

---

**Ano Letivo** 2022-23

---

**Unidade Curricular** BIOTECNOLOGIA DO FÁRMACO

---

**Cursos** BIOTECNOLOGIA (2.º ciclo)

---

**Unidade Orgânica** Faculdade de Ciências e Tecnologia

---

**Código da Unidade Curricular** 15481019

---

**Área Científica** TECNOLOGIA

---

**Sigla**

---

**Código CNAEF (3 dígitos)** 524,347

---

**Contributo para os Objetivos de Desenvolvimento Sustentável - ODS (Indicar até 3 objetivos)** 12, 9

---

**Línguas de Aprendizagem** Português ou inglês.

**Modalidade de ensino**

Presencial ou em e-learning, dependendo da evolução da pandemia COVID-19.  
Em regime diurno.

**Docente Responsável**

Sara Isabel Cacheira Raposo

DOCENTE	TIPO DE AULA	TURMAS	TOTAL HORAS DE CONTACTO (*)
Sara Isabel Cacheira Raposo	PL; S; T; TP	T1; TP1; PL1; S1	15T; 13TP; 10PL; 4S

\* Para turmas lecionadas conjuntamente, apenas é contabilizada a carga horária de uma delas.

ANO	PERÍODO DE FUNCIONAMENTO*	HORAS DE CONTACTO	HORAS TOTAIS DE TRABALHO	ECTS
1º	S2	15T; 13TP; 10PL; 4S	156	6

\* A-Anual;S-Semestral;Q-Quadrimestral;T-Trimestral

**Precedências**

Sem precedências

**Conhecimentos Prévios recomendados**

Sem requisitos.

**Objetivos de aprendizagem (conhecimentos, aptidões e competências)**

O objetivo desta UC é focar os principais aspetos da produção microbiana de fármacos, permitir que os alunos conheçam os tipos de reatores com diferentes geometrias e modos de operação. Saibam trabalhar com balanços de massa ao substrato, biomassa e produto para efeitos do dimensionamento de um processo biológico. Serão focados exemplos de produção de fármacos. Condições de operacionalidade dos reatores e modos de esterilização de equipamento, matéria-prima ou nutrientes líquidos ou gasosos. Serão ainda abordados os conceitos da produção de biofármacos.

### Conteúdos programáticos

1. The importance and development of bioprocesses
  - 1.1. Definition of a biotechnological process
  - 1.2. Development of a bioprocess.
  - 1.3. The concept of sustainability applied to bioprocesses
2. Principles of Operation for bioreactors for Suspension Systems
  - 2.1. Factors that influence the cultivation mode
  - 2.2. Different cultivation modes
  - 2.3. Physical and hydrodynamic processes in bioprocesses.
3. Constraints on scale-up, modes of operation and control in Bioreactors
  - 3.1. Scale-up and its constraints
4. Biological Systems Application
  - 4.1. Bioprocesses Application in the food sector
  - 4.2. Bioprocesses Application in health
  - 4.3. Bioprocesses Application in the production of biofuels
5. Concept of biorefinery applied to the different biological resources

---

### Metodologias de ensino (avaliação incluída)

Aulas expositivas de transmissão de conceitos teóricos, recorrendo sempre que oportuno ao questionamento dos alunos e de análise crítica do conhecimento. Aulas de resolução de problemas teórico-práticos. Estudo autónomo do estudante. A informação e os textos de apoio serão disponibilizados na tutoria eletrónica. A a **avaliação** desta UC incidirá na **componente teórica/teórico-prática** através da realização de um **teste escrito individual** com a duração de uma hora e trinta minutos e na **componente prática laboratorial**, que englobará a entrega do **relatório** referente ao trabalho realizado nas aulas práticas e na **apresentação e discussão** do mesmo. Para obter **dispensa ao exame**, a **nota do teste** deve ser **igual ou superior a nove valores e cinco décimas** (9,5). O exame incidirá sobre todos os conteúdos lecionados. A ponderação para a **classificação final** será: trabalho prático, relatório e apresentação (25%) + exame final (75%).

---

### Bibliografia principal

- Reactores Biológicos (2006). Lidel, Edições Técnicas  
Doran, P. M. (1999) Bioprocess Engineering Principles, Ac. Press.  
Shuler, M.L. & Kargi, F. (2002) Bioprocess Engineering Basic Concepts, 2nd Ed., Prentice Hall International Series, NY.  
Bailey, J.E. & Ollis, D.F. (1986) Biochemical Engineering Fundamentals, 2nd ed., McGraw-Hill, NY.  
Blanch, H. W.; Clarck, D. S. (1997) Biochemical Engineering, Marcel Dekker.  
Riet, K. & Tramper, J. (1991) Basic bioreactor design, Marcel Dekker.  
Atkinson, B. & Mavituna, F. (1991) Biochemical Engineering and Biotechnology Handbook, 2nd Ed., McMillan. Lima, N. & Mota, M. (2003) Biotecnologia: Fundamentos e Aplicações, Lidel.  
Cabral, J.M., Mota, M. & Tramper, J. (2001) Multiphase Bioreactor Design, Taylor & Francis, London

