Course Presentation

High Performance Computing

4th Year Computer Science Engineering

5th Year Computer Engineering & Mathematics

Who and Where

- GROUPS 149 English: IVÁN GONZÁLEZ MARTÍNEZ (ivan.gonzalez@uam.es) Laboratorio 15
  - Monday 16:00-18:00
- GROUPS 146: FRANCISCO J. GÓMEZ ARRIBAS. (francisco.gomez@uam.es) Aula 8.
  - Monday 16:00-18:00
- GROUPS 147/150: DANIEL PERDICES BURRERO (daniel.perdices@uam.es) Aula 7
  - Monday 16:00-18:00

All groups are coordinated.

Course contents

- Theory and laboratory contents are in the same Moodle course: https://moodle.uam.es/course/view.php?id=144973

- Content
  - Lecture slides
  - Proposed and resolved exercises
  - Laboratory tasks and documents

Laboratory Teams

- In Moodle you can sign up in the different practice groups at the link:

https://moodle.uam.es/mod/groupselect/view.php?id=2502170

IMPORTANT!

- Can I use theory slides to study?
  - No way. Slides are supporting material. They are used to show graphics and highlight some ideas. You must create personal notes from class explanation and recommended textbooks.
  - Slides help students to understand the theoretical content.
  - You must read recommended textbooks and complete the exercises.

Assessment Rules

- Continuous assessment / Non-continuous assessment **are independent for both theory and laboratory**.

  Default: continuous assessment.

- Continuous assessment for theory:
  - You must complete midterms exams
  - Attendance is not mandatory, but highly recommendable.

Assessment Rules

Continuous assessment for laboratory:

- Attendance **is mandatory** (online/face-to-face), and complete and submit the laboratory tasks on time.
- If any task is not submitted, repeatedly miss classes without justification, o fail any practice midterms exam, **you will fail the ordinary call**.

Non-continuous assessment for laboratory:

- Attendance is not mandatory, but highly recommendable.
- To apply for this type of assessment, student must contact the laboratory coordinator **before the first midterm exam**.

Assessment Rules: Scoring

- Theory and laboratory are scored on 10 points.
- The final score is calculated using the following formula:

Final Grade: 0,4*Not_Lab + 0,6*Not_Teo

- To pass the course, a score greater or equal to 5 points is required, both in theory and laboratory. Otherwise, the final score will be:

Final Grade:

(0,4 *Min(5,Not_Lab) + 0,6*Min(5,Not_Teo))

Assessment Rules: Scoring

- The theory score in continuous assessment is calculated using the following formula:

  Not_Teo: MAX([0,1*deliverables + 0,2*ExP1 + 0,2*ExP2 + 0,5*ExFinal], ExFinal)

  - The midterm exams (ExP1 and ExP2) will be held during class hours.
  - Deliverables are other activities that will preferably focus on the objectives that must be achieved by students in the partial periods of the course.
  - All exams can include theory and laboratory questions and contents.

Assessment Rules: Scoring

- The laboratory score for continuous assessment is calculated applying the following formula:

Not_Lab = 0,2*P1+0,3*P2+0,3*P3+0,2*PP

- P1 to P3 are the scores obtained in practices 1 to 3 and PP the score of the practical project.
- A % of the score of each assignment will be obtained from the completion of an exam with some questions about it.
- It is necessary to obtain more than 4 points in each laboratory task, except the PP task, which is not mandatory.

Assessment Rules: Scoring

- For non-continuous assessment, the score will be:

  Not_Teo = ExFinal

  Not_Lab = 0,1*P1+0,1*P2+0,1*P3+0,2*PP+ 0,5*LabExFinal

  – It is necessary to obtain more than 4 points in each laboratory task, except the PP task, which is not mandatory.

Assessment Rules: Scoring

- In both assessment modalities, the theory score is kept only for the extraordinary call in the same academic year.
- The laboratory score is kept for the extraordinary call in the same academic year. If the score is higher or equal to 7.0, the score is kept for the two calls of the next academic year
- In case of score recognition, the new laboratory score will be (5+Old_score)/2.

Regulations and Exams

- EPS regulation is applied:
  - Copying/Cheating/Plagiarism cases.
  - ID is required.
- Do not use red pen / marker pen.
- Notices:
  - Laboratory contents could be part of the midterm/final exam.
  - Theory obviously too.

Tutorial and others

- Personal or group tutorials:
  - Request by email to the professor

Program

UNIT 1. Introduction to high performance computing.

UNIT 2. Systems for parallel and distributed computing, and their programming.

UNIT 3. Large-scale data parallelism with GPU.

UNIT 4. Convergence of HPC computing and Big Data processing

References


- Introduction to parallel computing. A. Grama, A. Gupta, G. Karpys, V. Kumar. Addison Wesley. 2004.ISBN 0-201-64865-2. Ref_UAM: INF 681.324/INT.

- Introduction to parallel processing. Behrooz Parhami. Plenum Press. 1999. ISBN 0-306-45970-1. Ref_UAM: INF 681.324/PAR

- Introducción a la programación paralela. F. Almeida, D. Giménez, J.M. Mantas, A. Vidal. Ed Paraninfo. 2008. ISBN 84-9732-674-1. Ref_UAM: INF 681.34/INT.

References


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- Parallel programming. Barry Wilkinson y Michael Allen, Ed. Prentice Hall. 1999. ISBN 0136717101. Ref_UAM: INF/681.324/WIL.
- Programming massively parallel processors A hands-on Approach. David B. Kirk, Wen-mei W. Hwu. Morgan Kaufmann. 2010. ISBN 9780123814722. Ref_UAM: INF/681.324/KIR.
- CUDA application design and development. Rob Farber. Morgan Kaufmann. ISBN 9780123884268. Ref_UAM: INF/681.3.06/FAR.
- Computer architecture: A Quantitative Approach". John L. Hennessy y David A. Patterson. Ed McGraw-Hill. 1993. ISBN 8476159129. Ref_UAM: INF/681.32.3/HEN.
- Designing and building parallel programs: concepts and tools for parallel software engineering “ Foster, Ian T. Addison-Wesley1995 (ISBN 0-201-57594-9)
- Advanced computer architecture and parallel processing. Hesham El-Rewini y Mostafa Abd-El- Barr, Ed John Wiley and Sons, 2005 (ISBN 0-471-46740-5)
- Advanced computer architecture - parallelism, scalability, programmability”, K.Hwang, McGraw- Hill, NY,USA, 1993, ISBN 0-07-031622-8
- White, T. (2015). Hadoop : The definitive guide (4th ed.). Beijing [etc.: O'Reilly.
- Karau, H. (2015). Learning Spark : Lightning-fast big data analysis. Beijing [etc.: O'Reilly.