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1. Introduction

The Department of Biological Engineering (DEB) is a permanent structure of the School of Engineering of the University of Minho, responsible for the production and transmission of knowledge in the scientific fields of Biological Engineering, Chemical Engineering and Biomedical Engineering. This Department hosts the research facilities of the Centre of Biological Engineering (CEB).

**Management Boards**

**DEB**
- Department Assembly
- Department Council
- Scientific Board
- Consulting Board
- Head of DEB: Prof. J.A. Teixeira

**CEB**
- General Assembly
- Direction Board
- Head of CEB: Prof. M. Mota

2. Academic and Non Academic Staff

**Faculty Members**
- Luís de Jesus Santos Soares
- João de Deus Rogado Salvador Pinheiro
- Manuel José Magalhães Gomes Mota
- José António Couto Teixeira
- Rosário V. J. Tavares de Oliveira
- Nelson Manuel Viana da Silva Lima
- Maria Teresa Campos Tavares
- Eugénio Manuel F. Campos Ferreira
- Maria João Lopes da Costa Vieira
- Francisco Miguel Portela da Gama
- António José Guerreiro Brito
- Armando Albino Dias Venâncio
- Maria Madalena dos Santos Alves
- Isabel Maria Fires Belo
- António A. Oliveira Soares Vicente
- Joana C. Valente Rodrigues Azeredo
- José Maria Marques Oliveira
- Regina Maria B. Nogueira
- João Monteiro Peixoto
- Lucília M. A. Ribeiro Domingues
- Maria Olívia B. Pereira

**Administrative and Technical Staff**
- Maria Madalena Costa Vieira
- Maria dos Anjos V. Cardoso Costa
- Manuel Araújo Gomes dos Santos
- Maria Helena Rio Madeira Silva
- Isabel Maria da Silva Soares
- Maria de Fátima Veríssimo Jacinto
- Maria Adelaide Novais Francisco
- Augusta Sameiro Ferreira Martins
- Maria da Glória da Silva Cruz Martins
Luís de Jesus Santos Soares

Full Professor

Education:
- Ph.D. in Chemical Engineering, University of Birmingham, 1972
- Master in Chemical Engineering, University of Birmingham, 1970
- Graduation in Chemical Engineering, FEUP, 1965

Positions:
- Full Professor, UM
- President of the Politechnic Institute of Porto

Teaching Areas:
- n/a

Research Activities:
- n/a

Selected publications:
João de Deus Rogado Salvador Pinheiro

Full Professor

Education:
- PhD in Chemical Engineering (Birmingham, UK, 1976)
- Graduation in Chemical Engineering (IST, Lisbon)

Positions:
- Full Professor, UM
- Rector of Universidade Moderna (2001-2002)
- Ministry for Education (1985-1987)
- Rector of Universidade do Minho (1984-1985)
- Vice-President of JNICT (1981)
- Associate Professor, UM, 1989-
- Assistant Professor, UM, 1987-1989
- Invited Assistant, UM, 1976-1987
- Teaching Assistant, University of Lourenço Marques, 1971-1972

Main Teaching Areas:
- Seminars
- Strategy of Process Engineering

Research Activities:
- n/a

Selected publications:
Manuel José Magalhães Gomes Mota

Full Professor

Education:
- Ph.D. in Biochemical Engineering, INSA, Toulouse, 1985
- Master in Microbiology, INSA, Toulouse, 1982
- Service in the Army 1973-1976
- Graduation in Chemical Engineering, FEUP, 1972

Positions:
- Vice-rector for Research and external Affairs, UM, 2002-
- Full Professor, UM, 1994-
- Associate Professor, UM, 1991-1994
- Associate Professor, FEUP, 1990-1991
- Assistant Professor, FEUP, 1985-1990
- Teaching Assistant, Faculty of Engineering, 1978-1981
- Teaching Assistant, Polytechnic Institute of Oporto, 1976-1978

Main Teaching Areas:
- Introduction to Biomedical Engineering

Research Activities:
- Population dynamics in aerobic and anaerobic processes
- Porous media properties
- Hyperbaric bioreactors
- Multiphase bioreactors
- Biodegradability of implants

Selected publications:
José António Couto Teixeira

Full Professor

**Education:**
- Ph.D. in Chemical Engineering, FEUP, 1988
- Graduation in Chemical Engineering, FEUP, 1980

**Positions:**
- Full Professor, UM, 2001-
- Associate Professor, UM, 1993-2001
- Associate Professor, FEUP, 1993
- Assistant Professor, FEUP, 1988-1993
- Teaching Assistant, FEUP, 1980-1988

**Main Teaching Areas:**
- Biological Reactors
- Food Biotechnology

**Research Activities:**
- Biological Multiphase Reactors
- Bioreactors Hydrodynamics and Mass Transfer
- Downstream Processing
- Food Technology
- Heavy Metal Removal

**Selected publications:**
Rosário V. J. Tavares de Oliveira

Full Professor

Education:
- Ph.D. in Engineering Science, UM, 1991
- Graduation in Chemical Engineering, University of Luanda, 1975

Positions:
- Full Professor, UM, 2003 -
- Associate Professor, UM, 1996 - 2003
- Assistant Professor, UM, 1991 - 1996
- Invited Assistant Professor, UM, 1982 - 1991

Main Teaching Areas:
- Instrumental Methods of Analysis
- Separation Processes in Biotechnology
- Solid Waste Treatment
- Elements of Biotechnology
- Interfacial Phenomena

