

Universitatea Babeş-Bolyai



Universitatea Babeş-Bolyai
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Cluj-Napoca,
February 21th, 2022

Nonlinear Applied Analysis (Course: 2, Seminar: 1, Examination: during the semester)

Contents

- Chapter 1: Contraction principle and applications; Qualitative properties of the fixed point set/fixed point problem;
- Chapter 2: Generalizations of the contraction principle and applications;
- Chapter 3: Caristi's theorem, Graph contraction theorem;
- Chapter 4: Picard and weakly Picard operators. Examples;
- Chapter 5: A characterization theorem for weakly Picard operators; Abstract Gronwall lemma. Comparison theorems. Examples and applications;
- Chapter 6: Hausdorff-Pompeiu metric. Introduction to multivalued operator analysis;
- Chapter 7: Multivalued contraction principle;
- Chapter 8: K^2M principle and applications;
- Chapter 9: Topological fixed point theorems. Schauder's theorems and applications.

- **Evaluation:** during the semester: two written tests (WT1, WT2), the evaluation of the home-works (H-W) and seminar activity (SA).
- The schedule for the two written tests: First written test (WT1): March 30, 2022, Second written test (WT2): May 25, 2022. The written tests will be performed through the MS Teams platform.
- The home-works must be submitted until May 28, 2022, at the latest.
- **Final mark FM**
 - $FM := 40\%WT1M + 40\%WT2M + 20\%(H - WM + SAM)$.

• **References**

1. A. Granas, J. Dugundji: Fixed Point Theory, Springer-Verlag, Berlin, 2003.
2. E. Zeidler: Nonlinear Functional Analysis and its Applications. I. Fixed-point Theorems, Springer-Verlag, New York, 1986.
3. R.P. Agarwal, M. Meehan, D. O'Regan: Fixed Point Theory and Applications, Cambridge Univ. Press, 2001.
4. W.A. Kirk, B. Sims (eds.): Handbook of Metric Fixed Point Theory. Kluwer Acad. Publ., Dordrecht, 2001.
5. A. Petrușel : Operatorial Inclusions, House of the Book of Science, Cluj-Napoca, 2002.
6. I.A. Rus: Generalized Contractions and Applications, Cluj University Press, 2001.

• **Important notes**

- 1) The course and the seminar will take place every Wednesday from 17.35 on Microsoft Teams platform, via the **Nonlinear Applied Analysis 2022 Team, code: 7pp58jn**
- 2) Office hours: Friday from 8.30-10.00 a.m., by appointment (E-mail: petrusel@math.ubbcluj.ro)
- 3) The two written tests cannot be recovered;
- 4) It is forbidden to transfer the home-works to the colleagues. In that case, both (all) of the home-works will not be considered;
- 5) In order to pass the exam every student need to have at least 10 participation at the seminars;
- 6) According to the National Education Law - 2011, the record through any procedure of the didactic activity can be done only with the consent of the guiding teacher and of all students. In particular, the record of this course is not allowed.