

Maria RODRIGUEZ-FERNANDEZ

Born place & date: Santiago de Compostela, Spain, 12/20/78
Nationality: Spanish
e-mail: mrodriguez@engineering.ucsb.edu

EDUCATION

2002-2006 PhD studies at the **Bio-Process Engineering Group, IIM-CSIC**, Spanish Council for Scientific Research, **Vigo, Spain**. Thesis Title: *Modeling and identification of bioprocesses*. Advisor: Prof. Julio R. Banga
2002-2004 **Chemical Engineering Postgraduate Courses**. University of Vigo
1996-2001 **Chemical Engineering**. University of Santiago de Compostela
1999-2000 Last year of the *École Nationale Supérieure des Mines de Saint-Etienne*. Major in: **PrISME (Process, Industrialization, Simulation, Modeling, Environment)**

RESEARCH EXPERIENCE

April 2010-present **Postdoctoral Scholar** at the Department of Chemical Engineering, Institute for Collaborative Biotechnologies, University of California Santa Barbara (UCSB).
Development of new methodologies for modeling biological systems. Working on different projects aiming to understand by means of mathematical modeling diverse biological phenomena ranging from Heat Shock, post-traumatic stress disorder (PTSD) and circadian-dependent performance and learning. Co-instructor and guest lecturer for various undergraduate and graduate courses. Advisor: Prof. Francis J. Doyle III
June 2007-Feb 2010 **Postdoctoral Researcher** at the Bio-Process Engineering Group, **IIM-CSIC**, Vigo, Spain.
SysMo project (European transnational funding and research initiative on “Systems Biology of Microorganisms”): *Ion and solute homeostasis in enteric bacteria: an integrated view generated from the interface of modeling and biological experimentation*. Advisor: Prof. Julio R. Banga
Aug 2006-May 2007 **Research Associate** at the Centre for Process Systems Engineering, Department of Chemical Engineering and Chemical Technology, **Imperial College London**.
EPSRC-sponsored project: Application of global sensitivity analysis for complexity reduction, parameter estimation and time series forecasting. Project supervisors: Prof. Nilay Shah and Prof. Costas Pantelides. Project coordinator: Dr. Sergei Kucherenko
Feb-July 2000 **Institut Français du Pétrole (IFP)** (Lyon, France)
Project: *Study and kinetic modeling of LCO's gas-oils hidrodésulfuration*. Conception of a kinetic model and development of software for parameter optimization and process simulation

TEACHING/MENTORING EXPERIENCE

March-June 2011 **Co-instructor** of the undergraduate course ChE-154: **Engineering Approaches to Systems Biology**. University of California Santa Barbara (UCSB), Department of Chemical Engineering
March-June 2011 **Co-instructor** of the graduate course BMSE-255: **Methods in Systems Biology**. University of California Santa Barbara (UCSB), Biomolecular Science and Engineering Program
April 2011 **Guest Lecturer** for the undergraduate course ChE-125: **Principles of Bioengineering**. University of California Santa Barbara (UCSB), Department of Chemical Engineering

- March-Aug 2008 **Mentoring** Markus Rehberg, undergraduate student from Otto-von-Guericke University, Magdeburg (Germany) visiting IIM-CSIC, Vigo (Spain) with the Erasmus program. Project: *Simultaneous model selection and parameter identification using MINLP: a case study of the KdpD/KdpE system of Escherichia Coli*
- Sept-Oct 2008 **Mentoring** Alejandra Cardelle-Cobas, graduate student from IFI-CSIC, Madrid (Spain) visiting IIM-CSIC, Vigo (Spain). Project: *Kinetic study on the formation of oligosaccharide derived from lactulose and β -galactosidases*

INVITED TALKS AND SEMINARS

- Invited speaker** at the **Southern California Systems Biology Conference**, 29-30 January 2011, Irvine, USA
- Invited speaker** at the **UCSB NSF-IGERT Systems Biology Seminar Series**, January 2011, Santa Barbara, USA
- Invited speaker** at the **6th Workshop on Computation of Biochemical Pathways and Genetic Networks**, September 2010, Heidelberg, Germany
- Invited speaker** at the **ARL/ICB Crash Course in Systems Biology**, August 2010, Berkeley, USA
- Keynote speaker** at the **Chemical and Biological Engineering Conference (CHEMPOR08)**, September 2008, Braga, Portugal
- Invited speaker** at the **SysMo Modelling Day**, April 2008, Aberdeen, UK
- Invited speaker** at the **PRISM Summer School**, July 2007, Vigo, Spain