Research Activities:
- Microbial adhesion
- Biofilm formation, composition and structure
- Biological treatment of solid waste (composting and anaerobic digestion)

Selected publications:
Nelson Manuel Viana da Silva Lima

*Full Professor*

**Education:**
- Ph.D. in Engineering Science (Biotechnology), UM, 1993
- Master in Microbiology, UM, 1989
- Graduation in Biology and Geology (Teacher Training), UM, 1983

**Positions:**
- Full Professor, (Integrated Science Department) UM, 2004-
- Associate Professor, (Integrated Science Department) UM, 1997-2004
- Assistant Professor, UM, 1993-1997
- Teaching Assistant, UM, 1988-1993
- Teaching Assistant, University of Aveiro, 1984-1988
- Teaching Assistant, Polytechnic Institute of Viseu, 1983-1984
- Teacher of Biology in Secondary School, 1982-1983

**Main Teaching Areas:**
- Ecology (Childhood Study Institute)
- Natural Conservation (Childhood Study Institute)
- Environmental Microbiology/Micology
- Microbial Genetics
- Environmental Promotion and Education

**Research Activities:**
- Environmental Microbiology/Micology
- Environmental Promotion and Education
- Preservation of Micological Resources

**Selected publications:**
Education:
- Ph.D. in Engineering Science, UM, 1991
- Graduation in Chemical Engineering, FEUP, 1982

Positions:
- Associate Professor, UM, 1999 -
- Assistant Professor, UM, 1991-1999
- Teaching Assistant, UM, 1983-1991

Main Teaching Areas:
- Chemical Reaction Engineering
- Separation Processes
- Wastewater Physico-Chemical Processing
- Applied Biocatalysis

Research Activities:
- Biological Removal of Chromium from Industrial Effluents
- Methodologies for Remediation of Contaminated Soils
- Biosorbents for Industrial Applications
- Integrated Method for Heavy Metal Recovery and Reuse

Selected publications:
Eugénio M. F. Campos Ferreira  
*Associate Professor*

**Education:**
- Post-doctoral studies, Universitat Autònoma de Barcelona 1997-1998
- Ph.D. in Chemical Engineering, FEUP Porto, 1995
- Graduation in Chemical Engineering, FEUP Porto, 1986

**Positions:**
- Associate Professor, UM, 2001-
- Assistant Professor, UM, 1995-2000
- Teaching assistant, UM, 1991-95

**Main Teaching Areas:**
- Control and Instrumentation
- Strategy of Process Engineering
- Water and Wastewater Treatment
- Air Pollution
- Biological Reactors

**Research Activities:**
*(Bio)Process Systems Engineering* in Biotechnological, Chemical, Biopharmaceutical and Environmental processes:
- Image Analysis Applications in Wastewater Treatment and Biotechnology
- Modelling, Monitoring, and Control of Bioprocesses
- Knowledge-Based Expert Systems in Supervision and Control
- Process Integration and Design for Pollution Prevention: Synthesis, Analysis and Optimization
- Chemometrics in Environmental Processes – Environmetrics

**Selected publications:**
Maria João Lopes da Costa Vieira  
Associate Professor

**Education:**
- Ph.D. in Chemical and Biological Engineering, UM, 1995
- Graduation in Chemical Engineering, FEUP, 1987

**Positions:**
- Associate Professor, UM, 2002-
- Assistant Professor, UM, 1995- 2002
- Teaching Assistant, UM, 1991-1995

**Main Teaching Areas:**
- Transport Phenomena
- Transport Phenomena in Bioprocesses
- Elements on Biochemical Engineering

**Research Activities:**
Research area: Biofilms. On-going projects:
- Control of biofilms using chemical methods
- Survival of *Helicobacter pylori* in drinking water biofilms
- Monitoring of biofilms in industrial equipment

**Selected publications:**
Francisco Miguel Portela da Gama

Associate Professor

**Education:**
- Ph.D. in Chemical and Biological Engineering, UM, 1996
- Master in Biotechnology (Biochemical Engineering), IST, 1991
- Graduation in Biochemistry, FCUP, 1986

**Positions:**
- Associate Professor, UM, 2003-
- Assistant Professor, UM, 1996-2003
- Teaching assistant, UM, 1992-1996

**Main Teaching Areas:**
- Physical Chemistry
- Enzymatic Engineering

**Research Activities:**
- Carbohydrate binding modules
- Enzyme technology
- Polysaccharide/Fibres characterization and modification
- Protein delivery systems

**Selected publications:**
António Guerreiro de Brito
Assistant Professor

Education:
- Ph.D. in Chemical and Biological Engineering, UM, 1997
- Graduation in Environmental Engineering, FCT-UNL, 1984

Positions:
- Assistant Professor, UM, 1997-2000 and (2002-)
- Teaching Assistant, UM, 1987-1997
- Consulting Engineer, 1986-1988
- Engineer at Divisão de Hidráulica, Direcção Regional das Obras Públicas e Equipamento, Sec. Regional do Equipamento Social, Governo Reg. Açores, 1984-1987

Main Teaching Areas:
- Transport Phenomena Laboratory
- Pollution Control
- Industrial Services
- Environmental Impact Assessment
- Laboratory of Water and Wastewater Technology

Research Activities:
- Biofilms in wastewater systems (SBR, UASB/EGSB, design and modeling of wastewater treatment plants)
- Biofilms in natural ecosystems (water quality modeling, eutrophication) and water resources management
- Nitrogen removal, PAH degradation
- Environmental engineering education

