

# CURRICULUM VITAE

Carlo LOVADINA

**Place and date of birth:** Milano (Italy) 4.7.1969

**Citizenship:** Italian

## CURRICULUM VITAE ET STUDIORUM

1. 30.06.1995: Assistant professor in Mathematical Analysis at the Engineering School of the University of Trento.
2. 01.11.2000– November 2011: Associate professor in Numerical Analysis at the Department of Mathematics of the University of Pavia.
3. February 2002–: Research associate at IMATI of C.N.R., Pavia.
4. March 2004– June 2004: Visiting professor at the Institute of Mathematics, Helsinki University of Technology, invited by R. Stenberg.
5. April 2008: Visiting at the Department of Engineering Mathematics of the University of Concepcion, invited by R. Rodríguez.
6. July 2010: Habilitation as full professor in Numerical Analysis.
7. December 2011 - September 2016: Full professor of Numerical Analysis at the Department of Mathematics of the University of Pavia.
8. October 2016 –: Full professor of Numerical Analysis at the Department of Mathematics of the University of Milano.

## Leading roles in projects

1. November 2002–October 2006: European project “Smart Systems: new materials, adaptive systems and their Nonlinearities. Modelling, Control and Numerical Simulation”. Leader, with R. Stenberg, of the Work Package “Numerical Simulation”. Scientific responsible of the following post-doc positions, financed by the project.
  - “Modelling and Numerical Simulation of Thin Structures”. Duration: 3 months.
  - “Stabilized FEM for evolution problems involving Smart Materials”. Duration: 12 months.
  - “FEM Analysis for Structural Mechanics”. Duration: 2 months.
  - “Numerical treatment of circuit-device problems for Adaptive Systems”. Duration: 3 months.
  - “Analysis and numerical simulation of rate-independent problems”. Duration: 3 months.
  - “Numerical treatment of circuit-device problems for Adaptive Systems”. Duration: 1 month.
2. September 2011 - August 2014 Unit leader of the European Project “Towards Enhanced Integration of Design and Production in the Factory of the Future through Isogeometric Technologies” (Small or medium-scale focused research project (STREP) proposal. Factories of the Future FP7-2011-NMP-ICT-FoF).

## Scientific activity

My scientific activity is mainly devoted to the numerical approximation of problems arising from Continuum Mechanics. In particular, I have considered the following topics.

- Finite Elements for Reissner-Mindlin plate problems.
- Finite Elements for piezoelectric plate problems.

- Finite Elements for laminated plate problems.
- Augmented-Lagrangian methods for problems in mixed form.
- Finite Elements for linear incompressible elasticity (and for the Stokes problem).
- Numerical approximation of finite Strain elasticity problems.
- Asymptotic behaviour of shell structures.
- *A posteriori* error estimates for elliptic problems in mixed form.
- Isogeometric Methods for Structural Mechanics problems.
- Virtual Element Methods.

### Some other activities

1. December 2002– December 2008 : member of the Commissione Informatica del Dipartimento di Matematica dell'Università di Pavia.
2. October 2003– September 2008: member of the Giunta del Dipartimento di Matematica dell'Università di Pavia.
3. January 2017– : director of Unità di Ricerca INdAM presso il Dipartimento di Matematica dell'Università degli Studi di Milano.
4. October 2016– September 2018: member and then president of the Comitato di Garanzia per gli assegni di ricerca dell'Università di Milano.
5. October 2017– January 2019: referente di Dipartimento per l'Assicurazione della Qualità della Ricerca presso l'Università degli Studi di Milano.
6. February 2017– October 2018: president of the Commissione Informatica del Dipartimento di Matematica dell'Università degli Studi di Milano.
7. October 2017– : memebre of the Giunta del Dipartimento di Matematica dell'Università degli Studi di Milano.

8. October 2018–: president of the Consiglio Didattico in Matematica (laurea triennale e laurea magistrale) presso l’Università degli Studi di Milano.

