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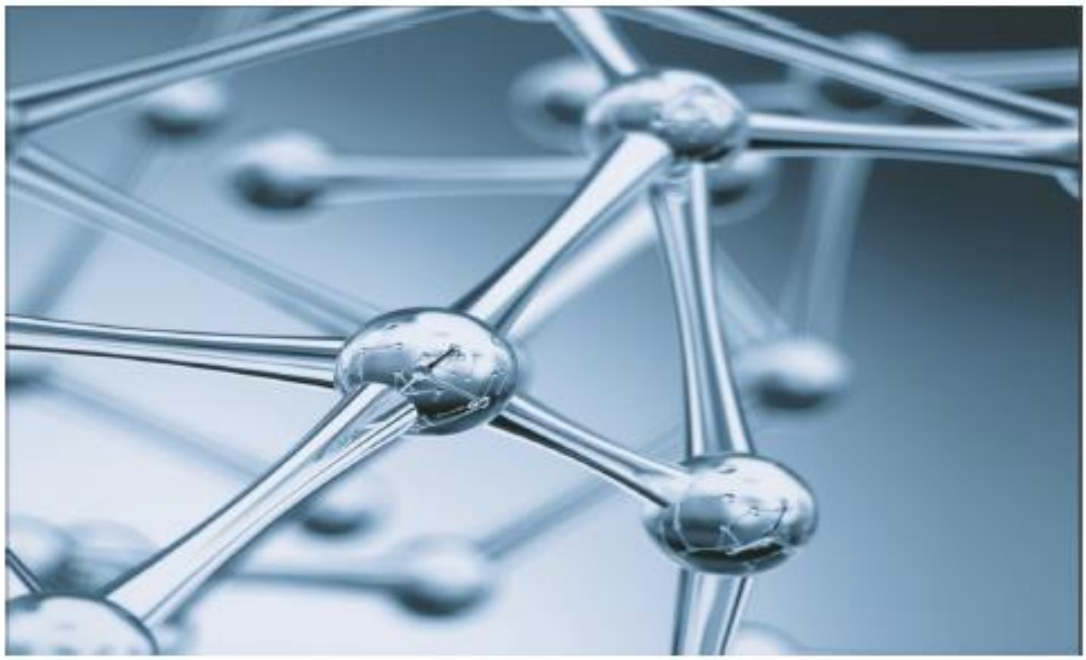

School of Medicine, National and Kapodistrian University of Athens

**I.P.S.P. "Nanomedicine"**

# Student Handbook

Athens 2025-2026

## Introduction

According to European Medicines Agency (EMA), “Nanotechnology is the use of tiny structures – less than 1,000 nanometres across – that are designed to have specific properties” and “Nanotechnology is an emerging field in science that is used in a wide range of applications, from consumer goods to health products”. Concerning medicine, Nanotechnology has so far been utilized for the improvement of certain drug molecule properties, such as their solubility and stability, altering their pharmacokinetic profile and biodistribution, but also for creating new ways to diagnose diseases, target pathological tissues and support cell and tissue regeneration. A number of nanotechnology-based medicines or nanomedicines have been approved by EMA, after recommendation from the Committee for Medicinal Products for Human Use (CHMP). Such formulations utilize the field of innovative excipients, like liposomes (e.g. Caelyx and Myocet) or are nanoparticles of previously used active substances (e.g. Abraxane and Rapamune). Nanomedicines are considered as a “multidisciplinary” subject in the EMA “human regulatory” issues.

The aim of the IPSP " "Nanomedicine" is to provide high-level post-graduate education in Nanomedicine. The IPSP leads to the award of a "Postgraduate Diploma" in Nanomedicine (MSc in Nanomedicine) after full and successful completion of curriculum-based studies.

