested in both your learning process *and* in your final level.
4) We (you and us) will be **honest** in all respects (giving/doing assignments, in the mutual relationships, …).
5) Nobody is perfect or always right: **errors and mistakes are natural**; what matters more is what will follow-up.

Exam / 1

The exam dynamics is still to be defined, we will communicate that soon.

Basically, you'll be given some assignment (code development) and after sending us the solution you will access an oral examination.

Exam / 2

You will be allowed to **repeat** the oral exam **without any constraint**.
However, please

(i) do not try multiple times in a short time span (save our time and take yours to digest better)

(ii) self-organize with your peers so to have groups of you that ask for an exam

(iii) there will be regular exam sessions, however usually we do prefer to agree with small groups of students to have exams whenever it ifts at best.

Exam / 4

Here is what ideally you should expect as final grade:

18–20	Too embarassing to mention
21–23	You got a basic understanding of the matter; slightly more advanced topics or unexpected facts throw you into panic
24–26	You have a robust understanding of the matter, upon thinking you can explore rough terrain
27	You have a firm comprehension of the matter, you sense the right direction and solution
28	Like 27 + you *see* the solution; some added shining
30	Like 28, but with shining
30*cum laude*	Like 30, but you really surprise us
29	Some accident happened along the route to 30

Resumé

Learning is a process that happens only together, among human beings.

Racism, sexism, homophobia, culturalism, discrimination in every sense are not allowed and definitely rejected.

Help us in building a better milieu and a wonderful experience in sharing this journey together.

Questions, comments, doubts, fears... ?

Now is the time (but another one will fit as well)

In case that later on you feel *l'esprit de l'escalier*, you can still contact us:

luca.tornatore @ inaf.it
stefano.cozzini @ areasciencepark.it
matteo.poggi @ exact-lab.it

that's all, have fun