## PUBLICATIONS

### Journal papers

- [1] C. Lovadina: “On the convergence of a mixed finite element method for Reissner-Mindlin plate”, *M<sup>2</sup>AN*, (28)5, 1994, 557–573.
- [2] C. Lovadina: “A new class of mixed finite element methods for Reissner-Mindlin plates”, *SIAM J. Numer. Anal.*, (33)6, 1996, 2457–2467.
- [3] C. Lovadina: “Some rectangular finite element methods for Reissner-Mindlin plates”, *Math. Models and Methods in Appl. Sci.*, (5)6, 1995, 777–787.
- [4] C. Chinosi, C. Lovadina: “Numerical analysis of some mixed finite element methods for Reissner-Mindlin plates”, *Comput. Mechanics*, 16(1), 1995, 36–44.
- [5] D. Boffi, C. Lovadina: “Analysis of new augmented Lagrangian formulations for mixed finite element schemes”, *Numer. Math.*, 75, 1997, 405–419.
- [6] C. Lovadina: “Analysis of a mixed finite element method for Reissner-Mindlin plate problem”, *Comput. Methods Appl. Mech. Engrg*, 163, 1998, 71–85.
- [7] C. Lovadina: “Analysis of strain-pressure finite element methods for the Stokes problem”, *Numer. Methods for PDE’s*, 13, 1997, 717–730.
- [8] A. Cazzani, C. Lovadina: “On some mixed finite element methods for plane membrane problems”, *Comput. Mechanics*, 20, 1997, 560–572.
- [9] C. Chinosi, C. Lovadina: “Remarks on partial selective reduced integration method for Reissner-Mindlin plate problem”, *Computers and Structures*, 73, 1999, 73-78.
- [10] F. Auricchio, C. Lovadina: “Partial selective reduced integration methods and kinematically linked interpolations for plate bending problems”, *Math. Models and Methods in Appl. Sci.*, (9)5, 1999, 693–722.

- [11] A. Blouza, F. Brezzi, C. Lovadina: “Sur la classification des coques linéairement élastiques”, *C.R. Acad. Sci. Paris, Serie I, Tome 328, 1999*, 831–836.
- [12] C. Baiocchi, C. Lovadina “Interpolation Theory and Shell Problems”, *Appl. Math. Letters*, 7, 2000, 33–37.
- [13] F. Auricchio, C. Lovadina: “Analysis of kinematic linked interpolation methods for Reissner-Mindlin plate problems”, *Comput. Methods Appl. Mech. Engrg*, 190, 2001, 2465–2482.
- [14] F. Auricchio, P. Bisegna, C. Lovadina: “Finite element approximation of piezoelectric plates”, *Int. J. Numer. Methods Eng.*, 50, 2001, 1469–1499.
- [15] F. Auricchio, C. Lovadina, E. Sacco: “Analysis of mixed finite elements for laminated composite plates”, *Comput. Methods Appl. Mech. Engrg*, 190, 2001, 4767–4783.
- [16] F. Auricchio, L. Beirão da Veiga, C. Lovadina: “Remarks on the asymptotic behaviour of Koiter shells”, *Computers and Structures*, 80, 2002, 735–745.
- [17] C. Baiocchi, C. Lovadina “A shell classification by Interpolation”, *Math. Models and Methods in Appl. Sci.*, (12)10, 2002, 1359–1380.
- [18] C. Lovadina, F. Auricchio: “On the Enhanced Strain Technique for Elasticity Problems”, *Computers and Structures*, 81, 2003, 777–787.
- [19] F. Auricchio, C. Lovadina, A.L. Madureira: “Asymptotically optimal models for heterogeneous linearly elastic plates”, *ESAIM Mathematical Modelling and Numerical Analysis*, 38, 2004, 877–897.
- [20] C. Lovadina: “A low-order nonconforming finite element for Reissner-Mindlin plates”, *SIAM J. Numer. Anal.*, 42, 2005, 2688–2705.
- [21] F. Auricchio, L. Beirão da Veiga, C. Lovadina, A. Reali: “A Stability Study of some Mixed Finite Elements for Large Deformation Elasticity Problems”, *Comput. Methods Appl. Mech. Engrg.*, 194, 2005, 1075–1092.
- [22] P. Hansbo, C. Lovadina, I. Perugia, G. Sangalli: “A Lagrange multiplier method for the finite element solution of elliptic interface problems using non-matching meshes”, *Numerische Mathematik*, 100, 2005, 91–115.

