. – **Differential Equations**

Professor Marco Squassina

***COURSE CONTENT***

**Part I.** *Harmonic functions*: fundamental solution; mean-value formulas; maximum principle; estimates of the derivatives; Liouville theorem; analiticity; Harnack inequality.

**Part II.** *Sobolev spaces*: definition and examples; some elementary properties; approximation by smooth functions; extension and trace; Sobolev inequalities; Poincaré inequality; compact embeddings.

**Part III.** *Elliptic equations*: weak formulation; existence via Fredholm alternative; weak maximum principle; Hopf lemma; strong maximum principle; H^2 internal regularity.

***READING LIST***

H. Brezis, *Analisi funzionale – Teoria e applicazioni,* Liguori, Napoli, 1986.

D. Gilbarg - N. S. Trudinger, *Elliptic partial differential equations of second order,* Grundlheren der Mathematischen Wissenschaften, 224, Springer-Verlag, Berlin-New York, 1977.

L. Tartar, *An Introduction to Sobolev Spaces and Interpolation Spaces,* Lecture Notes of the Unione Matematica Italiana, 3. Springer, Berlin; UMI, Bologna, 2007.

***TEACHING METHOD***

Classroom lessons.

***ASSESSMENT METHOD***

Oral exams.

***NOTES***

 Further information can be found on the lecturer's webpage at http://www2.unicatt.it/unicattolica/docenti/index.html or on the Faculty notice board.