---

**Academic Year** 2022-23

---

**Course unit** PRODUCTION TECHNOLOGIES OF BIOACTIVE COMPOUNDS

---

**Courses** BIOTECHNOLOGY  
Common Branch

---

**Faculty / School** FACULTY OF SCIENCES AND TECHNOLOGY

---

**Main Scientific Area**

---

**Acronym**

---

**CNAEF code (3 digits)** 524,347

---

**Contribution to Sustainable  
Development Goals - SGD  
(Designate up to 3 objectives)** 12,9

---

**Language of instruction** Portuguese or English.

**Teaching/Learning modality**

Presencial or in e-learning, depending on the evolution of the COVID-19 pandemic.  
Diurnal.

**Coordinating teacher**

Sara Isabel Cacheira Raposo

Teaching staff	Type	Classes	Hours (*)
Sara Isabel Cacheira Raposo	PL; S; T; TP	T1; TP1; PL1; S1	15T; 13TP; 10PL; 4S

\* For classes taught jointly, it is only accounted the workload of one.

**Contact hours**

T	TP	PL	TC	S	E	OT	O	Total
15	13	10	0	4	0	0	0	156

T - Theoretical; TP - Theoretical and practical ; PL - Practical and laboratorial; TC - Field Work; S - Seminar; E - Training; OT - Tutorial; O - Other

**Pre-requisites**

no pre-requisites

**Prior knowledge and skills**

No requirements

**The students intended learning outcomes (knowledge, skills and competences)**

The goal of this course is to focus on the main aspects of microbial production of pharmaceuticals, allowing students know the types of reactors with different geometries. Know how to work with substrate, biomass and product mass balances for the design of a biological process. Will be focused examples of industrial pharmaceutical processes. Operating conditions of the reactors are discussed through the study of the concepts of mass transfer and heat, as well sterilization methods of equipment, raw materials or nutrients liquid or gaseous. There will also be discussed concepts of the production of biopharmaceuticals.

## Syllabus

1. The importance and development of bioprocesses
    - 1.1. Definition of a biotechnological process
    - 1.2. Development of a bioprocess.
    - 1.3. The concept of sustainability applied to bioprocesses
  2. Principles of Operation for bioreactors for Suspension Systems
    - 2.1. Factors that influence the cultivation mode
    - 2.2. Different cultivation modes
    - 2.3. Physical and hydrodynamic processes in bioprocesses.
  3. Constraints on scale-up, modes of operation and control in Bioreactors
    - 3.1. Scale-up and its constraints
  4. Biological Systems Application
    - 4.1. Bioprocesses Application in the food sector
    - 4.2. Bioprocesses Application in health
    - 4.3. Bioprocesses Application in the production of biofuels
  5. Concept of biorefinery applied to the different biological resources
- 

## Teaching methodologies (including evaluation)

Teaching methodologies will be, mainly, transmission of theoretical concepts by oral communication and practical problems based- learning. Independent study of the student is performed, at home, in work groups or individually.

The evaluation of this course will focus on the theoretical / theoretical-practical component through an individual written test lasting one hour and thirty minutes and the laboratory practical component, which will include the delivery of the report on the work done in practical classes and presentation and discussion of it. To obtain exemption from the exam, the test grade must be equal to or greater than nine values and five tenths (9.5). The exam will focus on all the contents taught.. Final classification will be: theoretical examination (75%) + Practical work, report and presentation (25%).

---

## Main Bibliography

- ¿ Reactores Biológicos (2006). Lidel, Edições Técnicas
- ¿ Doran, P. M. (1999) Bioprocess Engineering Principles, Ac. Press.
- ¿ Shuler, M.L. & Kargi, F. (2002) Bioprocess Engineering Basic Concepts, 2nd Ed., Prentice Hall International Series, NY.
- Bailey, J.E. & Ollis, D.F. (1986) Biochemical Engineering Fundamentals, 2nd ed., McGraw-Hill, NY.
- Blanch, H. W.; Clarck, D. S. (1997) Biochemical Engineering, Marcel Dekker.
- Riet, K. & Tramper, J. (1991) Basic bioreactor design, Marcel Dekker.
- Atkinson, B. & Mavituna, F. (1991) Biochemical Engineering and Biotechnology Handbook, 2nd Ed., McMillan.
- Lima, N. & Mota, M. (2003) Biotecnologia: Fundamentos e Aplicações, Lidel.
- Cabral, J.M., Mota, M. & Tramper, J. (2001) Multiphase Bioreactor Design, Taylor & Francis, London