Selected publications:
- Brito AG, Melo LF. Operation of UASB and EGSB reactors with low strength acidified wastewaters: a simplified analysis of reaction and mass transfer effects. *Environmental Technology* 18, 35-44, 1997.
Armando Albino Dias Venâncio

Assistant Professor

Education:
- Ph.D. in Chemical and Biological Engineering, UM, 1996
- Graduation in Chemical Engineering, FEUP, 1991

Positions:
- Assistant Professor, UM, 1997-
- Teaching assistant, UM, 1994-1997

Main Teaching Areas:
- Separation Processes
- Food Processes

Research Activities:
- Food Technology
- Food Safety: mycotoxins
- Aqueous Two-Phase separations

Selected publications:
Maria Madalena dos Santos Alves  

Assistant Professor

Education:
- Ph.D. in Chemical and Biological Engineering, UM, 1998
- Master in Biotechnology (Biochemical Engineering), IST, 1992
- Graduation in Chemical Engineering, FEUP, 1987

Positions:
- Assistant Professor, UM, 1998-
- Teaching assistant, UM, 1988-1998

Main Teaching Areas:
- Chemical Reaction Engineering
- Laboratory of Chemical Technology
- Biological Wastewater Treatment
- Laboratory of Environmental Microbiology

Research Activities:
- Anaerobic digestion of liquid, slurries and solid wastes
- Biological Wastewater Treatment: anaerobic and combined anaerobic- aerobic processes
- Environmental microbiology focused on anaerobic consortia

Selected publications:
Isabel Maria Pires Belo

Assistant Professor

Education:
- Ph.D. in Chemical and Biological Engineering, UM, 2000
- Graduation in Chemical Engineering, FEUP, 1988

Positions:
- Assistant Professor, UM, 2000-
- Teaching assistant, UM, 1990-2000

Main Teaching Areas:
- Graphic Representation of Equipment and Processes
- Introduction to Chemical Processes
- Introduction to Process Engineering

Research Activities:
- Pressurized bioreactors: application on fermentation technology
- High-pressure technology on biotechnological processes
- Oxidative stress response of microbial cells

Selected publications:
António A. M. Soares de Oliveira Vicente

Assistant Professor

Education:
- Ph.D. in Chemical and Biological Engineering, UM, 1998
- Graduation in Food Engineering, ESB-UCP, 1994

Positions:
- Assistant Professor, UM, 2001-
- Teaching Assistant, UM, 1998-2001

Main Teaching Areas:
- Thermodynamics
- Control and Instrumentation
- Laboratory of Microbial Technology
- Laboratory of Biotechnology

Research Activities:
- Fermentation Engineering (high cell density systems, bioreactor design, pH control analysis)
- Ohmic heating (thermal processing of foods)

Selected publications:
Joana C. Valente R. Azeredo

Assistant Professor

Education:
- Ph.D. in Chemical and Biological Engineering, UM, 1998
- Graduation in Biological Engineering, UM, 1994

Positions:
- Assistant Professor, UM, 2001-
- Teaching Assistant, UM, 1998-2001

Main Teaching Areas:
- Transport Phenomena
- Interfacial Phenomena
- Laboratory of Bioprocess Engineering

Research Activities:
- Adhesion of microorganisms and surface phenomena
- Biological control of biofilms (using bacteriophages)

Selected publications:
José Maria Marques Oliveira

Assistant Professor

Education:
• Ph.D. in Chemical and Biological Engineering, UM, 2001
• Pedagogic and Scientific Exam in Enology (Equivalent to Master’s Degree), UM, 1995
• Graduation in Biological Engineering, UM, 1991

Positions:
• Assistant Professor, UM, 2001-
• Teaching assistant, UM, 1991-2000

Main Teaching Areas:
• Enology
• Laboratory of Instrumental Methods of Analysis
• Laboratory of Bioprocess Engineering

Research Activities:
• Aromatic characterisation of “Vinhos Verdes” grape varieties
• Impact of winemaking technology on the aromatic profile of “Vinhos Verdes”

Selected publications:
Regina Maria de Oliveira Barros Nogueira

Assistant Professor

**Education:**
- Ph.D in Chemical and Biological Engineering, UM, 2002
- Master in Environmental Technology, UM, 1996
- Graduation in Biological Engineering, UM, 1992

**Positions:**
- Assistant professor, UM, 2002-
- Teaching assistant, UM, 1993-2002

**Main Teaching Areas:**
- Laboratory of Fluids and Heat Transfer
- Transport Phenomena Laboratory
- Instrumental Methods of Analysis
- Laboratory of Chemical Technology

**Research Activities:**
- Kinetics and mass transfer processes in biofilms
- Environmental microbiology focused in nitrifying and heterotrophic bacteria
- Biofilms in freshwaters

**Selected publications:**
João Monteiro Peixoto

Assistant Professor

**Education:**

- Ph.D in Chemical and Biological Engineering, UM, 2003
- Master in Environmental Technology, UM, 1996
- Graduation in Biological Engineering, UM, 1993
- Graduation in Nursing, Nursing School Calouste Gulbenkian, Braga, 1980

**Positions:**

- Assistant Professor, UM, 2003-
- Teaching Assistant, UM, 1994-2003

**Main Teaching Areas:**

- Environmental Engineering
- Thermodynamics
- Laboratory of Fluids and Heat Transfer

**Research Activities:**

- Bioreactors for the treatment of VOCs
- Air pollution control

**Selected publications:**

Lucília Maria Alves Ribeiro Domingues

Assistant Professor

Education:
- PhD in Chemical and Biological Engineering, UM, 2001
- Master in Biological Engineering, UM, 1997
- Graduation in Chemical Engineering, FEUP, 1994