REVIEWING EXPERIENCE

- Journal reviewer:** Bioinformatics, Computers & Chemical Engineering, IET Systems Biology, Reliability Engineering & System Safety, Statistics and Computing
- Judge** for the **poster competition** at the 12th Annual UC System wide Bioengineering Symposium, 13-15 June, 2011, Santa Barbara, US

HONORS AND AWARDS

- 2010 **Licensed as Ph.D Assistant Professor** by the Spanish National Agency for Quality Assessment and Accreditation (ANECA). PAD#: 2010-2074
- 2009 **Jose Castillejo Visiting Fellowship** from the Spanish Ministry of Science and Innovation, for a 4 months research stay at the UCSB under the supervision of Prof. Francis J. Doyle III
- 2007 **Extraordinary doctorate award**, “Premio extraordinario de doctorado” (top prize for doctoral dissertations in the Spanish universities)
- 2005 **Certificate of Teaching Proficiency** (Certificado de Aptitud Pedagógica, CAP), Universidad de Santiago de Compostela
- 2005 **Xunta de Galicia Visiting Fellowship** for a 3 months research stay at the UCSB under the supervision of Prof. Francis J. Doyle III
- 2003 **Marie Curie Visiting Fellowship, CTS** (Control Training Site) for a 5 months research stay at **L2S-CNRS-Supélec** under the supervision of Prof. F. Lamnabhi-Lagarrigue and Prof. Eric Walter, Paris, France
- 2000 Awarded by the **GestalenT Project** (www.gestalent.com) with an exclusive program for training managing skills: *The seventy most talented senior university students*. Organized by the Instituto de Empresa and Hay Group (100 hours)

JOURNAL ARTICLES

1. Rodriguez-Fernandez M., Banga J. R. & Doyle III F. J. **Novel global sensitivity analysis methodology accounting for the crucial role of the distribution of input parameters: application to systems biology models.** Accepted in *International Journal of Robust and Nonlinear Control*.
2. Rodriguez-Fernandez M.*, Cardelle-Cobas A.*, Villamiel M. & Banga J. R. (2011) **Detailed Kinetic Models Describing Lactulose Hydrolysis and Oligosaccharide Synthesis Using Different β -Galactosidases.** *Journal of Biotechnology*. 153:116-124.
3. Yuraszcek T. M., Neveu P., Rodriguez-Fernandez M., Robinson A., Kosik K. S. & Doyle III F. J. (2010) **Vulnerabilities in the Tau Network and The Role of Ultrasensitive Points in Tau Pathophysiology.** *PLoS Computational Biology*. *PLoS Comput Biol* 6(11):e1000997.
4. Rodriguez-Fernandez M. & Banga J. R. (2010) **SensSB: A software toolbox for the development and sensitivity analysis of systems biology models.** *Bioinformatics*, 26(13):1675-1676.
5. Kucherenko S., Rodriguez-Fernandez M., Pantelides C. C. & Shah N. (2009) **Monte Carlo evaluation of Derivative based Global Sensitivity Measures.** *Reliability Engineering & System Safety*, Vol. 94, 1135-1148.
6. Rodriguez-Fernandez M., Balsa-Canto E., Egea J. A. & Banga J. R. (2007) **Identifiability and Robust Parameter Estimation in food process modelling: application to a drying model.** *Journal of Food Engineering*, 83(3):974-383.
7. Egea J. A., Rodriguez-Fernandez M., Banga J. R. & Marti R. (2007) **Scatter Search for Chemical and Bio-Process Optimization.** *Journal for Global Optimization*. 37(3):481-503.
8. Balsa-Canto E., Rodriguez-Fernandez M. & Banga J. R. (2007) **Optimal Experimental Design for determining kinetic parameters in the termal processing of bioproducts.** *Journal of Food Engineering*, 82(2):178-188.
9. Rodriguez-Fernandez M., Egea J. A. & Banga J. R. (2006) **Novel Metaheuristics for Parameter Identification in Nonlinear Dynamic Biological Systems.** *BMC Bioinformatics*. 7:483.
10. Rodriguez-Fernandez M., Mendes P. & Banga J. R. (2006) **A Hybrid Approach for Efficient and Robust Parameter Estimation in Biochemical Pathways.** *BioSystems*, 83:248-265.
11. Banga J. R., Balsa-Canto E., Rodriguez-Fernandez M. & Alonso A. A. (2005) **Model Calibration in Systems Biology.** *BioForum Europe* 9:42-43.