- [23] F. Auricchio, L. Beirão da Veiga, C. Lovadina, A. Reali: “An analysis of some mixed-enhanced finite element for plane linear elasticity”, *Comput. Methods Appl. Mech. Engrg.*, 194, 2005, 2947–2968.
- [24] C. Lovadina, R. Stenberg: “A posteriori error analysis of the linked interpolation technique for plate bending problems”, *SIAM J. Numer. Anal.*, 43, 2005, 2227–2249.
- [25] C. Chinosi, C. Lovadina, L.D. Marini: “Nonconforming locking-free finite elements for Reissner-Mindlin plates”, *Comput. Methods Appl. Mech. Engrg.*, 195, 2006, 3448–3460.
- [26] C. Lovadina, R. Stenberg: “Energy norm a posteriori error estimates for mixed finite element methods”, *Math. Comp.*, 75, 2006, 1659–1674.
- [27] L. Beirão da Veiga, C. Lovadina, L.F. Pavarino: “Positive Definite Balancing Neumann-Neumann preconditioners for Nearly Incompressible Elasticity”, *Numer. Mathematik*, 104, 2006, 271–296.
- [28] L. Beirão da Veiga, C. Lovadina: “Asymptotics of Shell Eigenvalue Problems”, *C.R. Acad. Sci. Paris, Ser. I*, 342, 2006, 707-710.
- [29] F. Auricchio, L. Beirão da Veiga, A. Buffa, C. Lovadina, A. Reali, G. Sangalli: “A fully ‘locking-free’ isogeometric approach for plane linear elasticity problems: a stream function formulation”, *Comput. Methods Appl. Mech. Engrg.*, 197, 2007, 160-172.
- [30] L. Beirão da Veiga, C. Chinosi, C. Lovadina, R. Stenberg: “A-priori and a-posteriori error analysis for a family of Reissner-Mindlin plate elements”, *BIT Numerical Mathematics*, 48, 2008, 189-213.
- [31] E. Artioli, L. Beirão da Veiga, H. Hakula, C. Lovadina: “Free vibrations for some Koiter shells of revolution”, *Appl. Math. Letters*, 21, 2008, 1245-1248.
- [32] C. Lovadina, M. Lyly, R. Stenberg: “A posteriori estimates for the Stokes eigenvalue problem”, *Numer. Methods for PDEs*, 25, 2009, 244-257.
- [33] L. Beirão da Veiga, C. Lovadina: “An Interpolation Theory approach to shell eigenvalue problems”, *Mathematical Models and Methods in Applied Sciences*, 18, 2008, 2003-2018.
- [34] F. Auricchio, L. Beirão da Veiga, C. Lovadina, A. Reali: “The importance of the exact satisfaction of the incompressibility constraint in nonlinear elasticity: mixed FEMs versus NURBS-based approximations”, *Comput. Methods Appl. Mech. Engrg.*, 199, 2010, 314-323.

