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

MTM410028 Numerical Analysis I

Pre-requisite: MTM410024 Computational Linear Algebra

Weekly lesson hours: 06h

Discipline syllabus: Ordinary differential equations. One-step and multi-step methods, implicit and explicit. Stability of methods. Stiff Problems. Methods for Linear and Nonlinear Value Problems at the 1D Border. Partial differential equations. Basic ideas of finite differences. Convergence, consistency, stability, the Lax Theorem .. 2D parabolic equations: convergence, stability. 2D elliptic equations. Conditions of Dirichlet and Neumann. Hyperbolic Equations 1D, Condition of Courant-Friedrichs-Lewy. Dispersion and Dissipation: some ideas. Conservation laws 1D: Scalar case.

BIBLIOGRAPHIC REFERENCES

Text book 1:

1. Leveque, R., *Finite Difference Methods for ordinary and Partial Differential Equations: Steady-State and Time-Dependent Problems* – Classics in Applied Mathematics, SIAM 2007.

Text book 2:

1. Golub, G. H., Ortega J. M. *Scientific Computing and Diferential Equations, an Introduction to Numerical Methods,* Academic Press , Boston 1992.

COMPLEMENTARY BIBLIOGRAPHY

1. Thomas, J. W., *Numerical partial differential equations*. Texts in Applied Mathematics, 33, Springer (1999).
2. Strikwerda, John C., *Finite difference schemes and partial differential equations*, Second Edition, SIAM, 2004.
3. Burden, R. L. Faires, J. D., *Numerical Analysis*, PWS-Kent Publishing Company, 2009.
4. Atkinson, K. E. *An Introduction to Numerical Analysis,* Second Edition, John Wiley 1988.
5. Gautschi, W. *Numerical Analysis – An Introduction*, Birkauser, London 1997.