Opening for Faculty Position - Department of Basic and Environmental Sciences of the Lorena Engineering School of the University of São Paulo (EDITAL ATAc/EEL/USP – 31/2024)

The Dean of the Lorena Engineering School (EEL) of the University of São Paulo (USP) announces the opening call for the faculty position (full-time), specialty "Mathematics".

Briefly, the position requires a commitment to teaching and extension activities and the ability to conduct independent research. Interested applicants should hold a Ph.D. granted or recognized by USP. Applications will be accepted between June 7th, 2024, at 8 a.m. to August 5th 2024, at 4 p.m. (GMT-3). The entry-level monthly salary (MS-3.1 level) is R$ 15.498,97 plus benefits. The public exam will be held in Portuguese language and covers the following program:

1. Vector spaces: definition and properties of vector spaces and vector subspaces. Linear combination and linear span. Linear dependence and independence. Finitely generated vector spaces. Bases and dimension of vector spaces;
2. Linear transformations: definition and properties of linear transformations and linear operators. Kernel and image of a linear transformation. Rank-nullity theorem. Inverse of a linear transformation;
3. Eigenvalues and eigenvectors: Definition and properties of the spectrum and eigenspace of a linear operator. Characteristic polynomial. Minimal polynomial;
4. Diagonalization: Bases of eigenvectors, simultaneous diagonalization of two operators, Jordan Form;
5. Inner product spaces: Definition and properties of inner-products. Cauchy-Schwarz inequality, Orthogonality. Orthogonal and orthonormal bases; gram Schmidt process. Orthogonal projection. Adjoint operator;
6. Applications: Definition, properties and solutions of homogeneous linear differential equations with constant coefficients and systems of homogeneous linear first-order differential equations with constant coefficients. Difference equations;
7. Vectors: Directed line. Axis. Directed line segment. Equipollent line segments. Vector. Operations with vectors. Angle between two vectors;
8. Vectors in 2 and 3 dimensions: Decomposition of a vector in 2 dimensions. Analytical expression of a vector. Equality, addition and scalar multiplication of vectors. Vectors defined by the coordinates of its initial and terminal point. Decomposition of a vector in 3 dimensions. Equality, addition and scalar multiplication of vectors. Vectors defined by its extreme points. Parallel vectors;
9. Linear dependence: Linear dependence and independence in 2 and 3 dimensions. Base. Base change;
10. Products of vectors: Dot product. Length of a vector. Properties of the dot product. Angle between two vectors. Direction cosines of a vector. Vector projection. Dot product in 2 dimensions. Cross product. Properties of the cross product. Geometric interpretation of the cross product magnitude. Scalar triple product. Properties of the scalar triple product. Geometric interpretation of the scalar triple product magnitude;

11. Lines: Vector equation of the line. Line defined by two points. Parametric equations of the line. Symmetric equations of the line. Reduced equations of the line. Lines parallel to the coordinate planes and axes. Angle between two lines. Parallel and orthogonal lines. Coplanar lines. Relative positions between two lines. Line orthogonal to two lines. Point that divides a line segment in a given ratio;
12. Planes: Vector equation of the plane. Plane defined by three points. Planes parallel to the coordinate planes and axes. Parametric equation of the plane. Angle between two planes. Angle between a line and a plane. Intersection of two planes. Intersection of a line and a plane;
13. Distances: Distance between two points. Distance from a point to a line. Distance between two lines. Distance from a point to a plane. Distance between two planes. Distance from a line to a plane;
14. Polar coordinates: definition, polar equations and graphics. Relation between polar and Cartesian coordinates.
15. Coordinate change: Changing coordinates in 2 and 3 dimensions. Applications of translations and rotations;
16. Parametric equations: line, circumference. Parametric equations for curves;
17. Conic sections: parabola, ellipse and hyperbola. The conic sections;
18. Quadric surfaces: centered quadric surfaces. Non centered quadric surfaces. Cones. Cylinders;
19. Real Numbers and Real Functions: trigonometric, exponential and logarithmic functions. Composite and inverse functions;
20. Limits: definition and algebraic properties. Squeeze theorem. Infinite limits and limits at infinite;
21. Continuity: Weierstrass theorem and intermediate value theorem;
22. Derivatives of real functions: definition, geometrical and physical interpretation. Differentiation rules, chain rule, derivative of inverse and implicit functions, L'Hôpital's rule, mean value theorem for derivatives and consequences, Taylor's Formula, Maximum and Minimum Problems;
23. Integration of real functions: primitive function, the Riemann Integral. Fundamental theorem of calculus. Integration techniques and improper integration;
24. The Euclidean space R^n: Open, closed and compact sets;
25. Function of n real variables: Graphs and level curves for functions with 2 variables;
26. Limits and continuity: Weierstrass's Theorem;
27. Differentiability: Partial derivatives, differentials, tangent planes and linear approximations. Directional derivatives, gradient vectors. Partial derivatives of higher order, Schwartz's Theorem, the chain rule. Implicit function theorem, Jacobian; e
28. Maximum and minimum: Extreme values of functions with several real variables on an open domain. Hessian. Lagrange multipliers.

The entire application process - from the inscription to the result - will be ruled by the Brazilian constitutional principles, notably that of impersonality, as well as by the Statute and General Regulations of the University of São Paulo (USP) and by the Regulations of the EEL-USP.

The public call is available in Portuguese language at https://uspdigital.usp.br/gr/admissao, where the applications must be submitted to by the deadline informed above. Additional information and regulations relevant about this opening call can be obtained from the e-mail: sacc@eel.usp.br.