Bahçeşehir University, Istanbul, Turkey
Analysis & PDE Center, Ghent University, Ghent, Belgium
Institute Mathematics & Math. Modeling, Almaty, Kazakhstan

"Analysis and Applied Mathematics"

Weekly Online Seminar

Seminar leaders:
Prof. Allaberen Ashyralyev (BAU, Istanbul),
Prof. Michael Ruzhansky (UGent, Ghent),
Prof. Makhmud Sadybekov (IMMM, Almaty)

Date: **Tuesday, March 22, 2022**
Time: 14.00-15.00 (Istanbul) = 12.00-13.00 (Ghent) = 17.00-18.00 (Almaty)

Zoom link: https://us02web.zoom.us/j/6678270445?pwd=SFNmQUlvT0tRaH-lDaVYrN3l5bzJVQT09, **Conference ID:** 667 827 0445, **Access code:** 1

Speaker:

Prof. Dr. Alberto Cabada
University of Santiago de Compostela, Galicia, Spain

Title: Existence and multiplicity results of fourth order equations with integral conditions on the boundary

Abstract: Fourth-order boundary value problems model some kinds of deformations of an elastic beam. They have been studied by many authors via various methods, such as Leray-Schauder continuation method, topological degree theory, shooting method, fixed point theorems on cones, critical point theory, the lower and upper solutions method or spectral theory.

In this talk, we study the existence and multiplicity of positive solutions for the fourth order problem

$$(P_\lambda)\begin{cases} u^{(4)}(t) + Mu(t) + f\big(t,u(t)\big) = 0, & t \in [0,1], \\ u(0) = u'(0) = u''(0) = 0, & u(1) = \lambda \int_0^1 u(s)ds. \end{cases}$$

The boundary conditions model the deflection of beam fixed in 0 that has some mechanism in 1 which controls the displacement according to the feedback from devices measuring the displacements along parts of the beam.

By using the characterization, given in [1], of the sign of the Green's function g_M related to (P_0), we obtain the explicit expression of the Green's function G_M related to (P_λ) as a combination of the expression of g_M. In this case, we will give the exact values on the positive parameter λ for which G_M remains negative on $(0,1) \times (0,1)$, whenever $g_M < 0$.

For such set of values, we prove the existence of countably many positive solutions for the nonlinear problem (P_λ) under suitable conditions on f. Some examples are given to show the applicability of the obtained results. The results are published in [2].

References:

[1] A. Cabada and C. Fernández-Gómez, Constant sign solutions of two-point fourth order problems, *Appl. Math. Comput.,* **263** (2015), 122–133.

[2] A. Cabada and R. Jebari, Multiplicity results for fourth order problems related to the theory of deformations beams, *Discrete Contin. Dyn. Syst. Ser. B*, **25** (2020), 2, 489–505.

Biography:

Alberto Cabada has obtained a degree in Mathematics in 1989 and PhD degree in Mathematics in 1992, both of them from University of Santiago de Compostela (Spain). After completion of his studies, he had a position of Interim Associate Professor (1992-1994) and Associate Professor (1994-2010). Alberto Cabada holds currently a position of a Full Professor since 2010. All of them at the University of Santiago de Compostela. Since 2004 he appears on the list of 1% of the most cited mathematicians in the world according to the Essential Scientific Indicators of the Institute of Scientific Information (ISI) of Philadelphia. According to this institution, his h-index is equal to 31. His topics of research deal mostly with the existence and multiplicity of solution in differential equations, both ordinary and partial derivatives, as well as in difference and fractional equations.