Basic/Essential Course Information	
Course title	Computing Technologies
Degree Course title	Physics
ECTS	6
Compulsory attendance	Yes
Course teaching language	ENGLISH

Teacher	Giacinto Donvito	giacinto.donvito@ba.infn.it

ECTS Details	Disciplinary area/broad field:	SSD	ECTS
	Characterizing	FIS/01	6

Time management and teaching activity type	Period	Year	lesson type
	2nd semester	1st	Lectures (48)

Time management	Total hours	in-class/in-lab study hours	out-of-class study hours
	150	48	92

Course calendar	Starting date	Ending date
	First week of March	Last week of May

Syllabus	
Prerequisites	Basics of the computing theory, including concepts connected to the common usage of the computing machines.
Expected learning outcomes (according to Dublin Descriptors)	**Knowledge and understanding** Knowledge of the basic aspects of the scientific computing, in particular those connected to some specific applications in physics and the most widely used models (Grid and Cloud computing, Big Data handling) **Knowledge and understanding skills applied** ability to perform raw estimates of the computing power needs for some specific applications in the scientific computing **Autonomy of judgment** Ability to perform evaluations and rating of different solutions and models with respect to their capability to solve specific problems of scientific computing in physics . **Communication skills** Communication skills in Italian/English; specific ability in the presentation and dissemination of knowledge with appropriate scientific language; general ability to work in a group, and to be inserted quickly and effectively in the workplace; communication skills based on the specific terminology used in the field of scientific computing.

Course contents summary	Basic elements of computing theory and scientific computing, principles of Grid computing, computing for the LHC experiments and other applications of the Grid, Cloud computing, Big Data processing/handling.
detailed syllabus	1. Il calcolatore (Memoria, modello di Von Neumann, Tassonomia di Flynn, etc) 2. Principi di calcolo distribuito e ambiti di applicazione 3. Cluster Beowulf ed esempi di batch system reali (HTCondor) 4. Differenza fra Calcolo HTC e HPC 5. Concetti di sicurezza e crittografia 6. Principi di Grid computing (middleware, infrastruttura WLCG, etc) 7. Esempi di modelli di calcolo dei principali esperimenti LHC 8. Principi di Cloud Computing (virtualizzazione, paradigmi IaaS, PaaS, SaaS, cloud storage, etc) 9. Framework per il calcolo distribuito Big Data (Apache Spark, Apache Hadoop, MapReduce) 10. Data center multi-disciplinari per calcolo scientifico: l'esempio di ReCaS Bari
books	Slides and references provided by the teacher.
notes	
Teaching methods	Lectures with slide presentations by the teacher and a final visit to the ReCaS Bari computing data center.
Assessment % of final mark	Oral exam consisting in a discussion about the contents treated during the course. (100%)
Evaluation criteria	**Knowledge** of the basic concepts and principles of scientific calculation, with particular reference to applications in physics; **knowledge** of the fundamental and peculiar characteristics of distributed and parallel computing (HTC and HPC), Grid calculation, Cloud paradigm, Big Data processing and handling; **knowledge and capability to evaluate** the specificity of some intensive computational applications in the scientific field in order to justify in detail the choice of the calculation paradigm that must be used in the given context and the reasons that lead to the exclusion of different solutions.