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# Contents

## Goals and Objectives

This postgraduate program, accredited by the National and Kapodistrian University of Athens, is designed to lay the scientific and technological foundation regarding the fast-growing field of Nanomedicine. In particular, this program provides an opportunity for students to better understand concepts that deal with nanotechnology applications in drug delivery, disease diagnosis, therapy, imaging and new applications in medicine as well as in numerous techniques for the physicochemical characterization of nanoparticles, in vitro and in vivo. Knowledge acquired during the course of this MSc Program, constitutes an important qualification for graduates who aim to be involved in:

- Divisions of Production relevant to Nanotechnology
- Quality Control of Assembly Lines
- Medical Imaging
- Regenerative Medicine
- Research and Development of Nano-Pharmaceuticals
- Doctoral Degree in Nanomedicine

The teaching program ensures that graduates will gain the necessary theoretical knowledge in order to meet the increased demands both in the field of medicine and pharmacy, and thus to work independently and effectively in the field of Nanomedicine. To accomplish that, theoretical teaching courses are complemented by:

- hands-on projects, such as active participation of students in laboratory exercises, workshops and presentations of their scientific projects in meetings and conferences.
- future perspectives projects, where students investigate new frontiers opening in this field

The “Nanomedicine” program accepts graduates in the subjects of Medicine, Pharmacology, Biology, Physics, Chemistry, Engineering and other related subjects from the Greek Universities or foreign institutions (recognized by the Hellenic National Academic Recognition and Information Centre).

## Program’s Duration

Program’s duration is two (2) Academic Semesters (1 year), including the time for writing the dissertation thesis, which is equivalent to 75 ECTS credit points.

Postgraduate students are provided with the possibility of part-time attendance. Students in this category must have a proven track record of working and submitting an employment contract or an employer certificate. Full-time attendance is also provided for non-working students who are unable to meet full-time requirements for health, family, military or other. In this case, an application is made to the SIC by the interested party explaining the reasons relied on by the student and the SIC decides definitively. The duration of part-time studies cannot exceed four (4) academic semesters.
The postgraduate student with application may request a reasoned suspension of study after a report and a justification of the reasons for the request. The SIC examines the application and as long as it approves it determines the student's program. Student suspension periods cannot exceed two consecutive academic semesters and do not count towards the expected maximum duration of normal study.

## Structure and Committees

Responsible for the program's structure and operation are the following bodies:

- Special Interdepartmental Committee (SIC), consisting of 7 members, 5 members TRS and 2 representatives of postgraduate students. Regarding the members of SIC, three of them will be designated by the Medical School Meeting and 2 will be appointed by the Assembly of the Department of Pharmacy
- Coordination Committee (CC), consisting of five (5) faculty members of the collaborating institutions, who have undertaken postgraduate work and are appointed by the Special Interdepartmental Committee. Three members of the CC will come from the Medical School and two members from the Department of Pharmacy
- Director and Deputy Director of the Program

Further information regarding the personnel is available in the following sections.

## Postgraduate Student Selection

Applications of postgraduate students are evaluated based on the following criteria:

1. Obligatory qualifications (on/off criteria)
   - **1.1** Bachelor's degree in health sciences, School of Sciences or other related subjects according to SIC judgment
   - **1.2** Good knowledge (level B2) of the English language according to the Common European Framework of References for Languages

2. Additional qualifications (100 total points)

   1. The degree grade is evaluated with six (6) points per grade and a maximum of sixty (60) points.
   2. Professional experience in the field of health is evaluated with one (1) point per year of work and a maximum of five (5) points.
   3. Professional experience in the field of nanomedicine is evaluated with one (1) point per year of work and a maximum of five (5) points.
   4. The number of publications in international peer-reviewed scientific journals is evaluated with one (1) point per publication and a maximum of five (5) points.
   5. The number of presentations at scientific conferences is evaluated with one (1) point per presentation and a maximum of five (5) points.
   6. Excellent knowledge of the English language is evaluated with five (5) points.

7. Participation in educational seminars is evaluated with one (1) point per day of educational seminar and a maximum of five (5) points.
8. The motivation letter is evaluated with a maximum of ten (10) points.

Total points: 100 points

Based on the overall criteria, the Coordinating Committee draws up an Assessment Panel for postgraduate students and submits it to the Special Interdepartmental Committee for approval. Successful candidates must be register with the Program Secretariat within 10 days of SIC's decision.