- [35] E. Artioli, L. Beirão da Veiga, H. Hakula, C. Lovadina: “On the asymptotic behaviour of shells of revolution in free vibration”, *Comput. Mechanics*, 44, 2009, 45-60.
- [36] L. Beirão da Veiga, C. Chinosi, C. Lovadina, L.F. Pavarino: “Robust BDDC preconditioners for Reissner-Mindlin plate bending problems and MITC elements”, *SIAM J. Numer. Anal.*, 47, 2010, 4214-4238.
- [37] C. Lovadina, L.D. Marini: “A-Posteriori error estimates for discontinuous Galerkin approximations of second order elliptic problems”, *Journal of Scientific Computing*, 40, 2009, 340-359.
- [38] C. Lovadina, D. Mora, R. Rodríguez: “Approximation of the buckling problem for Reissner-Mindlin plates”, *SIAM Numer. Anal.*, 48, 2010, 603-632.
- [39] C. Lovadina, D. Mora, R. Rodríguez: “A locking-free finite element method for the buckling problem of a non-homogeneous Timoshenko beam”, *ESAIM Mathematical Modelling and Numerical Analysis*, 45, 2011, 603-626.
- [40] F. Auricchio, G. Balduzzi, C. Lovadina; “A new modeling approach for planar beams: finite-element solutions based on mixed variational derivations”, *Journal of Mechanics of Materials and Structures*, 5, 2010, 771-794.
- [41] L. Beirão da Veiga, A. Buffa, C. Lovadina, M. Martinelli and G. Sangalli, “An isogeometric method for the Reissner-Mindlin plate bending problem”, *Comput. Methods Appl. Mech. Engrg.*, 209, 2012, 45-53.
- [42] L. Beirão da Veiga, C. Chinosi, C. Lovadina, L.F. Pavarino, “BDDC preconditioners for Naghdi shell problems and MITC9 elements”, *Computers and Structures*, 102, 2012, 28-41.
- [43] L. Beirão da Veiga, C. Lovadina, A. Reali, “Avoiding shear locking for the Timoshenko beam problem via Isogeometric collocation methods”, *Comput. Methods Appl. Mech. Engrg.*, 241, 2012, 38-51.
- [44] P.F. Antonietti, L. Beirão da Veiga, C. Lovadina, M. Verani, “Hierarchical a posteriori error estimators for the mimetic discretization of elliptic problems”, *SIAM J. Numer. Anal.*, 51(1), 2013, 654-675.
- [45] F. Auricchio, L. Beirão da Veiga, J. Kiendl, C. Lovadina, A. Reali, “Locking-free isogeometric collocation methods for spatial Timoshenko rods”, *Comput. Methods Appl. Mech. Engrg.*, 263, 2013, 113-126.

- [46] F. Auricchio, L. Beirão da Veiga, C. Lovadina, A. Reali, RL Taylor, P. Wriggers, “Approximation of incompressible large deformation elastic problems: some unresolved issues”, *Comput. Mechanics*, 52, 2013, 1153-1167.
- [47] F. Auricchio, G. Balduzzi, C. Lovadina, “The dimensional reduction modelling approach for 3D beams: differential equations and finite-element solutions based on Hellinger-Reissner principle”, *Int. Journal of Solids and Structures*, 50, 2013, 4184-4196.
- [48] L. Beirão da Veiga, C. Lovadina, D. Mora, Numerical results for mimetic discretization of Reissner-Mindlin plate problems, *Calcolo*, 50, 2013, 209-237.
- [49] L. Beirão da Veiga, T.J. R. Hughes, J. Kiendl, C. Lovadina, J. Niiranen, A. Reali, H. Speleers, A locking-free model for Reissner-Mindlin plates: Analysis and isogeometric implementation via NURBS and triangular NURPS, *Mathematical Models and Methods in Applied Sciences*, 25, 2015, 1519-1551.
- [50] F. Auricchio, G. Balduzzi, C. Lovadina, The Dimensional Reduction Approach for 2D Non-prismatic Beam Modelling: a Solution Based on Hellinger-Reissner Principle, *Int. Journal of Solids and Structures*, 63, 2015, 264-276.
- [51] L. Beirão da Veiga, C. Lovadina, D. Mora, A Virtual Element Method for elastic and inelastic problems on polytope meshes, *Comput. Methods Appl. Mech. Engrg.*, 295, 2015, 327-346.
- [52] L. Beirão da Veiga, C. Lovadina, G. Vacca, Divergence free Virtual Elements for the Stokes problem on polygonal meshes, *ESAIM Mathematical Modelling and Numerical Analysis*, 51, 2017, 509-535.
- [53] E. Artioli, L. Beirão da Veiga, C. Lovadina, E. Sacco, Arbitrary order 2D virtual elements for polygonal meshes: part I, elastic problem, *Computational Mechanics*, 60, 2017, 355-377.
- [54] E. Artioli, S. de Miranda, C. Lovadina, L. Patruno, A stress/displacement Virtual Element method for plane elasticity problems, *Comput. Methods Appl. Mech. Engrg.*, 325, 2017, 155-174.
- [55] E. Artioli, L. Beirão da Veiga, C. Lovadina, E. Sacco, Arbitrary order 2D virtual elements for polygonal meshes: part II, inelastic problem, *Computational Mechanics*, 60, 2017, 643-657.



