



Programme of Course "Parallel Computing"

- Code: DT0256
- Type of course unit: Elective (Master Degree in Mathematical Engineering curriculum Comune)
- Level of course unit: Postgraduate Degrees
- Semester: 2

Number of ects credits: (Master Degree in Mathematical Engineering) 6 (workload 150 hours)

Teachers: Adriano Festa (adriano.festa@univaq.it)

1	Course objectives	Skills on numerical methods and numerical algorithms with reference to applications to problems of numerical ODE, linear algebra, solving numerical problems in a supercomputer.
2	Course content and learning outcomes (dublin descriptors)	<p>Topics of the module include:</p> <ul style="list-style-type: none"> • Linux/Unix OS and tools • HPC architecture • System Scheduler • Message Passing Interface • open MP • GPU computing • Applications: Linear algebra, PDE , ODE. • Basic difference schemes for ODE. The conditions of convergence. Stability and approximation properties of difference schemes. • Numerical differentiation • Numerical integration, numerical Fourier transform • Difference equations. Stability of solutions • Boundary value problems and their applications to the calculus of variations <p>On successful completion of this module, the student should :</p> <ul style="list-style-type: none"> • Have a deep knowledge of High Performance Computing concepts Be able to apply numerical schemes of solution of ODE / PDE and linear algebra to the parallel programming on CPU/GPU technologies.
3	Course prerequisites	Basic calculus of differentials of one and many variables, Integration, Basic facts from the theory of ODE, basic linear algebra, basic algebra (polynomials).
4	Teaching methods and language	<p>Lectures and exercises. The teaching language is English</p> <p>Language: English</p> <p>Reference textbooks</p> <ul style="list-style-type: none"> • E. Isaacson, H. Keller, <i>Analysis of numerical methods</i>. J. Wiley & sons, New York. 1966. • A. Quarteroni, R. Sacco, F. Saleri, <i>Matematica Numerica</i>. Springer Collana Unitext. 2000. • Rauber, Thomas, Rüniger, Gudula, <i>Parallel Programming for Multicore and Cluster Systems</i>. Springer-Verlag. 2013.
5	Assessment methods	Students individual research projects and a written theoretical exam.