## Number of Entrants and Eligibility

The number of students admitted to the IPPC will be forty (40) each academic year (as long as there are so many candidates who have the qualifications of attending the IPSP in Nanomedicine).

The IPSP accepts titles of the first cycle of studies derived from the Departments of Medicine, Pharmacy, School of Sciences and other related departments of the Greek Universities. In cases of non-governmental organizations, DOATAP recognition is obligatory.

## Study fees and the possibility of partial payment

Study fees are set at 2,000€ for the entire program. Optionally, they can be paid in 4 equal installments of 500€ each, throughout the academic year.

## Obligations to obtain Postgraduate Diploma

The Postgraduate Student is obliged to:

- successfully pass (higher or equal to 5) both the written and the oral examinations in each module
- successfully pass (higher or equal to 5) the examination of diploma thesis

Postgraduate Diploma is acquired when 75 ECTS are gathered, according to the European Credit Transfer and Accumulation System (ECTS).

| A' Semester | | |
|---|---|---|
| Lessons | Teaching Hours | ECTS |
| Basic Principles I | 13*3 weeks | 6 |
| Basic Principles II | 13*3 weeks | 6 |
| Basics of Nanomedicine | 13*3 weeks | 6 |
| Basic Applications of Nanotechnology in Therapy | 13*3 weeks | 6 |
| Theranostics and Regenerative Medicine | 13*3 weeks | 6 |
| Total | 195 | 30 |
| | | |
| B' Semester | | |
| Lessons | Teaching Hours | ECTS |
| Toxicity Aspects & Current Nanodrugs | 13*3 weeks | 5 |
| Advanced Topics | 13*3 weeks | 5 |
| Encironmental Aspects | 13*3 weeks | 5 |
| Ethics and Regulatory Aspects | 13*3 weeks | 5 |
| Dissertation | | 25 |
| Total | 156 | 45 |

## Reasons and removing process from the Program

It is possible to remove a student from the IPSP by decision of the SIC. Among the reasons for deleting a student are the following:

- Copying in examinations or in work or in solving exercises, inappropriate behavior, and other misconduct that is inconsistent with postgraduate student status.
- Using ideas, methods and results or copying part of the work of other scientists without mentioning them in their postgraduate diploma thesis or other work.
- Unsuccessful examination in more than one (1) course at the semester and unsuccessful review of a course.
- Unsuccessful examination in the postgraduate diploma thesis.
- Exceeding the period of study as set out in Article 5 of this Regulation.
- Delay for the student to pay the prescribed tuition fee within the time limits set out in this Regulation (Article 8).

Also, removal is provided if requested by the Postgraduate Student itself. In this case, the Postgraduate Student is not obliged to pay the attendance fees corresponding to the time leaves.

## Diploma Thesis

The diploma thesis starts with the beginning of the 2nd semester. The Coordinating Committee is obliged to review the request of each individual candidate, that contains:

- proposal regarding the title of the diploma thesis,
- the corresponding supervisor, related to the specific scientific field (the supervisor of postgraduate diploma thesis may be a faculty member or a researcher or a lecturer at the IPSP)
- a summary of the proposed work

After the review process is finalized, the Coordination committee appoints the supervisor and establishes the three-member committee (members of the three-member examination board may be TRS members or researchers or lecturers of the IPSP), whose task is the approval, supervision and finally grading the dissertation. In order for the dissertation thesis to be completed, each student has to put together a 20-minute-long presentation of his/her work and adequate answer to all of the questions submitted by the three-member committee. Successfully completed postgraduate diploma theses must be posted on the website of the Medical School, and more specifically to the digital repository "PERGAMOS", according to the decisions of the Senate of the University of Athens.

## Distance Learning

The educational process of the Postgraduate Program may also be organized using modern distance learning methods.

The organization of courses and other educational activities using modern distance learning methods concerns courses and educational activities that, by their nature, can be supported by the use of distance learning methods and do not involve practical, laboratory, or clinical training for students, which requires the physical presence of students.