- [56] L. Beirão da Veiga, C. Lovadina, A. Russo, Stability analysis for the virtual element method, *Mathematical Models and Methods in Applied Sciences*, 27, 2017, 2557-2594.
- [57] L. Beirão da Veiga, C. Lovadina, G. Vacca, Virtual elements for the Navier-Stokes problem on polygonal meshes, *SIAM J. Numer. Anal.*, 56, 2018, 1210-1242.
- [58] E. Artioli, S. de Miranda, C. Lovadina, L. Patruno, A family of virtual element methods for plane elasticity problems based on the Hellinger-Reissner principle, *Comput. Methods Appl. Mech. Engrg.*, 340, 2018, 978-999.
- [59] E. Artioli, S. de Miranda, C. Lovadina, L. Patruno, An equilibrium-based stress recovery procedure for the VEM, *Int. Journal Numer. Methods Engrg.*, 117, 2019, 885-900.

### Sections in books

- [60] F. Auricchio, F. Brezzi, C. Lovadina: “Mixed Finite Element Methods”, in *“Encyclopedia of Computational Mechanics”*, Wiley & Sons. Editors: E. Stein, R. de Borst, T.J.R. Hughes.
- [61] C. Lovadina: “A brief overview of plate finite element methods”, in *Integral Methods in Science and Engineering, Volume 2: Computational Aspects*, Chapter 25, Birkhauser Boston. Editors: C. Constanda and M.E. Perez, 2010.

### Some Congress Proceedings

- [62] C. Chinosi, C. Lovadina: “Mixed finite elements for Reissner-Mindlin plate model”, in *Advances in Finite Element Techniques, CIVIL-COMP*, M. Papadrakakis and B.H.V. Topping Eds, 1994, 33–38.
- [63] A. Cazzani, C. Lovadina: “Finite elements for plane membrane problems with unsymmetric stresses”, in *Joint Conference of Italian Group of Computational Mechanics and Ibero-Latin American Association of Computational Methods in Engineering*, 1996, 69–72.
- [64] F. Auricchio, C. Lovadina: “Linking methods for Reissner-Mindlin plate problems”, in *Atti del Congresso GIMC 98, Trento*, 1998, 13–16.
- [65] F. Auricchio, C. Lovadina, E. Sacco: “Finite elements for laminated plates”, in *Atti del Congresso GIMC2000, Brescia*, 2000.

