Degree in Biomedical Laboratory Techniques

Teaching: **PATHOLOGICAL ANATOMY**
SSD: **MEDS-04/A, MEDS-26/A**
Coordinator: Manuel Scimeca e-mail: **manuel.scimeca@unicamillus.org**
Numero di CFU totali: **5**

SUBJECT: **FUNDAMENTALS OF HISTOPATHOLOGY AND SPECIAL HISTOPATHOLOGY**
SSD: **MEDS-04/A**
Professor: Manuel Scimeca e-mail: **manuel.scimeca@unicamillus.org**
CFU: **2**

SUBJECT: **FUNDAMENTALS OF HISTOPATHOLOGY AND SPECIAL HISTOPATHOLOGY**
SSD: **MEDS-04/A**
Professor: Angela Carlino e-mail: **angela.carlino@unicamillus.org**
CFU: **2**

SUBJECT: **BIOMEDICAL LABORATORY TECHNICAL SCIENCES ISTO-CYTOPATHOLOGY**
SSD: **MEDS-26/A**
Professor: Roberto Virgili e-mail: **roberto.virgili@unicamillus.org**
CFU: **1**

PREREQUISITES
Although no formal prerequisites are required, knowledge of basic elements of chemistry, biology, anatomy, histology, and general pathology is necessary.

LEARNING OBJECTIVES
Essential objectives include the acquisition of basic knowledge about the main safety standards of the histopathology laboratory, knowledge of histological techniques from sample fixation/preservation to paraffin embedding, and cytological techniques from sample fixation/preservation to preparation; basic histochemical and immunohistochemical techniques; issues related to the preparation of histological and cytological samples and ancillary techniques (histochemical and immunohistochemical); principles of optics, optical microscopy, and electron microscopy. These objectives will be achieved through lectures and interactive teaching activities, designed to facilitate learning and improve the ability to solve problems related to the execution of histo-cytopathological preparation techniques.

EXPECTED LEARNING OUTCOMES
The expected learning outcomes are consistent with the general provisions of the Bologna Process and the specific provisions of Directive 2005/36/EC. They fall within the European Qualifications Framework (Dublin Descriptors) as follows:

Knowledge and understanding
At the end of this course, students should be able to:

- Understand the main methods of histological and cytological fixation
- Understand the main methods of preparing paraffin-embedded histological samples
- Understand the main methods of preparing cytological samples
- Understand the main methods of preparing fresh samples

- Know the main histochemical staining methods for tissues
- Understand the principles of immunohistochemical techniques
- Learn to identify the main artifacts related to the preparation of histological and cytological samples and ancillary techniques (histochemical and immunohistochemical)
- Learn the operating principles of instruments used for histological and cytological sample preparation and related ancillary techniques (histochemical/immunohistochemical)
- Understand the main chemical and biological risks associated with the techniques used
- Understand and explain the principles of cellular and tissue pathology
- Understand and explain the concept of ischemia
- Understand and explain the main subcellular modifications
- Understand and explain the concept of cell death
- Understand and explain the concept of oncosis
- Understand and explain the basic principles of microscopic optics
- Understand and explain the basic functioning of electron microscopes
- Understand and explain the techniques for preparing histological samples for molecular pathology analyses
- Understand and explain in situ hybridization techniques
- Understand and explain the applications of histopathological techniques in anatomical pathology practice

Communication skills
At the end of the integrated course, the student should be able to communicate scientific and practical contents clearly and unequivocally, using appropriate scientific and technical terminology.

Autonomy of judgment
At the end of the integrated course, the student should be able to:
- Independently interpret the information related to the topics covered
- Independently use the acquired knowledge to recognize and explain the molecular mechanisms underlying diseases

Learning skills
At the end of the integrated course, the student should:
- Acquire suitable learning methods for in-depth study
- Improve their skills in general and clinical pathology by consulting scientific literature, databases, and specialized websites, focusing on aspects that are fundamental and relevant to their professional context

PROGRAM
BASIC HISTOLOGICAL AND CYTOLOGICAL TECHNIQUES:
- Main techniques for histological sample fixation and preparation
- Main techniques for biological fluid sample fixation and preparation
- Techniques for paraffin embedding of histological samples
- Techniques for paraffin embedding and sectioning
- Techniques for fresh sample preparation
- Artifacts from technical preparation
- Principles of operation and use of equipment
- Safety in the Anatomical Pathology Laboratory

ANCILLARY HISTOLOGICAL AND CYTOLOGICAL TECHNIQUES:

- Histochemical staining techniques
- Immunohistochemical investigation techniques
- Immunofluorescence techniques (direct and indirect)
- Introduction to electron microscopy techniques