The Digital Governance Unit of the University of Athens is responsible for supporting the distance learning process, as well as for issues related to the protection of personal data. The University of Athens maintains an electronic platform accessible to persons with disabilities, through which asynchronous distance learning services are provided. Educational material for each course may be posted on the electronic platform, which may include notes, presentations, exercises, indicative solutions to these, as well as video-recorded lectures, provided that the applicable legislation on the protection of personal data is complied with. All educational material is provided exclusively for the educational use of students and is protected by Law 2121/1993 (A' 25), provided that the relevant conditions are met.

## Curriculum

| **Courses** |
| --- |
| **Lesson 1.1. Basic Principles I**<br><br>Nanoscience and Nanotechnology are relatively young scientific and nanotechnological fields which investigate the structure, properties, morphology and functionality of nanomaterials and nanostructures. Nanotechnology is a collective term for a range of scientific fields, technologies, techniques, processes and applications that involve the treatment and the investigation of matter at nanoscale. Nanoscience and nanotechnology can offer advantages in the development process of new drugs, and they represent a new approach to research in this field. These areas offer benefits for the development of innovative products and promote new properties of the materials used, which could be essential in the effectiveness of the final product. Scientists in this field work at the atomic, molecular and supramolecular levels, and can manufacture new nanodevices and nanosystems with new properties and functions. Nanotechnology is the scientific area of the design and the development of devices at the mesoscopic and molecular scale. These systems could be correlated to the living organisms due to their self-assembly properties, their hierarchical structural organization, as well as to their biocompatibility and biodegradability characteristics.<br><br>**Lesson 1.2. Basic Principles II**<br><br>The main types of nanosystems are lipid (i.e. liposomes, trasferosomes etc.); polymeric (i.e. micelles, polymersomes etc.) and inorganic (i.e. gold nanoparticles etc.). The physicochemical characteristics of nanosystems (play a key role on administration, distribution, metabolism, and excretion (ADME profile) of the encapsulated Active Pharmaceutical Ingredients (APIs) or the imaging agent. The most important techniques including light scattering (dynamic, static, and electrophoretic), thermal analysis (especially differential scanning calorimetry), and imaging techniques are presented for the physico-chemical characterization of nanosystems. These techniques are used extensively for the detailed characterization of nanosystems, i.e. in the research and development of innovative nanocarriers, and are required from the regulatory authorities.<br><br>**Lesson 1.3. Basic Principles III**<br><br>This lesson addresses the applications of quantitative imaging to study multiple physiological variables of living tissues. Protocols are presented for investigations ranging from in vitro cell and tissue approaches to in vivo imaging of intact organs. These include the measurement of cytosolic parameters both in vitro and in vivo. Additionally, Magnetic Resonance Imaging (MRI), an imaging technique primarily used as diagnostic tool in clinical/preclinical research, will be analyzed in depth. Cell and Molecular Biology area will focus on cancer, cell biology and cellular dynamics, plant biology and bioenergetics. Experimental approaches in cell signaling and differentiation, molecular biology, |

proteomics, genomics and genetics, and advanced cell imaging are interwoven throughout these major focus areas.

**Lesson 2.1. Basics of Nanomedicine**

This lesson is an introduction in topics such as pharmacokinetics, pharmacodynamics, metabolism and absorption of nanodrugs, as well as in their role in immunology and more precisely their application in procedures regarding vaccination. Mainly this course includes information about lipid nanosystems found in modern vaccines and in polymers used in pharmaceutics. In addition to that, there is an introduction in nanomedicine and its application cosmetology, as the mechanisms that nanoparticles interact with the skin were discussed. Finally, the stability of those nanoparticle-based drugs is discussed.

**Lesson 2.2. Basic Applications of Nanotechnology in Therapy**

This lesson is dedicated to the utilization of nanotechnology into treating several types of diseases, in cardiology and pharmacology, as well as in skin diseases. Additionally, applications in radiotherapy, orthopedics and in surgery are discussed.