SUBMITTED/IN PREPARATION JOURNAL ARTICLES

12. Sriram K., Rodriguez-Fernandez M & Doyle III F. J. **In-silico modeling of cortisol dynamics in neuro-endocrine axis that distinguishes normal, depressed, and post-traumatic stress disorder (PTSD) in humans.** Under revision in *PLoS Computational Biology*.
13. Sriram K., Rodriguez-Fernandez M & Doyle III F. J. **A detailed modular analysis of heat-shock protein dynamics under acute and chronic stress and its implication anxiety disorders.** Submitted to *PLoS Computational Biology*.
14. Rodriguez-Fernandez M., Grosman B., Yuraszcek T., Helwig B. G., Leon L. R. & Doyle III F. J. **Modeling the Intra- and Extracellular Cytokine Signaling under Heat Shock.** To be submitted to *Molecular Systems Biology*.
15. Rodriguez-Fernandez M., Rehberg M., Kremling A. & Banga J. R. **An optimization approach for simultaneous model selection and parameter identification in systems biology: application to homeostasis in Escherichia coli.** To be submitted to *BMC Systems Biology*.
16. Rodriguez-Fernandez M., Wang W., Cajochen C., Grafton S. T., & Doyle III F. J. **Modeling Individualized Circadian-Dependent Performance and Learning of Sequence Structures.** In preparation.

17. Heermann R., Zigann K., Gayer S., Rodriguez-Fernandez M., Banga J. R., Kremling A., & Jung K. **Identification of the primary stimulus perceived by the widely distributed histidine kinase KdpD.** In preparation.

BOOK CHAPTERS

1. Rodriguez-Fernandez M. & Doyle III F. J. (2011) **Optimal Experiment Design, Multimodality.** Accepted in *Encyclopedia of Systems Biology*, Springer.
2. Rodriguez-Fernandez M. & Banga J. R. (2009) **Global sensitivity analysis of a biochemical pathway model.** *Advances in Soft Computing*. Vol. 49, pp. 233-242, Springer.
3. Kiparissides A., Rodriguez-Fernandez M., Kucherenko S., Mantalari A. & Pistikopoulos E. N. (2008) **Application of Global Sensitivity Analysis to Biological models.** *Computer-Aided Chemical Engineering*, Vol. 25, pp. 689-694, Elsevier.
4. Rodriguez-Fernandez M., Kucherenko S., Pantelides C. C. & Shah N. (2007) **Optimal experimental design based on global sensitivity analysis.** *Computer-Aided Chemical Engineering*, Vol. 24, pp. 63-68, Elsevier.
5. Rodriguez-Fernandez M., Alonso A. A. & Banga J. R. (2006) **Robust Identification in Nonlinear Dynamic Process Models.** *Taming Heterogeneity and Complexity of Embedded Control (IsteLtd)*, pp. 635-644, Wiley.
6. Rodriguez-Fernandez M., Egea J. A. & Banga J. R. (2006) **Novel metaheuristics for parameter estimation and optimal experimental design in Systems Biology.** *Understanding and Exploiting Systems Biology in Bioprocesses and Biomedicine*, pp. 85-91, Fundacion Cajamurcia.
7. Balsa-Canto E., Rodriguez-Fernandez M., Alonso A. A. & Banga J. R. (2006) **Computational design of optimal dynamic experiments in systems biology: a case study in cell signalling.** *Understanding and Exploiting Systems Biology in Bioprocesses and Biomedicine*, pp. 103-117, Fundacion Cajamurcia.
8. Rodriguez-Fernandez M., Alonso A. A. & Banga J. R. (2005) **Robust Parameter Estimation in Nonlinear Dynamic Process Models.** *Computer Aided Chemical Engineering*, Vol. 20, pp. 37-42, Elsevier.
9. Fernandez C. V., Garcia M. R., Rodriguez-Fernandez M., Balsa-Canto E., Banga J. R. & Alonso A. A. (2004) **On Systematic Model Reduction Techniques for Dynamic Optimization and Robust Control of Distributed Process Systems.** *Computer Aided Chemical Engineering*, Vol. 18, pp. 841-846, Elsevier.