Positions:
- Assistant Professor, UM, 2003-
- Teaching Assistant, UM, 2001-2003
- Invited Assistant, UM, 2000-2001

Main Teaching Areas:
- Chemical Reaction Engineering
- Laboratory of Chemical Technology
- Microbial Technology
- Applied Environmental Microbiology

Research Activities:
- Molecular Biotechnology
  - cloned gene expression
  - development of yeast strains for biotechnological processes (ethanol fermentation, heterologous protein production)
- High cell density fermentation systems

Selected publications:
Maria Olívia B. Pereira

Assistant Professor

**Education:**
- Ph.D. in Chemical and Biological Engineering, UM, 2001
- Graduation in Biological Engineering, UM, 1993

**Positions:**
- Assistant Professor, UM, 2003-
- Teaching Assistant, UM, 2001-2003
- Invited Assistant, UM, 2000-2001

**Main Teaching Areas:**
- Transport Phenomena
- Laboratory of Fluids and Heat Transfer
- Biological Wastewater Treatment
- Laboratory of Environmental Technology

**Research Activities:**
- Biofilm prevention and control
- Disinfection and Sanitation
- Biofilm monitoring in industrial, food and medical equipment

**Selected publications:**
3. Laboratories

Research Laboratories

Lab. Instruments  Lab. Mycology & Molecular Biology  Lab. Pilot Plants

Lab. Chromatography  Lab. Biofilms  Lab. Fermentation

Lab. Chemical Engineering  Lab. Applied Microbiology  Lab. Environmental Biotechnology

Lab. Image Analysis  Lab. Enzyme Technol. & Bioseparation  Lab. Food Science & Technology
Research Laboratories

Lab. Wastewater Treatment & Minimization
Lab. Molecular Microbiology & Ecology
Lab. Cell & Tissue Culture

Pedagogical Laboratories

Lab. Chemical Technology
Lab. Environmental Technology
Lab. Fluids & Heat Transfer
Lab. Food Technology
Lab. Bioengineering
Lab. Molecular Microbiology & Ecology
4. Education

**BIOLOGICAL ENGINEERING COURSE (GRADUATE DEGREE)**

The Biological Engineering course has a strong component of Chemical Engineering and aims at forming specialists -"Process Engineers"- for industries having predominantly biological, chemical or physico-chemical processes. The acquired knowledge makes them capable of collaborating in industrial sectors of pollution control and quality control, or to get into a research career in those domains.

The course is divided in two tracks. The division takes place at the end of the 3rd year, but in the 4th year there are still some common subjects, being the difference completely established in the 5th year, thus:

- in the track of "Chemical and Food Technology", there is an emphasis in the food domain and in the 5th year there are some specific disciplines of this area - Food Processes, Enology, etc;

- in the track of "Pollution Control", the 5th year is centred in treatment systems of wastewater, gaseous emissions and solid wastes, as well as in the project and modification of industrial processes in order to minimise pollution.

The course is structured in order to set up an interface between Chemical Engineering and Biological Sciences, especially Microbiology.

In the 1st year there is a predominance of basic sciences (Mathematics, Physics and Chemistry) in parallel with an Introduction to Informatics and Chemical Engineering. In the 2nd and 3rd years the stress is laid upon subjects of Chemical Engineering and Biological Sciences. The convergence of those two domains gives rise to the disciplines of specialisation in the 4th and 5th years. In the 4th year there is still a common core of disciplines, giving formation in fields like: Fermentation Technology, Recovery of Biological Products, Enzyme Technology and Process Control.

The practical formation assumes a great importance, hence around 25% of the total number of classes are laboratory classes and the last semester of the course is a probation in industry. This period of training is supervised by a teacher from the University and a professional from the Industry. The disciplines of Project (in both tracks) of the 5th year have also the purpose of involving the students in industrial and/or research projects.

This type of formation enables a wide range of professional careers in areas such as:

- food industry with fermentative processes (beer, wine, cheese, etc.);
- food industry having essentially physical or physico-chemical processes (biscuits, fruit juices, edible oils, etc.);
- pharmaceutical industry (antibiotics, steroids);
- industries of cellulose, tanning, cork, wood;
- chemical industries in general (organic and inorganic);
- water industries (mineral waters), water treatment plants and wastewater treatment plants;
- other companies concerned with industrial pollution control;
- Consulting and project enterprises.

**Director:** Maria João Vieira
PROFESSIONAL SITUATION OF THE GRADUATES IN BIOLOGICAL ENGINEERING

The total number of graduates in Biological Engineering since 1991 is 389. Only 4% of the graduates do not have a full time job and 15% are attending post graduation courses like masters and Ph.D. 81% of Biological Engineers develop their professional activity mainly in companies (37%) and industries (18%). Research (17%) and public administration jobs (10%) also represent an important fraction of employment.