- [66] F. Auricchio, C. Lovadina, E. Sacco: “Finite element techniques for laminated composite plates”, in *Proceedings of ECCOMAS 2000. CD-ROM*.
- [67] C. Lovadina: “Energy estimates for linear elastic shells”, in *Proceedings of the first MIT Conference on Computational Fluid and Solid Mechanics*, Vol. I, Elsevier, 2001, 330-331.
- [68] C. Lovadina: “Energy estimates for shell problems”, in *Numerical Mathematics and Advanced Applications ENUMATH2001*, Springer, 2003, 381-388.
- [69] C. Lovadina, R. Nascimbene, I. Perugia, P. Venini: “Mixed methods for interface problems”, in *Proceedings of the second MIT Conference on Computational Fluid and Solid Mechanics*, Vol. II, Elsevier, 2003, 2053-2056.
- [70] F. Auricchio, L. Beirão da Veiga, C. Lovadina, A. Reali: “Enhanced Strain Methods for Elasticity Problems”, in *Proceedings of ECCOMAS 2004. CD-ROM*.
- [71] C. Chinosi, C. Lovadina, L.D. Marini: “Nonconforming finite elements for Reissner-Mindlin plates”, in *Applied and Industrial Mathematics in Italy* (M. Primicerio, R. Spigler, and V. Valente Eds.), Series on Advances in Mathematics for Applied Sciences 69, 2005, 213–224, World Scientific.
- [72] P. Hansbo, C. Lovadina, I. Perugia, G. Sangalli: “A Lagrange multiplier method for finite elements on non-matching meshes”, in *Applied and Industrial Mathematics in Italy* (M. Primicerio, R. Spigler, and V. Valente Eds.), Series on Advances in Mathematics for Applied Sciences 69, 2005, 360–370, World Scientific.

### Other works

- [73] C. Lovadina, I. Perugia: “Finite element methods for piezoelectric Reissner-Mindlin plates”, *Istituto Lombardo (Rend. Sc.)*, A129, 1995, 107–120.
- [74] D. Boffi, C. Lovadina: “Remarks on augmented Lagrangian formulations for mixed finite element schemes”, *Bollettino UMI*, 11–A, 1997, 41–55.
- [75] A. Blouza, F. Brezzi, C. Lovadina: “A new classification for shell problems”, *Pubblicazioni IAN–CNR n. 1128, Pavia, 1999*.

### PhD thesis

- [76] C. Lovadina: “Some finite element technique for plate bending problems”, Tesi di Dottorato, Milano, 1999.

### Teaching activity

Starting from 1995, I have taught several courses of Mathematical Analysis and Numerical Analysis at: the University of Trento, Pavia and Milano.

### Theses supervised

- 2005/2006 – BSc Thesis in Civil Engineering at the University of Pavia: “Esperienze numeriche con il metodo degli elementi finiti per la trave di Timoshenko”. Student: F. Marchetto.
- 2005/2006 – MSc Thesis in Mathematics at the University of Pavia: Titolo della tesi: “Studio della deformazione di un disco elastico incomprimibile: simulazione numerica ed identificazione dei parametri materiali”. Student: L. Ferrari.
- 2006/2007. MSc Thesis in Civil Engineering at the University of Pavia: “Homogeneous and multilayered beam models: variational derivation, analytical and numerical solutions”. Student: G. Balduzzi.
- 2007/2010. Co-supervisor with R. Rodríguez, of the PhD thesis: “Métodos de elementos finitos para problemas de estabilidad de estructuras delgadas”. PhD student: D. Mora.
- 2010/2013. Co-supervisor with F. Auricchio, of the PhD thesis: “Beam Models: Variational Derivation, Analytical and Numerical Solutions”. PhD student: G. Balduzzi.
- 2014/2015. BSc in Mathematics. Thesis: “Geometric integration of the point vortex equation on a rotating sphere”. Student: M. Viviani.
- 2015/2016. BSc in Mathematics. Thesis: “Metodi di elementi virtuali per problemi in forma mista”. Student: M. Visinoni.
- 2015/2016. BSc in Mathematics. Thesis: “Metodi di collocazione isogeometrica per problemi ellittici”. Student: A. Libera.
- 2017/2018. (with M. Fuhrman) BSc in Mathematics. Thesis: “Numerical simulation of option pricing with stochastic volatility: the SABR model”. Student: L. Bottelli.

Milano, 10 April 2019

Carlo Lovadina