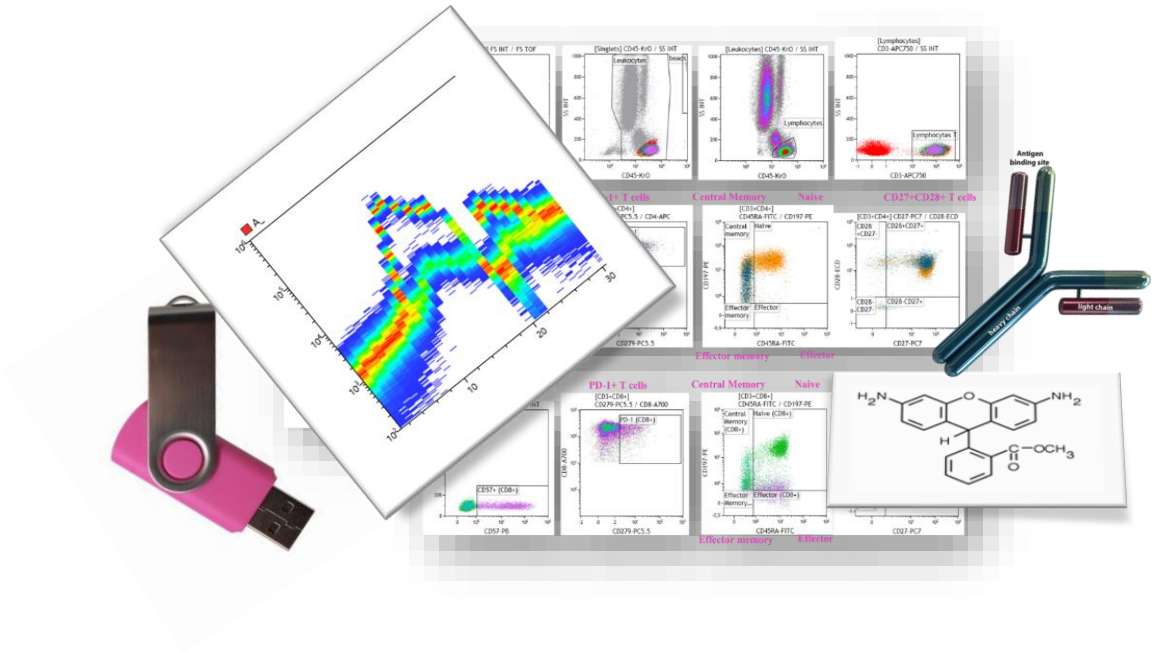
# University Certificate in Flow Cytometry: Fundamentals, Techniques and Applications

## 2nd On Line Edition

## February-June 2022



## REGISTRATION AND INFORMATION:

## Fees: 650 €

**End of Pre-admission period: February 2022**

https://www.uv.es/uvweb/college/en/postgraduate-courses/university-postgraduate-qualifications/uv-specific-degrees/uv-specific-degrees-1286006703791.html?p2=2-1&p5=21724140


**More Information:**

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# OBJECTIVES

Knowledge of the basic principles of cytometric techniques and the user's acquaintance with the critical points of their practical application are essential for the correct use of cytometry in the basic and clinical context. Despite this, there are currently no systematic and integrated education initiatives aimed at providing cytometry users with sufficient training to know and properly use the instruments, to design and optimize cytometric experiments, and to correctly manage and interpret the results obtained.

The teaching contents of this Specialization Course are organized following the exam guidelines to obtain the European Certificate for Cytometry Operators, from the European Society for Clinical Cell Analysis (ESCCA), so they can be used to prepare that examination.

**NOTE:** The official language of the Course is **English**. However, for Spanish-language attendants the Course Manual, the Webinars and on-line tutorials will be provided also in **Spanish**.

# COURSE ORGANIZATION AND PROGRAM

The Course covers 10 ECTS credits. The theoretical part will include online and recorded webinars and online tutorials, as well as a collection of reviews and articles. For the practical aspects, students will be provided with open-source cytometric software and commented list-mode files of real cases (basic and clinical applications) that can be executed and interpreted as in a real cytometric experiment.

All the online and recorded teaching activities will be available through the Blackboard Collaborate platform associated to the Virtual Classroom of the Course (Moodle platform in the University of Valencia). All the teaching and practical materials will be organized and available from the Virtual Classroom.

# GENERAL CONTENTS

Module 1. Fundamentals and Applications of Flow Cytometry.

Module 2. Design and Optimization of Cytometric Experiments: The Pre-Analytic Phase.

Module 3. Design and Optimization of Cytometric Experiments: The Analytical Phase.

Module 4. Analysis, Interpretation and Data Management.

Module 5. Applications and Techniques in Biomedicine, Biotechnology and Enviroment.

Module 6. Applications and Techniques in Diagnosis and Clinical Research.

Module 7. Practical Exercises: Resolution of Real Cases.