CELLULAR RESPONSE TO DAMAGE:

- Cellular response to ischemia (definition of ischemia and hypoxia, types of hypoxia: hypoxic, anemic, stagnant, ischemic, histotoxic)
- Warm and cold ischemia
- Ischemia times and cellular susceptibility
- Ischemic cell damage, hydropic degeneration, vacuolar degeneration, cloudy swelling
- Reversible and irreversible subcellular modifications associated with hydropic swelling
- Microscopic aspects of cell death, concepts of oncosis, coagulative necrosis, liquefactive necrosis, and apoptosis

PRINCIPLES OF OPTICS:

- Principles of optics
- Converging and diverging lenses
- Chromatic aberrations
- Image formation

MICROSCOPY:

- Principles of optical microscopy
- Brightfield microscopy
- Darkfield microscopy
- Fluorescence microscopy
- Digitalization

ELECTRON MICROSCOPY:

- Principles of electron microscopy
- Applications of ultrastructural microscopy

APPLICATIONS FOR ANATOMICAL-PATHOLOGICAL MOLECULAR DIAGNOSTICS

- FISH and SISH

TEACHING METHODS

The course is structured with 50 hours of lectures, divided into 2 or 3-hour sessions according to the academic calendar. The lectures include theoretical teaching with interaction and video projection on the topics covered. At the beginning of each lesson, a summary of the previous lesson will be presented to ensure proper understanding by the students.

- Interactive frontal lessons with learning assessments (50 hours)
- Discussion on selected topics guided by the teacher
- Self-assessment

MODULES:

Fundamentals of Histopathology and Special Histopathology (40 hours)
Technical Sciences of Laboratory Medicine – Histo-cytopathology (10 hours)

ASSESSMENT METHODS

Evaluation of *Fundamentals of Histopathology and Special Histopathology*

Assessment of the entire teaching will be by written examination followed by an oral test. The written test will consist of 40 multiple-choice questions, including 30 from the histopathology

and special histopathology fundamentals module and 10 questions from the laboratory technical science module. One point will be awarded for each correct answer. To enter the oral examination, the student must have scored at least a minimum of 16 points for the fundamentals of histopathology and special histopathology module and 6 points for the laboratory technical sciences module.
Failure to pass the written test precludes taking the oral examination.
During the oral examination, the Examination Board will assess the Student's ability to apply knowledge and ensure that skills are adequate to know and correctly apply histo-cytological techniques. The following will also be assessed: autonomy of judgment (making judgements), communication skills (communication skills) and learning skills (learning skills) as indicated in the Dublin descriptors
The exam will be overall evaluated according to the following criteria:
Unsuitable: Major deficiencies in subject knowledge and understanding; limited capacity for analysis and synthesis, frequent generalisations.
18-20: just sufficient knowledge and understanding of the topics with possible imperfections; ability to analyze synthesis and independent judgment sufficient.
21-23: knowledge and understanding of routine topics; correct analysis and synthesis skills with coherent logical argumentation.
24-26: good knowledge and understanding of the topics; good analytical and synthesis skills with rigorously expressed arguments.
27-29: complete knowledge and understanding of the topics; remarkable skills of analysis, synthesis. Good autonomy of judgment.
30-30L: excellent level of knowledge and understanding of the topics. Remarkable capacity for analysis and synthesis and independent judgement. Arguments expressed in an original way.

SUPPORT ACTIVITIES

In the final evaluation, the weighted average of the teaching modules will be considered. The knowledge and comprehension abilities will weigh 40%, the knowledge and applied comprehension abilities will weigh 40%, and the autonomy of judgment will weigh 20%.

RECOMMENDED TEXTS AND BIBLIOGRAPHY

- Scientific articles and teaching materials selected and provided by the teacher
- Free downloadable book: *Practical Histopathology 1st Edition* by Shafie Abulkadir Hassan

Title: *Laboratory Methods in Histotechnology*
Authors: Edna B. Prophet, Armed Forces Institute of Pathology (U.S.)
Editor: Edna B. Prophet
Edition: Reprint
Publisher: American Registry of Pathology, 1992
Source: University of Michigan
Digitized: July 29, 2008
Title: *Advanced Laboratory Methods in Histology and Pathology*
Author: Ulrika V. Mikel
Editor: Ulrika V. Mikel
Contributor: Armed Forces Institute of Pathology (U.S.)
Illustrated Edition
Publisher: Armed Forces Institute of Pathology, American Registry of Pathology, 1994
Source: University of Michigan
Digitized: July 31, 2008

CONTACT DETAILS

Student reception is available by appointment via email or phone using the following contacts:

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