REFEREED PROCEEDINGS

1. Rodriguez-Fernandez M., Banga J. R. & Doyle III F. J. (2010) **Global sensitivity analysis for systems biology: an overview of current methods and applications.** Proceedings of the *6th Workshop on Computation of Biochemical Pathways and Genetic Networks*, Logos Verlag Berlin GmbH.
2. Palerm C. C., Rodriguez-Fernandez M., Bevier W. C., Zisser H., Banga J.R., Jovanovic L. & Doyle III F. J. (2006) **Robust Parameter Estimation in a Model for Glucose Kinetics in Type 1 Diabetes Subjects.** Proceedings of the *IEEE Engineering in Medicine and Biology Conference*, New York, USA.
3. Banga J.R., Balsa-Canto E., Moles C. G., Garcia S., Sendin O. H., Rodriguez-Fernandez M. & Alonso A. A. (2004) **Advances in the Optimization of Industrial Food Processing.** Proceedings of *FOODSIM'2004*, WICC-WIR, Wageningen, Holland.
4. Rodriguez-Fernandez M., Alonso A. A & Banga J. R. (2004) **Robust Parameter Estimation in Heat and Mass Transfer Models of Food Processing.** Proceedings of the *International Conference on Engineering and Food 9 (ICEF 9)*, Montpellier, France.

CONFERENCES (Presenter underlined)

1. Rodriguez-Fernandez M., Mirsky H., Doyle III F. J. **Global sensitivity analysis for deterministic and stochastic oscillating biological systems.** *International Conference on Systems Biology (ICSB2011)*. 28 August-1 September 2011, Heidelberg/Mannheim, Germany. Oral presentation.

2. St. John P., Rodriguez-Fernandez M., Doyle III F. J. **Advanced Global Optimization and Sensitivity Techniques for Analyzing Deterministic Circadian Models.** *12th Annual UC Systemwide Bioengineering Symposium*, 13-15 June 2011, Santa Barbara, USA. Poster.
3. Sriram K., Rodriguez-Fernandez M., Doyle III F. J. **Dynamical analysis of the stress-induced heat-shock protein network in post-traumatic stress disorder (PTSD).** *12th Annual UC Systemwide Bioengineering Symposium*, 13-15 June 2011, Santa Barbara, USA. Poster.
4. Rodriguez-Fernandez M., Mirsky H., Doyle III F. J. **Novel global sensitivity analysis methodology accounting for the crucial role of the distribution of input parameters: application to a mammalian circadian clock model.** *Southern California Systems Biology Conference*, 29-30 January 2011, Irvine, USA. Invited speaker.
5. Grosman B., Rodriguez-Fernandez M., Yuraszcek, T., Helwig, B. G., Leon, L. R., Doyle III, F. J. **Modeling the Intra- and Extracellular Cytokine Signaling under Heat Stroke.** *International Conference on Systems Biology (ICSB2010)*. 11-14 October 2010, Edinburg, U.K. Poster.
6. Gayer S., Heermann R; Zigann K., Jung K., Kremling A., Rodriguez-Fernandez M., Banga J. **Mathematical Modeling of the Inducible K⁺ Uptake System Kdp of E. coli.** *International Conference on Systems Biology (ICSB2010)*. 10-14 October 2010, Edinburgh, U.K. Poster.
7. Rodriguez-Fernandez M. & Banga J. R. **SensSB.- A software toolbox for sensitivity analysis in systems biology models.** *International Conference on Systems Biology (ICSB2009)*. 30 August-4 September 2009, Stanford, California, USA. Poster.
8. Rodriguez-Fernandez M., Yuraszcek T. M., Doyle III F. J. & Banga J. R. **A pseudo-global method for detecting parameters correlations in dynamic models of biological systems.** *International Conference on Systems Biology (ICSB2009)*. 30 August-4 September 2009, Stanford, California, USA. Poster.
9. Yuraszcek T. M., Neveu P., Rodriguez-Fernandez M., Robinson A., Kosik K. S. & Doyle III F. J. **A mathematical model describing the pathophysiology of the 3R and 4R tau isoforms and its Implications for understanding Alzheimer's disease.** *International Conference on Systems Biology (ICSB2009)*. 30 August-4 September 2009, Stanford, California, USA. Poster.
10. Yuraszcek T. M., Neveu P., Rodriguez-Fernandez M., Robinson A., Kosik K. S. & Doyle III F. J. **Development of a mathematical model to investigate the pathophysiology of tau protein.** *Foundations of Systems Biology in Engineering (FOSBE'09)*. 9-12 August 2009, Denver, USA. Poster.
11. Rodriguez-Fernandez M., Egea J. A. & Banga J. R. **Global optimal experimental design for parameter estimation in systems biology.** *IET BioSysBio 2009*. 23-25 March 2009, University of Cambridge, UK. Poster.
12. Rodriguez-Fernandez M. & Banga J. R. **Global sensitivity analysis of a biochemical pathway model.** *2nd International Workshop on Practical Applications of Computational Biology & Bioinformatics (IWPACBB'09)*. 22-24 October 2008, Salamanca, Spain. Oral presentation.
13. Rodriguez-Fernandez M. & Banga J. R. **Methods and tools for global sensitivity analysis of dynamic models of biological systems.** *Chemical and Biological Engineering Conference (CHEMPOR08)*. 4-6 September 2008, Braga, Portugal. Oral presentation, keynote.
14. Rodriguez-Fernandez M. & Banga J. R. **Global sensitivity analysis methods for dynamic models in systems biology.** *International Conference on Systems Biology (ICSB2008)*. 22-28 August 2008, Gothemburg, Sweden. Poster.
15. Rehberg M., Rodriguez-Fernandez M., Egea J. A., Kremling A. & Banga J. R. **Simultaneous model discrimination and parameter estimation in dynamic models of biological systems.** *International Conference on Systems Biology (ICSB2008)*. 22-28 August 2008, Gothemburg, Sweden. Poster.
16. Kiparissides A., Rodriguez-Fernandez M., Kucherenko S., Mantalaris A. & Pistikopoulos E. N. **Application of Global Sensitivity Analysis to Biological models.** *European Symposium on Computer Aided Process Engineering: ESCAPE-18*. 1-4 June 2008, Lyon, France. Poster.

