



**UNIVERSIDADE FEDERAL DE SANTA CATARINA  
CENTRO DE CIÊNCIAS FÍSICAS E MATEMÁTICAS  
PÓS-GRADUAÇÃO EM MATEMÁTICA PURA E APLICADA**

**MTM410038 Distribution Theory and Sobolev Spaces**

Pre-requisite: Theory of measurement and integral of Lebesgue, MTM410029 Functional Analysis

Weekly lesson hours: 06h

**Discipline syllabus:** The Function Space Tests. Density. Distributions in an open  $\Omega$  of  $\mathbb{R}^n$ . Derivation of distributions. Temperate Distributions. Fourier transform in  $L^1(\mathbb{R}^n)$ ,  $S(\mathbb{R}^n)$  and  $L^2(\mathbb{R}^n)$ . Fourier transform of tempered distributions. Plancherel's theorem. The Sobolev Spaces  $W(\Omega)$ . Properties, Reflexivity, Separability, Dual. The Space  $W(\Omega)$ . Prolonging Operators. The Sobolev spaces  $H^s(\Omega)$  and  $H^s(\Omega)$ ,  $s$  real,  $\Omega$  open subset of  $\mathbb{R}^n$ . The Trace Theorem. Applications to Partial Differential Equations. Generalized Solutions and Existence and Uniqueness of Initial and Border Value Problems.

**BIBLIOGRAPHIC REFERENCES**

1. Medeiros, L. A., Miranda, M. M., *Espaços de Sobolev*, 2a. Edição, Instituto de Matemática, UFRJ, 2004.
2. Brezis, H., *Analyse Fonctionnelle: théorie et Applications*, Masson (1983).
3. Kesavan, S., *Topics in Functional Analysis and Applications*, Wiley (1989).

**COMPLEMENTARY BIBLIOGRAPHY**

1. Adams, R. A., *Sobolev Spaces*, Academic Press (1975).
2. Evans, L. C., *Partial differential equations*, American Mathematical Society, 2002.
3. Hörmander, L., *The Analysis of Linear Differential Operators I, Distribution Theory and Fourier Analysis*, Springer-Verlag, 2ed., 1990
4. Medeiros, L. A. , Rivera, P. H. *Iniciação aos Espaços de Sobolev*, IM-UFRJ, Rio de Janeiro (1977).
5. Renardy, M., Rogers, R.C., *An introduction to partial differential equations*, Springer-Verlag, 1993.