

# Short CV

## Personal Data

Name: Helder Carriço Rodrigues  
Nationality: Portuguese  
Date of Birth: 12 May 1957  
Address: Instituto Superior Técnico, Mechanical Engineering Department.  
Av. Rovisco Pais, 1049-001 Lisbon, Portugal.  
Telephone: +351 21 8417280.  
Fax: +351 21 8417915.  
Email: [hcr@ist.utl.pt](mailto:hcr@ist.utl.pt)

## Actual Positions:

Associate Professor (w/Habilitation), Mechanical Eng. Dep., Instituto Superior Técnico, TU Lisbon (since 2002).

Member Executive Committee of IDMEC- Instituto de Engenharia Mecânica

Director of the Centre for Mechanical Design, IDMEC-IST, TU Lisbon ( since 2001).

## Academic Degrees

“Licenciado” Mechanical Engineering, Instituto Superior Técnico, 1981.

M. Sc. Mechanical Design, Instituto Superior Técnico, 1984.

Ph. D. Aerospace Engineering, University of Michigan, USA, 1988.

Habilitation, Mechanical Engineering, Technical University of Lisbon, 2001.

## Academic Positions

Visiting Assistant Professor, Mathematics Department, Technical University of Denmark, Lyngby, September 1988 - March 1989.

Assistant Professor, Mechanical Engineering Department, Instituto Superior Técnico, 1989 -1994.

Associate Professor, Mechanical Engineering Department, Instituto Superior Técnico, November 1994 - December 2001.

Assistant Professor, Mathematics Department, Faculty of Sciences, University of Lisbon, 1993/94.

Visiting Associate Professor, Mathematics and Solid Mechanics Departments, Technical University of Denmark, Lyngby, February 1994 - July 1994.

Associate Professor, Instituto Superior de Ciências do Trabalho e da Empresa, Lisbon, 1994-1996.

Visiting Associate Professor Aerospace Engineering Department, University of Michigan, USA, July 1997 - February 1998.

## Organization of Scientific Meetings

Local Organizer - NATO Advanced Research Workshop (ARW) "Topology Design of Structures", June 1992, Sesimbra Portugal.

"International Summer School on Mathematical Methods in Materials Science and Engineering", CIM-Centre International for Mathematics, August 1997, Coimbra, Portugal.

Symposium "Simulation on Bioengineering", IV Congress on Numerical Methods in Engineering, SEMNI, June 1999, Seville, Spain.

Symposium "Biomechanics", VI National Congress for Applied and Computational Mechanics, APMTAC, April 2000, Aveiro, Portugal.

Symposium "Simulation on Bioengineering", V Congress on Numerical Methods in Engineering, SEMNI-APMTAC, June 2002, Madrid, Spain.

"Advanced School and Workshop CIM: Bone Mechanics - Mathematical and Mechanical Models for Analysis and Synthesis", June 2002, IST, Lisbon.

"CIM Thematic Term: Mathematics and Biology", Portugal, 2002.

ICCB2003 "International Congress on Computational Bioengineering", Zaragoza, Spain, September 2003.

"Congress on Numerical Methods in Engineering", SEMNI-APMTAC, LNEC, Lisbon, May 2004.

ICCB2005 "International Conference on Computational Bioengineering", IST, Lisboa, September, 14-16 2005.

1<sup>o</sup> Biomechanics Encounter, Martinchel, Abrantes, 3-4 February 2005.

ECCM2006- III European Conference on Computacional Solid and Structural Mechanics, 5-8 June 2006, LNEC, Lisboa; Portugal.

2<sup>o</sup> Biomechanics Encounter, Evora 7-8 February 2007.

ICCB2007 "International Conference on Computational Bioengineering", Maguerita, Venezuela, Setembro, 14-16 2007.

Workshop on "Mathematical Aspects of Imaging, Modeling and Visualization in Multiscale Biology" March 31 – April 4, 2009, The University of Texas at Austin, TX, USA

Organizing Committee ESMC2009, Lisboa 7-11 September de 2009.

ICCB2009 "4<sup>th</sup> International Conference on Computational Bioengineering", Bologna, Italy, September, 14-16 2009.

WCSMO-8 " ISSMO World Congress On Structural and Multidisciplinary Optimization", Lisbon, 1-5 de June 2009.

