COURSE PRESENTATION FORM – ACADEMIC YEAR 2010/2011

COURSE NAME	**Mathematical Methods for Physics**
COURSE CODE	70131
LECTURER	Leonardo Colletti
TEACHING ASSISTANTS	--
TEACHING LANGUAGE	English
CREDIT POINTS	4
LECTURE HOURS	24
EXERCISE HOURS	12
TIME SPAN	21.02.2011 - 11.06.2011
TIME TABLE	See Timetable Page
OFFICE HOURS LECTURER	During the lecture time, TBD, Thursdays when exercise hour is scheduled, 15-16, Faculty of CS, POS Building, piazza Domenicani 3, office 2.10
OFFICE HOURS TEACHING ASSISTANT	--
PREREQUISITES	Differentiation and integration of a one-variable function and related practical skills. The student is supposed to have taken and passed the Analysis exam.
OBJECTIVES	• differentiation and integration of multivariable functions • interpreting and solving ordinary differential equations • interpreting and solving partial differential equations • gaining some qualitative insights in physics and models • learning basic numerical approaches to differential equations.
SYLLABUS	MULTIVARIABLE CALCULUS. Many-variable functions.Differentiation of many-variable functions. Partial derivatives. The differential. The gradient. The directional derivative. The Hessian.Maxima and minima. Saddles. Lagrange multipliers.Multiple integrals.Flux, line integral, divergence and curl of a vector field.The divergence theorem. The Stokes theorem.Physical examples: gravitational, electric and magnetic fields. DIFFERENTIAL EQUATIONS. Physics as paradigm for science: the search for description and predictability; quantitative models and equations.Differential equations:

basic concepts.Initial-value and boundary-value problems.Ordinary differential equations.Basic principles of classical dynamics and electromagnetism.Application of first-order differential equations.Non linear differential equations.Partial differential equations.Heat transfer equation. Diffusion equation. Wave equation.

NUMERICAL ANALYSIS.
Zero and extremes of a function.Numerical differentiation.Numerical integration.Random number generators and Monte Carlo integration.Numerical methods for solving ordinary differential equations. Predictor-corrector methods. The Euler and Picard methods. The Runge-Kutta method.Numerical metods for solving partial differential equations.

TEACHING FORMAT Frontal lectures

ASSESSMENT final exam only, written [100 % of mark]

READING LIST Text book:

None

Reading suggestions:
Lecture notes (published in the Reserve Collection of the Library)

SOFTWARE USED none

LEARNING OUTCOME Insights into the scientific method, in particular about modellization and computation. Ability in recognizing and interpreting a certain number of typologies of differential equations; solving skills, both analytical as well as numerical, with application to basic physical models.

COURSE PAGE Reserve Collection