INTERNATIONAL STUDENTS EXCHANGE PROGRAMMES

The international students exchange is done under the following programmes:

- **Erasmus/Socrates** for academic training of students.
- **Leonardo Programme** for industrial training of students.
## Syllabus of Biological Engineering

<table>
<thead>
<tr>
<th>Year</th>
<th>Subjects</th>
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<th>2º S</th>
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<td><strong>General Biochemistry</strong></td>
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*Note: T = Theory, P = Practice, SE = Seminars, L = Laboratory*
**SYLLABUS OF BIOLOGICAL ENGINEERING - TRACK OF POLLUTION CONTROL**

<table>
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<td></td>
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<td>Air Pollution</td>
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<td>Solid Waste Treatment</td>
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**SYLLABUS OF BIOLOGICAL ENGINEERING - TRACK OF FOOD AND CHEMICAL TECHNOLOGY**

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<td>Food Biotechnology</td>
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T: theoretical; P: practical; L: laboratorial; SE: seminar
The curriculum of this course is composed of disciplines belonging to different areas of knowledge: Basic Sciences, Health and Life Sciences, Engineering Sciences (such as Technical Drawing, Transport Phenomena, Physical-Chemistry of Materials, etc.), Management (Cost Analysis, Operations Research, Hospital Management, etc.), Humanities (involving subjects such as Interpersonal relationship, Human Resources, Ethics, etc.) and Specific Technologies related with the different tracks offered as professional careers. The curriculum is distributed according to the following fields of knowledge:

- Basic Sciences (Physics, Chemistry, Mathematics) – 12%
- Health and Life Sciences (e.g., Anatomy and Physiology, Cellular and Molecular Biology) – 10%
- Engineering Sciences (e.g., Technical Drawing, Transport Phenomena, Interfacial Phenomena, etc.) – 22%
- Management – 8%
- Humanities – 4.5%
- Specific Technologies – 43.5%

There will be a common core and, in the end of the 3rd year, students will have to choose among the 4 different tracks offered. For example, those students who will be interested in a career on Rehabilitation Engineering, will have to follow courses on, e.g., Biomechanics, where they will learn, besides the body mechanisms (muscle and bone), concepts of ergonomics. Clinical Engineering is the track of the responsibility of the Department of Biological Engineering.

The students will have a training period where they will be placed in medical device companies during the final semester of the course. Alternatively, they may develop a research project either inside the University of Minho or in other research Centres. The students will have to present a written report about the training period and to make an oral presentation before a jury.

**Director:** Manuel Mota
# Syllabus of Biomedical Engineering

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<tr>
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T: theoretic; P: practical; L: laboratorial
### Syllabus of Biomedical Engineering - Track of Clinical Engineering

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M.Sc. in Environmental Technology

This MSc course is designed to give a solid background in process design and retrofit in order to minimize on site pollution. It also gives formation on design and operation of water and wastewater treatment plants, as well as on solid waste treatment and disposal, air pollution control and environmental impact assessment.

Qualifications for Admission

The candidates should hold a degree in Biological, Civil, Mechanical, Metallurgical, Chemical, Production, Polymer or Textile Engineering. Other degrees that include subjects belonging to the field of the MSc course may also be accepted. The candidates must have 14 (in a scale 0/20) as minimal classification on their courses.

Available Teaching Staff and Hardware

Nine Lecturers from the University of Minho (coming out from 6 Departments). Other invited Lecturers from other Portuguese and foreign universities. The available facilities are the Laboratory of Molecular Microbiology & Ecology, Laboratory of Environmental Technology, Laboratory of Geographical Information Systems. The students may also have access to the Department Library.

Syllabus

- Module A (10 weeks + exams)
  
  Quality of the Environment and Natural Resources
  Hydraulic Resources Planning
  Applied Environmental Microbiology
  Laboratories of Environmental Technology

- Module B (10 weeks + exams)
  
  Physico-chemical Processes in Liquid Medium
  Biological Processes in Liquid Medium
  Air Pollution Control
  Treatment of Solid Wastes

- Module C (6 weeks + exams)
  
  Environmental Impact Analysis
  Strategies of Process Design
  Options (subject to be selected):
  Water Recovery in Textile Industries
  Environment and Energy
  Other Themes
  Laboratories of Environmental Technology II

After having completed successfully the curricular modules, the students will have to do original research during one year. This research is presented under the form of an MSc thesis, which is examined by a qualified jury.

Director: Rosário Oliveira
M.Sc. in Environmental Management

This MSc course is designed to give training in environmental management and pollution prevention in an industrial context. It is guided to the solution of problems in process industries as well as the acquisition of softskills in clean technologies and source pollution reduction contributing for a sustainable development. It covers the environmental issues surrounding industrial processes, including the legislative framework and explains how to minimise pollution and resource usage (green engineering) towards a cleaner production.

Qualifications for Admission

The candidates should hold a degree in Biological, Chemical, Environmental, Polymer, Materials, Production, Textile, Mechanical or Civil Engineering. Other degrees that include subjects belonging to the field of the MSc course may also be accepted. The candidates must have 14 marks (out of 20) as minimal classification on their courses.

Available Teaching Staff and Hardware

Lecturers from the University of Minho (coming from 9 Departments) and other invited lecturers from other Portuguese and foreign Universities. Additionally, experts from the industry and consulting firms will contribute. Library, computer facilities and laboratories are provided at the Department of Biological Engineering.

Syllabus (40ETCS)

- 1st Semester (13 weeks + exams)
  - Environmental Management Systems
  - Products and Clean Processes
  - Environmental Law and Policy
  - Pollution Control Technologies I
  - Energy and Environment
  - Strategies of Process Integration

- 2nd Semester (13 weeks + exams)
  - Quality, Safety, and Environment
  - Pollution Control Technologies I
  - Impact and Risk Analysis
  - Recycling and Materials
  - Environmental Auditing
  - Economy and Environment

After having completed successfully the curricular modules, the students will have to do original research during one year. This research is presented under the form of an MSc thesis, which is examined by a qualified jury.

