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COURSE: MATHEMATICAL ANALYSIS TWO

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ACADEMIC YEAR: 2016/2017

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TYPE OF EDUCATIONAL ACTIVITY: (Basic, Characterizing, Affine, Free choice, Other)

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PROFESSOR: Sorin DRAGOMIR

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website:

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mobile (optional):

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Language: Italian

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ECTS: 6

n. of hours: 60

Campus: Potenza  
School: School of Engineering  
Program:

Semester: I

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#### EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES

Developing and achieving abilities within differential and integral calculus for functions of several real variables together with knowledge of elements of local differential geometry and potential theory (Gauss-Green formulae) allowing for the comprehension of specific mathematical analysis applications to physics and engineering.

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#### PRE-REQUIREMENTS

Pre-requirements consist of the contents of the courses Linear Algebra and Geometry and Mathematical Analysis One

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#### SYLLABUS

Differentiable functions of several real variables. Directional derivative, differential, gradient. Existence and continuity of partial derivatives implies differentiability. Theorem of Schwartz. Chain rule. Taylor's formula with a remainder. Critical points of quadratic forms and eigenvalue theory. Maximum and minimum points for real valued functions of several real variables. Necessary/sufficient conditions for critical points to be local maxima or minima. Eigenvalues of Hessian matrices. Homogeneous functions and Euler's equation. Hints to the theory of partial differential equations. Convection equation. Laplace equation. Heat equation. Wave equation. Maxwell's equations. Local differential geometry of plane and space curves. Curvature, torsion, Frenet's formulae. Integrals along regular curves. Differential forms. Closed forms, exact forms. Criteria of exactness for differential forms. Double integrals on normal domains. Change of variables for double integrals. Triple integrals on normal domains. Local differential geometry of surfaces in space. Regular surfaces, first and second fundamental form. Curves on surfaces. Surface integrals. Elements of potential theory. Gauss, Green and Stokes formulae. Applications of integral calculus in mechanics and to the theory of partial differential equations.

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#### TEACHING METHODS

Theoretical lessons, Classroom tutorials, Bi-weekly home work assignments.

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#### EVALUATION METHODS

Written examination, Oral examination, Evaluation of results obtained in solving the exercises proposed within the bi-weekly home work assignments.

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#### TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

E. Giusti, *Analisi Matematica 2*, Bollati Boringhieri Ed. s.r.l., Torino, 1989.

G. Di Fazio & P. Zamboni, *Analisi Matematica Due*, Monduzzi Ed., Bologna, 2008.

G. Fiorito, *Analisi Matematica 2*, Spazio Libri Ed., Catania, 2007.

R.A. Adams, *Calcolo Differenziale 2. Funzioni di più variabili*, Casa Editrice Ambrosiana, 1992, (Edizione italiana a cura di Luigi Quartapelle).

N. Fusco & P. Marcellini & C. Sbordone, *Analisi Matematica Due*, Liguori Editore, Napoli, 1996

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#### INTERACTION WITH STUDENTS

- Transmission (by e-mail) of lecture notes, shortly after teaching each lesson.
- Transmission (by e-mail) of the Bi-weekly home work assignments.
- Transmission (by e-mail) of the solutions to the exercises proposed in the Bi-weekly home work assignments.
- Office hours: Tuesday 15:00 - 17:00 and Thursday 15:00 - 17:00.

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#### EXAMINATION SESSIONS (FORECAST)

02/02/2017, 25/04/2017, 29/06/2017, 21/09/2017, 14/11/2017.

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SEMINARS BY EXTERNAL EXPERTS    YES     NO

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#### FURTHER INFORMATION

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Università degli Studi della Basilicata  
**Scuola di Ingegneria**