# PROFESSORS AND COLLABORATORS

**Alberto Alvarez-Barrientos, Ph.D:**
Director of the Service of Techniques Applied to Biosciences, University of Extremadura, Badajoz, Spain

**Paula Fernandez, MD, PhD:**
President of the European Society for Clinical Cell Analysis (ESCCA); Director of the Cytometry and Stem Cell Laboratory, Institut für Labormedizin, Aarau, Switzerland

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Head of the Cytometry Service, Central Research Unit, Incliva-UVEG, Valencia, Spain

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**Alicia Martínez-Romero, PhD:**
Head of the Cytomics Technological Service, Príncipe Felipe Research Center, Valencia, Spain

**José-Enrique O'Connor, PhD:**
Director of the Course. Member of the Executive Board of the ESCCA; Past-President of the Iberian Society of Cytometry (SIC), Director of the Cytomics Laboratory, Department of Biochemistry and Molecular Biology, University of Valencia, Spain

**Jordi Pétriz, PhD:**
Past-President of the SIC, Member of the Education and Accreditation Committee of the ESCCA. Group Leader, Functional Cytomics Laboratory, Josep Carreras Institue against Leukemia, Badalona, Spain

**Alan Graham Pockley, PhD:**
Director, John van Geest Cancer Research Center, Nottingham University, United Kingdom

**Francisco Sala de Oyanguren, PhD:**
Responsible of Cytometry Laboratories, Ludwig Institute for Cancer Research, Lausanne University, Lausanne, Switzerland.

# COURSE PROGRAM

**MODULE 1. FUNDAMENTALS AND APPLICATIONS OF FLOW CYTOMETRY**

1.1 Technical basis of flow cytometry.

1.2 Overview of general applications of flow cytometry.

1.3 Fluorescence and fluorescent markers.

1.4 Components and operation of the flow cytometer: Fluidic System.

1.5 Components and operation of the flow cytometer: Optical System.

1.6 Components and operation of the flow cytometer: Electronic System.

1.7 Data generation, display, storage and management in Flow Cytometry.

1.8 Recent technological advances in Flow Cytometry.

1.9 Cytometry resources on the Internet.

1.10 Self-assessment questionnaire.

**MODULE 2. DESIGN AND OPTIMIZATION OF EXPERIMENTS: THE PRE-ANALYTICAL PHASE**

2.1 Essential issues for experimental design in Flow Cytometry.

2.2 Differential characteristics of existing Flow Cytometers and Cell Sorters.

2.3 Collection, Storage and Preparation of samples: Clinical cytometry.

2.4 Collection, Storage and Preparation of samples: Basic cytometry.

2.5 Considerations for the selection of reagents for Flow Cytometry.

2.6 Internet tools for reagent selection for Flow Cytometry.

2.7 Internet tools for panel design in Flow Cytometry.

2.8 Rules for the design and optimization of panels in Flow Cytometry.

2.9 Controls in Flow Cytometry.

2.10 Self-assessment questionnaire.

## MODULE 3. DESIGN AND OPTIMIZATION OF EXPERIMENTS: THE ANALYTICAL PHASE

3.1 Connecting and disconnecting the cytometer.

3.2 Cleaning and maintenance of the cytometer.

3.3 Standardization and Quality Control.

3.4 Acquisition of data with cytometer's own software.

3.5 Cell separation by flow cytometry ("Cell Sorting")

3.6 Occupational Risks and Safety Procedures in Flow Cytometry.

3.7 Detection of common problems and troubleshooting.

3.8 Completion of the self-assessment questionnaire.

## MODULE 4. ANALYSIS, INTERPRETATION AND DATA MANAGEMENT

4.1 Strategies for population selection (“Gating”).

4.2 Fluorescence compensation.

4.3 Specific format of final data in flow cytometry (FCS format).

4.4 Conventional statistical methods in flow cytometry.

4.5 Advanced statistical and bioinformatics methods in Flow Cytometry.

4.6 Specific statistics for the Flow Cytometry of rare events.

4.7 Modeling methods for cell cycle analysis and proliferation by Flow Cytometry.

4.8 Quantitative and Ratiometric methods in Flow Cytometry.

4.10 Fusion of files in flow cytometry and virtual immunophenotype.

4.11 Introduction to cytometer- interfaced software, third-party software and public domain software.

4.12 Self-assessment questionnaire.

## MODULE 5. APPLICATIONS AND TECHNIQUES IN BIOMEDICINE, BIOTECHNOLOGY AND ENVIRONMENT

5.1 Analysis of the expression of surface ("Immunophenotype") and intracellular proteins.

5.2 Analysis of cell pigments and fluorescent proteins.

5.3 Analysis of the cell cycle and cell proliferation.

5.4 Analysis of intercellular communication and signal transduction.

5.5 Analysis of cell death: Apoptosis and necrosis.

5.6 Analysis of cell metabolism and bioenergetics.

5.7 Kinetic Analysis by Real Time Cytometry (RT-FCM)

5.8 Introduction to Nanocitometry: Analysis of microorganisms, microvesicles and exosomes.

5.9 Industrial and Environmental applications of Cytometry.

5.10 Self-assessment questionnaire.

**MODULE 6. APPLICATIONS AND TECHNIQUES OF CYTOMETRY IN DIAGNOSIS AND CLINICAL RESEARCH**

6.1. Flow cytometry in the diagnosis and monitoring of leukemia and lymphomas.

6.2 Flow Cytometry in the detection of measurable residual disease.

6.3 Flow cytometry in Non-oncological hematology

6.4 Flow cytometry in the diagnosis of immunodeficiencies

6.5 Flow cytometry in immune system dysfunctions

6.6 Flow cytometry in transplantation and transfusion.

6.7 Flow cytometry of platelet function and Hemostasis

6.8 Flow cytometry in solid tumor Oncology.

6.9 Flow cytometry in the study of circulating progenitor and tumor cells.

6.10 Self-assessment questionnaire.

**MODULE 7. PRACTICAL EXERCISES: RESOLUTION OF REAL CASES WITH LISTMODE FILES**

7.1 Guided practical exercises of panel design in Flow Cytometry.

7.2 Instructions and recommendations for the use of cytometers own software, commercial licensed software and public domain software.

7.3 Exercises for analysis of real cases optimized for resolution with cytometers own software, commercial software with use license or public domain software.