Director: Eugénio Ferreira
M.Sc. in Biotechnology - Bioprocess Engineering

Biotechnology is often considered as an area involving the use of biological organisms, of their subcellular components and of the products they excrete to human profit. Therefore, biotechnological processes appear either in biomass production and products or in waste treatment. In all cases, bioreactors are the central units where the principal transformations take place. Furthermore, bioseparations occur in downstream processing and constitute a fundamental step to obtain useful products. The MSc in Biotechnology - Bioprocess Engineering is thus formed by themes centred in bioreactors and bioseparations.

Qualifications for Admission

The candidates should hold a degree in Biological, Biochemical, Chemical, Food or Environmental Engineering, or Biochemistry, Biology, Chemistry and Pharmacy. Other degrees that include subjects belonging to the field of the MSc course may also be. The candidates must have 14 (in a scale 0/20) as minimal classification on their courses. Maximum allowable number of students: 20.

Available Teaching Staff and Hardware

Eleven Lecturers from the University of Minho and other invited lecturers from other Portuguese and foreign universities. All the laboratory and computer facilities are provided by the Department of Biological Engineering.

Syllabus (23.5 credits)

- 1st Semester (13 weeks + exams)
  - Introduction to Biotechnology
  - Introduction to Bioprocess Engineering
  - Biochemical Engineering Fundamentals
  - Microbial Technology
  - Transport Phenomena in Bioengineering
  - Applied Biocatalysis

- 2nd Semester (13 weeks + exams)
  - Biological Reactors
  - Separation Processes in Bioengineering
  - Laboratories of Bioengineering
  - Option I - Environmental Biotechnology
  - Option II - Food Biotechnology

After having completed successfully the curricular modules, the students will have to do supervised original research during one year. This research is presented under the form of an MSc thesis, which is examined by a qualified jury.

Director: José Teixeira
5. Research

The research staff besides the Faculty members listed in page 3 includes 13 Ph.D. members and 27 Ph.D. students.

### Non-Permanent Staff

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<thead>
<tr>
<th>Researcher</th>
<th>Project</th>
<th>Supervisor</th>
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<tbody>
<tr>
<td>Alexander Yelshin</td>
<td>Filtration in Porous Media</td>
<td>N/a</td>
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<tr>
<td>Ana Cristina Rodrigues</td>
<td>Polycyclic Aromatic Hydrocarbons Removal Using Sequencing Batch Biofilms Reactors</td>
<td>A.Brito</td>
</tr>
<tr>
<td>Ana Paula Nicolau</td>
<td>Application of New Biological Models And Methods in the Determination of Quantitative Structure-Activity Relationships (Qsars) in Ecotoxicology</td>
<td>N.Lima</td>
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<tr>
<td>António Luís Amaral</td>
<td>Image Analysis in Biotechnological Processes</td>
<td>E.Ferreira</td>
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<tr>
<td>Fernando Dourado</td>
<td>Polysaccharides Bioactivity and Modification</td>
<td>M.Gama</td>
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<tr>
<td>Isabel Cristina Rocha</td>
<td>Metabolic Engineering</td>
<td>E.Ferreira</td>
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<tr>
<td>Jaroslav Klein</td>
<td>Three Phase Air-Lift Reactors for Fermentation</td>
<td>J.Teixeira</td>
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<td>Maria Alcina Pereira</td>
<td>Anaerobic Biodegradation of Long Chain Fatty Acids</td>
<td>M.Alves</td>
</tr>
<tr>
<td>Maria do Pilar Teixeira</td>
<td>Adhesion of Clinical Relevant Strains to Biomedical Materials</td>
<td>R.Oliveira</td>
</tr>
<tr>
<td>Mariana Coelho</td>
<td>Production of Dextran in Immobilised Biomass Reactors</td>
<td>J.Teixeira</td>
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<td>Nicolina Marques Dias</td>
<td>In Vitro Cytotoxicity Assessment of Toxic Compounds using Tetrathymena Pyriformis</td>
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<tr>
<td>R. Russell M. Paterson</td>
<td>A Simplified and Integrated Chemotaxonomy of Subgenus Penicillium Based on the Functional Characters of Mycotoxins/Antibiotics</td>
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<td>Tomás Brányik</td>
<td>Yeast Immobilization Systems in Brewing</td>
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### Ph.D. Students