**Lesson 2.3. Theranostics and regenerative medicine**

Theranostics is a new field of medicine which combines specific targeted therapy based on specific targeted diagnostic tests. The theranostics paradigm involves using nanotechnology to unite/combine diagnostic and therapeutic applications to form a single nanocarrier, allowing for diagnosis, drug delivery and treatment response monitoring. Micro-nano fabrication and cell patterning, Molecular markers for medical imaging and Image processing will be analyzed for building up nanoparticle-based theranostics.

Tissue engineering evolved from the field of nanobiomaterials development and refers to the practice of combining biopolymers, scalffolds, cells, and biologically active molecules into functional tissues. The goals of tissue engineering and regenerative medicine are to assemble functional constructs that restore, maintain, or improve damaged tissues or whole organs using types of embryonic, fetal and adult stem cells.

**Lesson 3.1. Toxicity Aspects**

Nanotoxicology involves different aspects of science, from molecular biology to quantum physics and chemistry and lays the foundations for eliminating all risks related to nanoparticles manufacturing and their applications. The major obstacle associated with nanoparticles hazardous impact determination is the variety of parameters that are suspects of their adverse effects. It is widely known that nanoparticles, dosage, size, composition, aggregation, surface charge, structure and chemistry even the route of administration and the exposure duration, are the main characteristics upon which Nanotoxicity depends.

**Lesson 3.2. Current Nanodrugs**

Clinical Nanomedicine deals with the use of nanomedicines in clinical use and practice. Special attention will be given to cancer nanotherapy. There are several liposomal and

polymeric drugs in market approved by FDA and EMA. In this lesson, case studies and examples will be presented focusing on the advantages of nanocarriers in clinical use.

**Lesson 3.3. Ethics and Regulatory Aspects**

III.1. Regulatory and Ethics in Nanomedicine.

III.2 Intellectual properties. Patenting and Commercialization of Biotech and Medtech Inventions

The entire "product life cycle," from the creation of nanomedical products to their final market introduction will be discussed in the above lesson. While focusing on critical issues relevant to nanoproduct development and translational activities, it tackles topics such as regulatory science, patent law, FDA and EMA law, ethics, personalized medicine, risk analysis, toxicology, nano-characterization and commercialization activities.

**Lesson 3.4 Advanced Topics**

Applications of Neural Networks, Regression models and Classification problems are increasingly applied in Pharmacy owing to the rapid development of technology in the last 10 years. In this course an introduction in concepts like prediction, characterization and optimization of pharmaceutical formulations with artificial neural networks, as well as their applications on drug design and testing will be held. Furthermore, a concise introduction in Chaos Theory in Pharmacy will also be delivered. Namely, this topic will include details about complex and critical phenomena with application to liposomal systems, as well as pharmaceutical applications of chaos theory and fractal geometry concluding to the value and perspective of applying complexity in Pharmaceutics.

**Lesson 3.5 Environmental aspects**

Air and water pollutants including particulate matter and toxic gases, dyes, organic materials, and oil spoils, released from di]erent industrial and human activities possess threats to human health and environment crisis, globally. Nanotechnology is a promising approach to overcome all these problems due to the unique properties of nanotechnology-based nanomaterials make them appropriate for air pollution abatement. From this perspective, the possible replacement of conventional energy supplies with nano-based ones is the first topic that is going to be discussed. The second issue focuses on the eco-e]ectiveness of nanotechnology and the potential use of recycle and reuse of photocatalysts. Finally, the green synthesis of nanoparticles is another sub-unit of this lecture.

**Lesson 3.6 Ethics and regulatory aspects**

1. Regulatory and Ethics in Nanomedicine.

2. Intellectual properties. Patenting and Commercialization of Biotech and Medtech Inventions. The entire "product life cycle," from the creation of nanomedical products to their final market introduction will be discussed in the above lesson. While focusing on critical issues relevant to nanoproduct development and translational activities, it tackles topics such as regulatory science, patent law, FDA and EMA law, ethics, personalized medicine, risk analysis, toxicology, nanocharacterization and commercialization activities.