Workshop "Nano09-Shaping the Future", International Iberian Nanotechnology Laboratory, Braga, Portugal, 10-11 December 2009 (H C Rodrigues).

EngOpt 2010, 2<sup>nd</sup> International Conference on Engineering Optimization, Instituto Superior Técnico, Technical, Portugal, 6-9 September 2010.

## Scientific Organizations Membership

Society for Industrial and Applied Mathematics (SIAM).

American Academy of Mechanics (AAM).

International Society for Structural and Multidisciplinary Optimization (ISSMO).

Executive Committee of the Portuguese Association for Theoretical, Applied and Computational Mechanics (APMTAC).

Scientific committee of ASMDO "Association for Simulation and Multidisciplinary Design Optimization".

## Publications

### BOOKS EDITION

1. M Doblaré, M. Cerrolaza e H. Rodrigues "Proceedings of the International Congress on Computational Bioengineering", Setembro, 2003, Zaragoza, Spain.
2. JA Simões, HC Rodrigues M A Vaz e AP Veloso " Encontro, 1; Biomecânica", ISBN 972-789-151-9, Sociedade Portuguesa de Biomecânica, Fevereiro 2005.
3. CA Mota Soares, AL Baptista, G. Bugada, M Casteleiro, JM Goicolea, JAC Martins, CAB Pina, HC Rodrigues "Métodos Computacionais em Engenharia", APMTAC-SEMNI, LNEC, Lisboa, 2004.
4. H Rodrigues, M Cerrolaza, M Doblaré , J Ambrósio and M Viceconti "Proceedings of ICCB2005", IST Press, Lisboa, ISBN: 972-8469-37-3, 2005.
5. CA Mota Soares, JAC Martins, HC Rodrigues and JAC Ambrosio "Computational Mechanics: Solids, Structures and Coupled Problems", Springer, Netherlands, 2006.
6. Proceedings of the "III European Conference on Computational Mechanics", June 5-8 2006, Lisbon, LNEC, Springer Netherlands, 2006.
7. HC Rodrigues, PR Fernandes, AP Veloso, JA Simões, M A Vaz "2º Encontro Nacional de Biomecânica 2007", IST Press, Lisboa, ISBN: 972-8469-37-3, 2007.
8. H.C. Rodrigues, J.M. Guedes, P.R Fernandes, J. Folgado, M.M. Neves, WCSMO-8, Eighth World Congress on Structural and Multidisciplinary Optimization – Book of Abstracts and CD-ROM Proceedings, APMTAC (ISBN:978-989-20-1554-5), 2009.

### BOOK CHAPTERS

1. H. C. Rodrigues e P. Fernandes "Topology optimization of linear elastic structures subjected to thermal loads", in Topology Design of Structures, M. Bendsøe and C. Mota Soares (eds.), Kluwer Academic Publishers, 437-450 (1993).
2. M. P. Bendsøe, H. C. Rodrigues and J. Rasmussen, "Topology and boundary shape optimization as an integrated design tool for computer aided design", in Lecture Notes in Engineering: Engineering Optimization in Design Processes, H. A. Eschenauer, C. Mattheck e N. Olhoff (eds.), Springer Verlag, 27-34, 1990.