17. Rodriguez-Fernandez M., Kremling A. & Banga J. R. **Global sensitivity methods for identifiability analysis and model reformulation in systems biology.** *IET Biosysbio 2008*. 20-22 April 2008, London, UK. Poster.
18. Rodriguez-Fernandez M., Kucherenko S., Pantelides C. & Shah N. **Optimal Experimental Design based on Global Sensitivity Analysis.** *European Symposium on Computer Aided Process Engineering: ESCAPE-17*. 27-30 May 2007, Bucarest, Rumania. Oral presentation.
19. Balsa-Canto E., Rodriguez-Fernandez M., Alonso A. A. & Banga J. R. **Optimal Identification in Systems Biology. Applications in Cell Signalling.** *AIChE Annual Meeting*, 12-17 November, 2006, San Francisco, USA. Poster.
20. Palerm C. C., Rodriguez-Fernandez M., Bevier W. C., Zisser H., Banga J.R., Jovanovic L. & Doyle III F. J. **Robust Parameter Estimation in a Model for Glucose Kinetics in Type 1 Diabetes Subjects.** *IEEE Engineering in Medicine and Biology Conference*, 30 August-3 September 2006, New York, USA. Oral presentation.
21. Rodriguez-Fernandez M., Alonso A. A. & Banga J. R. **Robust Identification in Nonlinear Dynamic Process Models.** *Second CTS Workshop*, 10-12 July 2006, Paris, France. Oral presentation.
22. Rodriguez-Fernandez M., Egea J. A. & Banga J. R. **Novel metaheuristics for parameter estimation and optimal experimental design in Systems Biology.** *First International Symposium on Systems Biology*, 1-2 June 2006, Murcia, Spain. Poster.
23. Balsa-Canto E., Rodriguez-Fernandez M. & Banga J. R. **Computational Design of Optimal Dynamic Experiments in Systems Biology: a Case Study in Cell Signalling.** *First International Symposium on Systems Biology*, 1-2 June 2006, Murcia, Spain. Oral presentation.
24. Rodriguez-Fernandez M., Egea J. A. & Banga J. R. **Novel Metaheuristics for Parameter Estimation in Nonlinear Dynamic Biological Systems.** *European Conference on Mathematical and Theoretical Biology - ECMTB05*, 18-22 July 2005, Dresden, Germany. Oral presentation.
25. Rodriguez-Fernandez M., Alonso A. A. & Banga J. R. **Robust Parameter Estimation in Nonlinear Dynamic Process Models.** *European Symposium on Computer Aided Process Engineering: ESCAPE-15*, 29 May-1 June 2005, Barcelona, Spain. Oral presentation.
26. Rodriguez-Fernandez M., Moles C.G., Mendes P. & Banga J. R. **A Hybrid Approach for Efficient and Robust Parameter Estimation in Biochemical Pathways.** *5th International Conference on Systems Biology (ICSB 2004)*, 9-13 October 2004, Heidelberg, Germany. Oral presentation.
27. Rodriguez-Fernandez M., Banga J. R. & Alonso A. A. **Parameter Estimation in Heat and Mass Transfer Models.** *First CTS Workshop*, 1-3 July 2004, Coimbra, Portugal. Oral presentation.
28. Banga J.R., Balsa-Canto E., Moles C. G., Garcia S., Sendin O. H., Rodriguez-Fernandez M. & Alonso A. A. **Advances in the Optimization of Industrial Food Processing.** *FOODSIM'2004*, 16-18 June 2004, WICC-WIR, Wageningen, Holland. Oral presentation.
29. Fernandez C.V., Garcia M.R., Rodriguez-Fernandez M., Balsa-Canto E., Banga J.R. & Alonso A.A. **On Systematic Model Reduction Techniques for Dynamic Optimization and Robust Control of Distributed Process Systems.** *European Symposium on Computer Aided Process Engineering (ESCAPE-14)*, 16-19 May 2004, Lisbon, Portugal. Poster.
30. Rodriguez-Fernandez M., Alonso A. A & Banga J. R. **Robust Parameter Estimation in Heat and Mass Transfer Models of Food Processing.** *International Conference on Engineering and Food 9 (ICEF 9)*, 7-11 March 2004, Montpellier, France. Oral presentation.