**Dissertation**

The dissertation (or final year project), is taking place after the end of the lessons and may last until mid-September. The expectation is that the student takes responsibility for his own learning and he produces a literature review, chooses a method for undertaking a study, writes up his findings and discusses the outcomes in a discussion section. The work for dissertation may be either a literature review or a small research project that lasts for two-three months. The student is being supervised by a faculty member during his work and at the end is being examined by a three-member committee.

## Academic Calendar

**Academic Calendar 2025-2026**
**Timetable for Self Study, Future Perspectives Projects and Exams**

| No. of Week | Date (from) | Date (to) | Title | Lecturer | E-mail | Identity |
|---|---|---|---|---|---|---|
| **UNIT 1: Introduction to Nanotechnology (12 ECTS)** | | | | | | |
| **Lesson 1: Basic principles I (6 ECTS)** | | | | | | |
| 1 | 13/10/2025 | 19/10/2025 | Introduction to the course and future perspectives projects | E. Efstathopoulos | stathise@med.uoa.gr; | Professor, School of Medicine, NKUA |
| | | | 1.1 Basics of Physics | E. Efstathopoulos | stathise@med.uoa.gr; | Professor, School of Medicine, NKUA |
| | | | 1.2 Basics of Chemistry | H. Iatrou | iatrou@chem.uoa.gr; | Professor, Department of Chemistry, NKUA |
| | | | 1.3 Basics of Biology | M. Gazouli, E. Katifelis | mgazouli@med.uoa.gr; e.ktor@hotmail. | Professor, School of Medicine, NKUA |
| | | | 1.4 Basics of Pharmaceutical science | C. Demetzos | demetzos@pharm.uoa.gr; | Professor, Department of Pharmacy, NKUA |
| | | | 1.5 The wider context of Nanotechnology and Nanomedicine | N. Lagopati | nefeli.lagopati@gmail.com; | Assistant Professor, School of Medicine, NKUA |
| | | | 1.5 The wider context of Nanotechnology and Nanomedicine | E. Efstathopoulos | stathise@med.uoa.gr; | Professor, School of Medicine, NKUA |
| | | | 1.6 The Fundamental Science of Nanotechnology | D. Tsoukalas | dtsouk@central.ntua.gr; | Professor, Department of Physics, NTUA |
| 2 | 20/10/2025 | 26/10/2025 | 1.7 Introduction to implementation of scientific project (structure, literature search etc) | E. Efstathopoulos - A. Ploussi | aploussi@gmail.com; | Research Fellow, School of Medicine, NKUA |
| | | | 1.8 Principles of Nanomedicine | E. Katifelis | e.ktor@hotmail.com; | Post doc Researcher, School of Medicine, NKUA |
| | | | 1.8 Principles of Nanomedicine | E. Efstathopoulos | stathise@med.uoa.gr; | Professor, School of Medicine, NKUA |
| | | | 1.9 Main types of Nanosystems | C. Demetzos | demetzos@pharm.uoa.gr; | Professor, Department of Pharmacy, NKUA |
| | | | 1.9 Main types of Nanosystems | H. Iatrou | iatrou@chem.uoa.gr; | Professor, Department of Chemistry, NKUA |
| 3 | 27/10/2025 | 02/11/2025 | 1.9 Main types of Nanosystems | A. Pippa | natpippa@pharm.uoa.gr; | Assistant Professor, Department of Pharmacy, NKUA |
| | | | 1.10.a Main types of Nanoparticles_Metallic nanoparticles | E. Spyratou | spyratouelias@gmail.com; | Post doc Researcher, Shool of Medicine, NKUA |
| | | | 1.10.b Main types of Nanoparticles_Bimetallic nanoparticles | M. Gazouli | mgazouli@med.uoa.gr; | Professor, School of Medicine, NKUA |
| | | | 1.11 Nanostructured materials | M. Gazouli | mgazouli@med.uoa.gr; | Professor, School of Medicine, NKUA |
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| **1st Meeting with Professors, Saturday 01/11/2025, 10:00-14:00**<br>**Meeting link: https://uoa.webex.com/meet/esiomou** | | | | | | |