3. H. Rodrigues, P. S. Miranda and J. M. Guedes, "Optimization of the porous coating distribution in non-cemented hip prostheses", in *Topology Optimization of Structures and Composite Continua*, G.I.N. Rozvany and N. Olhoff, (eds), Kluwer Academic Publishers, 2000.
4. M. P. Bendsøe, J. M. Guedes, M. M. Neves, H. C. Rodrigues and O. Sigmund, "Aspects of the design of microstructures by computational Means", in *Gakuto International Series Mathematical Sciences and Applications vol. 18: Homogenization 2001*, L. Carbone e R. Arcangelis (eds), Gakkotosho, Tokyo, Japan, 2003.
5. H. Rodrigues, P. R. Fernandes and J. M. Guedes, "Modelos de Optimización de Material Aplicados a la Simulación del Proceso de Remodelación Ósea", in *Bioingeniería en Iberoamerica – Avances y Desarrollo*, C. Müller-Karger and M. Cerrolaza (Eds.), CIMNE, Barcelona, Cap. 15, pp. 381-406, 2003.
6. H. Rodrigues and P.R. Fernandes "Optimization Models in the Simulation of the Bone Adaptation Process", in *Computational Bioengineering; Current Trends and Applications*, M Cerrolaza, M Doblaré, G. Martinez and B Calvo (eds), Imperial College Press, London, 2004.
7. H. Rodrigues " Modelos Computacionais para otimização da topologia e do material de estruturas" in *Simulación e Modelado en Ingenieria y Ciencias*, B. Gamez, D. Ojeda, G. Larrazábal, M. Cerrolaza (eds), SVMNI, Caracas, pp. 57-66, 2006.
8. H. Rodrigues "Topology Optimization of Structures: Applications in the Simulation and Design of Cellular Materials" in *COMPUTATIONAL METHODS IN ENGINEERING AND SCIENCE*, Z. H. Yao, M. Y. Yuan, Y. Q. Chen (eds), Tsinghua University Press & Springer, pp. 101-112, 2006.

#### PAPERS IN INTERNATIONAL SCIENTIFIC JOURNALS

1. C. A. Mota Soares, H. C. Rodrigues, L. M. Oliveira Faria e E. J. Haug "Optimization of the geometry of shafts using boundary elements", *ASME Journal of Mechanisms, Transmissions and Automation in Design*, 106, 199-203, 1984.
2. C. A. Mota Soares H. C. Rodrigues e K. K. Choi, "Shape optimal structural design using boundary elements and minimum compliance techniques", *ASME Journal of Mechanisms, Transmissions and Automation in Design*, 106, 518 – 523, 1984.
3. H. C. Rodrigues, "Shape optimal design of elastic bodies using a mixed variational formulation", *Computer Methods in Applied Mechanics and Engineering*, 69, 29-44, 1988.
4. M. P. Bendsøe e H. C. Rodrigues, "On topology and boundary variations in shape optimization ", *Control and Cybernetics*, Vol.19, 3-4, 9-36, 1990.
5. M. P. Bendsøe e H. C. Rodrigues, "Integrated topology and boundary shape optimization of 2-d solids", *Computer Methods in Applied Mechanics and Engineering*, 87, 15-34, 1991.
6. H. C. Rodrigues, "A mixed variational formulation for shape optimization of solids with contact conditions", *Structural Optimization*, 6, 19 – 28, 1993.
7. H. Rodrigues e P. Fernandes, "Topology optimal design of thermoelastic structures using a homogenization method", *Control and Cybernetics*, 23, 3, 553-663, 1994.