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<td>Monitoring and Control of E. coli Fermentations</td>
<td>E.Ferreira</td>
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<tr>
<td>Ana Isabel Ferraz</td>
<td>Biological Removal of Heavy Metals</td>
<td>J.Teixeira /T.Tavares</td>
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<tr>
<td>Cláudia Teresa Alves</td>
<td>Modeling of Biological Kinetics of Nitrification-Denitrification</td>
<td>A.Brito</td>
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<td>Cristina Maria Quintelas</td>
<td>Modelling and Implementation of Biosorption Systems for Heavy Metals</td>
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<td>Cristina Vicente</td>
<td>Valorisation of Proteins from Cheese Whey</td>
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<td>Diana Zita Sousa</td>
<td>Construction and Molecular Characterization of Anaerobic Consortia Specialized for Lipids/LCFA Degradation</td>
<td>M.Alves</td>
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<td>Fernanda Isabel Santos</td>
<td>Contribution for the Establishment of Filamentous Fungi Culture Collection</td>
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<td>Inês Alexandra de Castro</td>
<td>Study of Ohmic Heating as a Processing Alternative to Conventional Thermal Treatments</td>
<td>A.Vicente</td>
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<td>João Ricardo Pinto</td>
<td>Surface Modification of Insoluble Polysaccharides</td>
<td>M.Gama /M.Mota</td>
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<td>José Carlos G. Costa</td>
<td>The Microfaune of an Integrated Biological Wastewater Treatment Process: Application of Image Analysis and Molecular Biology Techniques in Process Control</td>
<td>E. Ferreira/M.Alves</td>
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<td>Lígia Raquel Rodrigues</td>
<td>Production of Biological Anti-fouling Agents</td>
<td>J.Teixeira /R.Oliveira</td>
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<tr>
<td>Luis Abrunhosa Pereira</td>
<td>Detoxification of Foods containing mycotoxins</td>
<td>A.Venâncio</td>
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<td>Manuel Vieira Simões</td>
<td>Chemical Biofilm Control</td>
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<td>Maria Adosinda Martins</td>
<td>Biodegradability of Textile Dyes by Filamentous Fungi</td>
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<td>Maria Alberta Araújo</td>
<td>Biodegradability of Starch-Based Prosthetic Implants</td>
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<td>Maria Catarina Almeida</td>
<td>Heterologous Proteins Production by Non-conventional Yeasts</td>
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<td>Mariana Henriques</td>
<td>Adhesion of <em>Candida</em> sp. to Protheses and Epithelial Tissue</td>
<td>R. Oliveira / J. Azeredo</td>
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<td>Nuno Miguel Cerca</td>
<td>Physiology of Adhered <em>Staphylococci</em> to Indwelling Devices</td>
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<td>Nuno Miguel Reis</td>
<td>Novel Oscillatory Multiphase Bioreactors for Biotechnology</td>
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<td>Olga Pereira Pires</td>
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<td>Pablo Dario Araya Kroff</td>
<td>Aggregation of Anaerobic Microbial Consortia</td>
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<td>Pedro Miguel Guimarães</td>
<td>Physiology of Immobilised Yeast Cells</td>
<td>J. Teixeira / L. Domingues</td>
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<td>Ricardo Pereira Dias</td>
<td>Design of Chromatography Beds for the Separation of Macromolecules with Different Molecular Conformations</td>
<td>M. Mota</td>
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<td>Rita Isabel Pinheiro</td>
<td>High Pressure Physiology of Yeasts</td>
<td>M. Mota / I. Belo</td>
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<td>Rita Maria Serra</td>
<td>Filamentous Fungi in Grapes and Wine Quality</td>
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## National Projects

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<tr>
<td>Manuel Mota</td>
<td>Porous Media Properties and Separation of Macromolecules</td>
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<td>January 2002</td>
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<tr>
<td>José Teixeira</td>
<td>Gas-Liquid Mass Transfer in Multiphase Reactors</td>
<td>FCT POCTI</td>
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<td>José Teixeira</td>
<td>Biological silage for milking cows</td>
<td>ADI POCTI</td>
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<td>José Teixeira</td>
<td>Production of Enzymes for the Food Industry using Cheese Whey Lactose as Substrate for Fermentation</td>
<td>ADI POCTI</td>
<td>September 2002</td>
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<td>José Teixeira</td>
<td>Protein Partition in Aqueous Two-Phase Systems: Thermodynamic Characterization</td>
<td>FCT POCTI</td>
<td>September 2000</td>
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<td>José Teixeira</td>
<td>Development and Chemical, Structural and Rheological Characterization of Protein-Polysaccharide Mixed Aqueous Systems</td>
<td>FCT POCTI</td>
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<td>Rosário Oliveira</td>
<td>Adhesion of <em>Candida albicans</em> and <em>Candida dubliniensis</em> to Prosthetic Devices and Buccal Epithelial Cells</td>
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<td>Rosário Oliveira</td>
<td>Anaerobic Digestion of Solid Wastes</td>
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<td>Teresa Tavares</td>
<td>Physiology of <em>Staphylococci</em> Attached to Indwelling Devices</td>
<td>FCT POCTI</td>
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<td>Maria João Vieira</td>
<td>Catalytic Reutilization of Zeolites Supported Biosorbents</td>
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<td>Maria João Vieira</td>
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<td>Maria João Vieira</td>
<td>Survival of <em>Helicobacter pylori</em> in Biofilms Formed in Drinking Water Distribution Systems.</td>
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<td>Maria João Vieira</td>
<td>Chemical and Biological Control of Industrial Biofilms</td>
<td>FCT POCTI</td>
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<td>Maria João Vieira</td>
<td>Cleaning and Disinfection in Dairy Industry Processes</td>
<td>AGRO INIA</td>
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<td>Miguel Gama</td>
<td>FUNCARB - FUNctionalization of biomedical materials using a CARBhydrate binding domain</td>
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<td>Miguel Gama</td>
<td>Immunobiological Studies of Microbial Virulence Immunomodulatory Proteins that Allow the Survival of the Secreting Microorganism in the Host</td>
<td>FCT POCTI</td>
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<td>Miguel Gama</td>
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<td>Miguel Gama</td>
<td>Cellulose Surface Modification using Enzymes Linked to CBDs</td>
<td>FCT POCTI</td>
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<td>Miguel Gama</td>
<td>CBD-Text: Utilization of CBD’s Domains for the Improvement of Textile Fabrics</td>
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<td>António Brito</td>
<td>Sustainable Systems for Wastewater Treatment in Rural Areas</td>
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<td>National Assessment on Water and Wastewaters systems - Infrastructures and Economics</td>
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<td>Armando Venâncio</td>
<td>Prevention of Contamination of Porto Wine and Vinho Verde by Fung</td>
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## Research On Going Projects

