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|------------------|--------------------------------|---------------|----------------|--------------------------------|-------|
| Course Unit      | Histotechnology I              |               | Field of study | Biomedical Laboratory Sciences |       |
| Bachelor in      | Biomedical Laboratory Sciences |               | School         | School of Health               |       |
| Academic Year    | 2023/2024                      | Year of study | 3              | Level                          | 1-3   |
| Type             | Semestral                      | Semester      | 1              | ECTS credits                   | 5.0   |
| Code             | 9995-804-3104-00-23            |               |                |                                |       |
| Workload (hours) | 135                            | Contact hours | T -            | TP 22,5                        | PL 30 |
|                  |                                |               | TC -           | S -                            | E -   |
|                  |                                |               | OT 7,5         | O -                            |       |

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Celso Tome dos Santos Lopes, Rossana Pilar Marcelino Correia

### Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. Understand the histotechnology contribution in the Pathology context. Know the general safety rules in the histopathology laboratory.
2. To know the principles of macroscopic description. Understand the tissue fixation mechanisms. Identify the chemical properties of fixation agents.
3. Recognize the importance and applicability of the decalcification of mineralized tissues. Identify the chemical properties of descaling agents.
4. Recognize and identify equipment and reagents and know their role in each processing step: Dehydration, diaphanization and impregnation. Recognize/solve technical errors.
5. Recognize the equipment/materials for tissue embedding. Know the main embedding rules, recognize technical errors and know how to solve the problems without prejudice to the final diagnosis.
6. Recognize the equipment / materials for histological section. Know the main microtomy rules, recognize technical errors and know how to solve the problems without prejudice to the final diagnosis.
7. Identify and characterize the main routine histological staining: hematoxylin & eosin. Identify the chemical properties of dyes.
8. Recognize the purpose of slide mounting and describe the main characteristics of the mounting media used in histology.

### Prerequisites

Not applicable

### Course contents

The main objective of the curricular unit of Histotechnology I is to introduce students to sample preparation protocols for optical microscope examination: sample reception and macroscopical registration, fixation, decalcification, tissue processing, tissue embedding, microtomy, tissue staining, slide mounting and main errors that can be identified and solved during the histological technique. Recognize the contribution of digital pathology

### Course contents (extended version)

1. Introduction to the study of tissues and their diseases
  - The importance of tissue preparation in pathology
  - Evolution of histology techniques
  - Tissue properties and physical considerations
2. Macroscopy
  - General Procedures of macroscopy.
  - Macroscopic description of biological material (tissue) sent more often
3. Fixation and fixatives
  - Tissue degeneration. Types of tissue change.
  - Physical fixation methods
  - Chemical fixation methods
  - General properties of fixatives. The ideal fixative for histology. The choice of the best fixative.
  - Compound fixative solutions. General properties of fixative solutions in histology.
  - Specific fixative solutions for proteins, lipids, nucleic acids and glycans.
  - Factors that influence the quality of fixation.
  - Fixation techniques
4. Tissue decalcification
  - Decalcification and their importance in histopathology
  - Decalcification with acid solutions
  - Decalcification with chelating agents
  - Decalcification methods
  - Decalcification tests
  - Decalcification of paraffin embedded samples
5. Tissue processing
  - General steps in tissue processing
  - Types of reagents used during the processing steps
  - Factors that influence tissue processing
  - Manual and automatic tissue processing
  - Microwave tissue processing
6. Tissue embedding
  - Equipment and materials used in tissue embedding
  - Commonly used embedding media
  - Tissue orientation during embedding
  - Basic rules to avoid errors
7. Microtomy
  - Microtome types
  - Microtome components and functioning
  - Microtome knives
  - Floating and adhesion of sections to slides
  - Solutions to avoid detachment of tissue sections
8. Hematoxylin-Eosin (H&E) Stain
  - Steps that preceded and precede the staining: Dewax, hydration, dehydration and diaphanization
  - Basic principles to H&E staining. Alternatives to H&E staining.
  - Manual and automatic staining.
9. Slide mounting
  - Mounting media. Resin media. Aqueous media. Coverslips.
  - Slide mounting technique.
10. Identification and resolution of errors during the histology technique.
  - During fixation, tissue processing and decalcification steps.
  - During tissue embedding and microtomy steps.
  - During staining protocol and mounting steps.

**Recommended reading**

1. Cook D. J. (2006) Cellular Patology: An Introduction to Techniques and Applications, 2nd ed. UK: Scion Publishing, 2007. ISBN 1-904842-30-5
2. Kiernan J. A. (2003) Histological & Histochemical Methods – Theory & Practice, 5th ed. London: Arnold ISBN 978-1-9048424-2-2
3. Freida L. Carson. Histotechnology: A Self-Instrumentation Text, 3rd Ed. ISBN-13: 978-0-89189-581-7; ISBN-10: 0-89189-581
4. Kennedy, Alexander (1977). Basic techniques in diagnostic histopathology. Churchill Livingstone : distributed in the U. S. A. by Longman, Edinburgh [Scot. ] ; New York; ISBN 978-0-443-01464-2
5. Kim Suvarna Christopher Layton John Bancroft - Bancroft's Theory and Practice of Histological Techniques 8th Edition

**Teaching and learning methods**

Expositive, experimental, demonstrative and "problem-based learning".

**Assessment methods**

1. Continuous evaluation - (Regular, Student Worker) (Final)
  - Practical Work - 20% (Individual practical exam.)
  - Reports and Guides - 10% (Individual written report.)
  - Intermediate Written Test - 70% (Theoretical test with minimum mark of 8, 5 values.)
2. Final exam - (Regular, Student Worker) (Supplementary, Special)
  - Final Written Exam - 100% (Minimum 8. 5 for theoretical component.)

**Language of instruction**

Portuguese, with additional English support for foreign students.

**Electronic validation**

|   |                      |                                 |                                       |
|---|----------------------|---------------------------------|---------------------------------------|
| Celso Tome dos Santos Lopes,<br>Rossana Pilar Marcelino Correia | Josiana Adelaide Vaz | Luis Migue Fernandes Nascimento | Adília Maria Pires da Silva Fernandes |
| 05-02-2024  | 15-02-2024           | 15-02-2024                      | 15-02-2024                            |