8. H. Rodrigues and P. Fernandes, "A material based model for topology optimization of thermoelastic structures ", *Int. J. Num. Met. Eng.*, 38, 1951-1965, 1995.
9. M. M. Neves, H. C. Rodrigues e J.M. Guedes "Generalized topology design of structures with a buckling load criterion", *Structural Optimization*, 10, 71-78, 1995.
10. H. Rodrigues, J. M. Guedes and M. P. Bendsøe, "Necessary conditions for optimal design of structures with a non-smooth eigenvalue based criterion", *Structural Optimization*, 9, 52 – 56, 1995.
11. H.C. Mateus, H.C. Rodrigues, C. M. Mota Soares, C. A. Mota Soares, "Sensitivity analysis and optimization of thin laminated structures with a non-smooth eigenvalue based criterion", *Structural Optimization*, 14, 219-224, 1997.
12. J. Folgado and H. Rodrigues, " Structural Optimization with a Non-Smooth Buckling Load Criterion", *Control and Cybernetics (Special issue in honor of Prof. Z. Mroz)*, 27, 2, 235-253, 1998.
13. H. Rodrigues, Ciro Soto and J.E. Taylor "A model to predict efficient two-component composite structures", *Structural Optimization*, 17, 186-198, 1999.
14. P. Fernandes, H. Rodrigues and C. Jacobs, "A model of bone adaptation using a global optimization criterion based on the trajectorial theory of Wolff", *Computer Methods in Biomechanics and Biomedical Engineering*, vol. 2, 125-138, 1999.
15. P. Fernandes, J. M. Guedes and H. Rodrigues, "Topology optimization of three dimensional linear elastic structures with a constraint on "perimeter" ", *Computers and Structures*, 73, 583-594, 1999.
16. M. M. Neves, J. M. Guedes and H. Rodrigues, "Optimal design of periodic linear elastic microstructures", *Computers and Structures*, 76, 421-429, 2000.
17. H. Rodrigues, J. M. Guedes and M. P. Bendsøe, "Hierarchical optimization of material and structure", *Structural Optimization*, 24 (1): 1-10, 2002.
18. J. M. Guedes, H. Rodrigues and M. P. Bendsøe, "A Material Optimization Model to Approximate Energy Bounds for Cellular Materials Under Multiple Load Conditions", *Structural and Multidisciplinary Optimization*, 25, 446-452, 2003.
19. J. F. Aguilar Madeira, H. Rodrigues and Heitor Pina, "Genetic methods in multi-objective optimization of structures with an equality constraint on volume", *Lecture Notes in Computer Science* , 2632: 767-781, 2003.
20. J. Folgado, P. R. Fernandes, J. M. Guedes and H. Rodrigues "Evaluation of Osteoporotic Bone Quality by a Computational Model for Bone Remodeling", *Computer & Structures* 82 (17-19): 1381-1388 JUL 2004.
21. J. F. Aguilar Madeira, H. Rodrigues and Heitor Pina, "Multi-Objective Optimization of Structures Topology by Genetic Algorithms", *Advances In Engineering Software*, 36, 21-28, 2005.
22. J. F. Aguilar Madeira, H. Rodrigues and Heitor Pina, "Multi-Objective Topology Optimization of Structures using Genetic Algorithms with Chromosome Repairing", *Structural and Multidisciplinary Optimization* ,32(1),31-39, 2006.

23. K P Jayachandran, J M Guedes and H C Rodrigues "Homogenized electromechanical properties of crystalline and ceramic relaxor ferroelectric  $0.58\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3-0.42\text{PbTiO}_3$ " *Smart Mater. Struct.* 16(5) 1534–1541, 2007.
24. P Coelho, P Fernandes, J M. Guedes, H. C. Rodrigues "A hierarchical model for topology optimization of three-dimensional structures". *Structural and Multidisciplinary Optimization*, 35 (2), 107-115, 2008.
25. J. Folgado, P.R. Fernandes and H.C. Rodrigues, "Computational Study on Bone Remodeling and Osseointegration for a Hip Replacement using a Conservative Femoral Stem", *Int. Journal for Computer Vision and Biomechanics*, 1(1), 97-106 2008.
26. K.P. Jayachandran, J.M. Guedes, H.C. Rodrigues, Piezoelectricity enhancement in ferroelectric ceramics due to orientation, *Applied Physics Letters*, 92(23) 232901 (2008).
27. J. F. Aguilar Madeira, H. L. Pina and H. C. Rodrigues, "GA Topology Optimization using Random Keys for Tree Encoding of Structures", *Structural and Multidisciplinary Optimization*, 2009 (Online).
28. K.P. Jayachandran, J.M. Guedes, H.C. Rodrigues, HC, Enhancement of the electromechanical response in ferroelectric ceramics by design, *Journal of Applied Physics* 105, 084103 (2009).
29. K.P. Jayachandran, J.M. Guedes, H.C. Rodrigues, Homogenization of textured as well as randomly oriented ferroelectric polycrystals, *Computational Materials Science*, 45, 816-820, (2009).
30. K.P. Jayachandran, J.M. Guedes, H.C. Rodrigues, Effect of microstructure and texture on the macroscopic piezoelectric response of ferroelectric barium titanate and PZN-PT films, *Journal of Intelligent Material Systems and Structures* 20 (2) 193-204 (2009).
31. P.G. Coelho, P.R. Fernandes, H.C. Rodrigues, J.M. Guedes, J.B. Cardoso "Numerical modeling of bone tissue adaptation – A hierarchical approach for bone apparent density and trabecular structure", *J. of Biomechanics*, 2008 (in print).
32. P.G. Coelho, J.B. Cardoso P.R. Fernandes, H.C. Rodrigues, "Parallel Computing Techniques Applied to the Simultaneous Design of Structure and Material", *Computers & Structures*, 2009 (submitted).