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<tr>
<td>Madalena Alves</td>
<td>Integration of Image Analysis, FISH Techniques and Physiological Activity to Monitor Anaerobic Digestion Processes</td>
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<td>Madalena Alves</td>
<td>Photoassisted Electrochemical Oxidation of Lipidic Compounds as a Precursor to Anaerobic Treatment</td>
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<td>Integrated Treatment of Textil Wastewater by Anaerobic/Aerobic/Advanced Oxidation Processes</td>
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<td>Madalena Alves</td>
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<td>António Vicente</td>
<td>Improvement of Enzyme-Modified Cheeses Towards Functionality</td>
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<td>Joana Azeredo</td>
<td>Biofilms in Contact Lenses: Formation and Control</td>
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<td>José Maria Oliveira</td>
<td>Determination of Complex Rootstock/Scion Most Important Effects on Yield And Quality of Vinhos Verdes</td>
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<td>Lake Restoration and Requalification Measures - Furnas</td>
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<td>Regional Plan for Sustainable Development of Azores</td>
<td>DRA/SRA</td>
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<tr>
<td>Manuel Mota</td>
<td>BI-EURAM II: “Industrial Biotechnology”</td>
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<td>José Teixeira</td>
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<td>José Teixeira</td>
<td>ISEKI-Food: Integrating Safety and Environmental Knowledge Into Food Studies towards European Sustainable Development</td>
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<td>Armando Venâncio</td>
<td>COMBOW: Control Of Mycological Contaminations in B ottled Water</td>
<td>QLK1-CT</td>
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<td>Nelson Lima</td>
<td>SAFER - Surveillance and Control of Microbiological Stability in Drinking Water Distribution Networks</td>
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<td>Armando Venâncio</td>
<td>Wine-Ochra Risk - Assessment and Integrated Ochratoxin A (OTA) Management in Grape And Wine</td>
<td>EU QL-KA1</td>
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<td>António Vicente</td>
<td>FOODPRO: Ohmic Heating for FOOD PROcessing</td>
<td>EU Craft</td>
<td>March 2004</td>
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**Ph.D. and M.Sc. Theses**

**Ph.D. Theses Concluded (Since 2001)**

Rita Isabel Couto Pinheiro: *Pressure effect on yeast physiology*, University of Minho. June 2004 Supervisors: Manuel Mota and Isabel Belo.


Maria Alcina Alpoim Pereira: *Anaerobic biodegradation of long chain fatty acids*, University of Minho, October 2003 Supervisors: Madalena Alves and Manuel Mota.

Fernando O. Querióz Dourado: *Enzymatic Extraction of Almond Oil*, University of Minho, October 2003 Supervisors: Miguel Gama and Manuel Mota.

Filipa Lopes: *Interaction between Corrosion and Biofouling*, University of Minho, October 2003 Supervisors: Luis Melo and Rosario Oliveira.


João Peixoto: *Biological Removal of VOC’s*, University of Minho, February 2003 Supervisor: Manuel Mota.


Regina Nogueira: *Nitrification and Denitrification Bioreactors*, University of Minho, December 2002 Supervisors: Luis Melo and António Brito.

Carla Maria Duarte Freitas: *Hydrodynamic Studies of Airlift Bioreactors*, University of Minho, October 2002 Supervisor: José A. Teixeira.

Helena Pala Dias de Sousa: *Utilization of Xylanases and celluloses in Paper Fibre Recycling*, University of Minho, September 2002 Supervisors: Miguel Gama and Manuel Mota.

Maria do Pilar Araújo Teixeira: *Aerobic Denitrification in Fixed Bed and Fluidised Reactors*, University of Minho, September 2002 Supervisor: Rosario Oliveira.


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**DEPARTMENT OF BIOLOGICAL ENGINEERING**

**RESEARCH**

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**DEPARTMENT OF BIOLOGICAL ENGINEERING**

**RESEARCH**
**MSc Theses Concluded** (Since 2001)


This list integrates only books, peer reviewed papers and publications in book chapters.

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**Books**


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**Book Chapters**


PEER-REVIEWED PAPERS


7. The "Micoteca da Universidade do Minho"

The *Micoteca da Universidade do Minho* - MUM - is a fungi culture collection established in 1996, with the double purpose of maintaining and supplying strains for research on biotechnology and for use in teaching laboratories, and also to act as a centre of expertise, information and training. The collection is registered with BioCise (Biological Collection Information Service in Europe) and with the World Data Centre of Microorganisms (WDCM). The collection is member of European Culture Collections’ Organisation (ECCO) and World Federation of Culture Collections (WFCC). MUM is a board member of ECCO.

The collection kept in the Department of Biological Engineering at the University of Minho holds about 150 identified species. The holdings include recognized standard strains and isolates derived from research activities, mainly of the genera *Penicillium* and *Aspergillus*. Details of the open collection’s holdings are available on-line at www.micoteca.deb.uminho.pt.

Research activities are presently focused on the subjects of biodegradation and biodeterioration, studies of mycotoxins in food products and studies of air quality in industrial environments.

The available specialized books include around 500 titles of which 250 are monographs.

Training services include individual training programmes to fulfil specialised or confidential training needs, in addition to advanced courses. A course on food-borne fungi takes place every year, aimed at professionals working in microbiology laboratories in the food and beverage industry and researchers in microbiology. It provides an introduction to the identification of important groups of fungal contaminants of foods and beverages. A manual on food-borne fungi was prepared to support this course.

Post-graduation studies (MSc, PhD) in mycology related areas are also available.