LANGUAGES

Spanish: Native language

Galician: Native language

French: Fluent. **D.E.L.F.** (Diplome d'Études en Leangue Française). 2nd Degré

English: Fluent. **C.A.E.** (Certificate in Advanced English, University of Cambridge)

COMPLEMENTARY EDUCATION

- July 2008-
Feb 2010 **Sysmo-DB PAL:** SysMO-DB is a project aiming to create a web-based platform, and tooling, for finding, sharing and exchanging Data, Models and Processes in Systems Biology. During this period I worked as SysMO-DB PAL (Project Area Liason) which are “front line” experimentalists, modelers and bioinformaticians from each of the SysMO (Systems Biology for Micro-Organisms) Consortium projects who act as SysMO-DB advocates and communicate SysMO-DB progress back to their projects
- 26-30 July
2009 **ERASysBio Summer School - Data Management for Systems Biology II.** Universidad de Verano de Adeje, Tenerife, Spain (30 hours)
- 9-12 Sep
2008 **Summer School on Sensitivity Analysis.** Venice, Italy. Organized by the Joint Research Centre of the European Commission together with the Centre IDEAS from University Ca' Foscari and Venice International University (20 hours)
- 2007-2008 **First year of the degree in Psychology,** Spanish Open University (UNED) (700 hours)
- Nov 2007 **Stochastic and Random Dynamics Course.** Imperial College, London, UK (25 hours)
- Oct 2006-
May 2003 **Residential Development Event for Post-doctoral Staff.** Imperial College, UK (20 hours)
Introduction to Geometric Nonlinear Control Theory Course. Institute of Systems Theory and Automatic Control (IST), University of Stuttgart (Germany) (20 hours).
- Feb-March
2003 **Modules of FAP (Formation en Automatique),** Paris (France)
Courses from the Marie Curie European Control Training Site
- *Modelling and boundary control of finite dimensional systems* (21 hours)
 - *Modelling and control of chemical and biotechnological processes* (21 hours)
 - *Modelling and nonlinear and adaptive compensation of friction* (21 hours)
 - *Control of oscillating mechanical systems, synchronisation and chaos* (21 hours)
 - *Algebraic analysis of control systems defined by partial differential equations* (21 hours)
 - *Nonlinear control of electrical and electromechanical systems* (21 hours)
 - *Advanced topics in linear systems* (21 hours)
 - *Advanced topics in nonlinear systems* (21 hours)
- July 2002 Summer school **Finites elements method: analysis, software and applications in engineering,** University of Vigo, Spain (30 hours)
- Oct 2000-
Feb 2001 **Internet: Web server develop and maintenance,** University of Santiago de Compostela, Spain (100 hours)
- July 1999 Summer school **Numeric simulation with finites elements applied to engineering,** University of Santiago de Compostela, Spain (25 hours)