Important information related to the competitions, posted according to art. 7, alin. 9 al H.G. 1339/29.12.2023

FACULTY OF SCIENCES

Department of APPLIED MATHEMATICS

Job description:
Full professor, position 1,
Discipline (Disciplines): Special Mathematics
The scientific domain: Mathematics

The attributions/activities related to the professor position, including the didactic norm and the types of activities included in the didactic norm, respectively the research norm:

I. Teaching-related activities:

Lecturing	168 hours;
Seminars, laboratories, projects	84 hours;
Other activities	196 hours.

Total 448 hours   Average hours per week 16 hours

II. Scientific and methodical preparation, and other activities for the benefit of education: 972 hours.

III. Scientific research activity: 300 hours (elaboration of scientific communications, writing studies and articles, publishing books, participation in national and international scientific events).

Total: 1720 hours

The topic of the competition tests, including lectures, courses or similar or the topics from which the competition committee can choose the topic of the tests:

1. Special Mathematics
   a. **Complex Analysis**. Algebraic, trigonometric forms, and geometric representation of complex numbers; Sequences of complex numbers; Complex functions of complex variables: limits, continuity, differentiability, Cauchy–Riemann theorem, holomorphic functions; Power series with complex coefficients: Abel theorem, Cauchy–Hadamard theorem, theorem of the identity of the power series coefficients, power series expansion theorem; Elementary functions; Analytic functions; Paths in $\mathbb{C}$; Integral of a complex function: properties, Cauchy theorem and Cauchy formula for holomorphic functions, Leibniz–Newton formula; Zeros of holomorphic functions; Isolated singular points: classification, properties; Laurent series: theorem of the annulus of convergence, theorem of the identity of the Laurent series coefficients, Laurent series expansion theorem; Residue theory: the residue of a function at a point, the residue theorem, applications of the residue theorem to the calculation of certain real integrals.
   b. **Ordinary Differential Equations (ODEs)**. General notions; Theorem of the existence and uniqueness, theorem of the existence for Cauchy problems associated to first order

ODEs; First order ODEs solvable by elementary methods: total differential equations, equations admitting integrating factor, equations with separable variables, homogeneous equations, linear equations, Bernoulli equations, Riccati equations, equations implicit with respect to the derivative, Clairaut equations, Lagrange equations; Systems of first order linear ODEs: theorem of the existence and uniqueness, Liouville theorem, fundamental matrices, systems with constant coefficients, Euler method for determining a fundamental matrix; Upper order linear ODEs: the existence and uniqueness of the solutions of the associated Cauchy problems, fundamental systems of solutions, equations with constant coefficients, Euler equations.

c. **Fourier Series**. Periodic, even, odd functions, periodic, even, odd extensions; Fourier coefficients, the Fourier series associated to a function; Bessel inequality; Parseval formula; Convergence of the Fourier series: Dirichlet theorem of convergence; Fourier cosine series, Fourier sine series, calculation of the sums of certain numerical series by using Fourier series.
d. **Laplace Transform**. Original signal; Laplace transform: definition, properties, fundamental theorems, the Laplace transforms of some elementary signals; determining of the Laplace transform, determining of the original; Applications to solving of some ODEs and systems of ODEs, integral equations and systems of integral equations.
e. **Z Transform**. Discrete signals; Z transform: definition, properties, fundamental theorems, the Z transforms of some elementary discrete signals, determining of the discrete signal, by knowing its Z transform; Applications to determining the general term of a sequence defined by linear recurrence relation.
f. **Fourier Transform**. Fourier original; Fourier transform: definition, properties, fundamental theorems, determining the Fourier transform, Fourier inversion theorem, inversion of the Laplace transform; Parseval formula; Fourier cosine transform and Fourier sine transform; Representation of certain functions as Fourier integrals.

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