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| **Lesson 2: Basic principles II (6 ECTS)** | | | | | | |
| 4 | 3/11/2025 | 9/11/2025 | 2.1 Physiochemical characterization techniques of nanosystems electron Microscopy | E. Spyratou | spyratouelias@gmail.com; | Post doc Researcher, Shool of Medicine, NKUA |
| | | | 2.1.a Physiochemical characterization techniques of nanosystems: Electron Microscopy | H. Iatrou | iatrou@chem.uoa.gr; | Professor, Department of Chemistry, NKUA |
| | | | 2.1.b Physiochemical characterization techniques of nanosystems: Light Scattering | A. Pippa | natpippa@pharm.uoa.gr; | Assistant Professor, Department of Pharmacy, NKUA |
| 5 | 10/11/2025 | 16/11/2025 | 2.2 Short overview of in-vivo imaging techniques: | | | |
| | | | 2.2.a Radiodiagnosis and Interventional Radiology | S. Spiliopoulos | stavspilliop@med.uoa.gr; | Professor, School of Medicine, NKUA |
| | | | 2.2.b Nuclear Medicine | S. Chatzioannou | sofiac@med.uoa.gr; | Professor, School of Medicine, NKUA |
| | | | 2.2.c Nuclear Medicine - Micro PET | A. Gaitanis | agaitanis@bioacademy.gr; | Staff Research Scientist, Clinical and Translational Research, BRFAA |
| | | | 2.2.d Physics of imaging with x-rays | E. Efstathopoulos | stathise@med.uoa.gr; | Professor, School of Medicine, NKUA |
| | | | 2.2.e Physics of Radiotherapy | E. Pantelis | vpantelis@phys.uoa.gr; | Associate Professor, School of Medicine, NKUA |
| | | | 2.2.f Imaging in interventional radiology | D. Filippiadis | dfilippiadis@med.uoa.gr; | Assistant Professor, School of Medicine, NKUA |
| | | | 2.2.g Neuroscience | G. Tsivgoulis - L. Palaiodimou | tsivgoulisgiorg@yahoo.gr;lina_palaiodi | Professor, School of Medicine, NKUA |
| | | | 2.2.h Neurosurgery | S. Sgouros | sgouros@med.uoa.gr; | Assistant Professor, School of Medicine, NKUA |
| | | | | | | |
| **2nd Meeting with Professors, Saturday 15/11/2025, 10:00-14:00<br>Meeting link: https://uoa.webex.com/meet/esiomou** | | | | | | |
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| 6 | 22/11/2025 | | Future perspectives and challenges - Students' project | E. Efstathopoulos | stathise@med.uoa.gr; | Professor, School of Medicine, NKUA |
| 7 | 29/11/2025 | | Examination of Unit 1 | | | |

| **UNIT 2: Applications of Nanotechnology in Medicine (18 ECTS)** | | | | | | |
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| **No. of Week** | **Date (from)** | **Date (to)** | **Title** | **Lecturer** | **E-mail** | **Identity** |
| | | | **Lesson 3: Basics of Nanomedicine (6 ECTS)** | | | |
| 8 | 15/12/2025 | 21/12/2025 | 3.1 Introduction to pharmacokinetics & pharmacodynamics | V.Karalis | vkaralis@pharm.uoa.gr; | Associate Professor, Department of Pharmacy, NKUA |
| | | | 3.2 Applications of nanotechnology in vaccines | N. Pippa | natpippa@pharm.uoa.gr; | Assistant Professor, School of Medicine, NKUA |
| | | | 3.3 Drug stability and principles of Pharmaceutical Technology | N. Pippa | natpippa@pharm.uoa.gr; | Assistant Professor, Department of Pharmacy, NKUA |
| | | | 3.4 Modelling and simulation in drug development and approval | V.Karalis | vkaralis@pharm.uoa.gr; | Associate Professor, Department of Pharmacy, NKUA |
| 9 | 05/01/2026 | 11/01/2026 | 3.5 Nanomolecular diagnostics and in vitro diagnostics: The Microbiology-Immunology perspective | I. Papaparaskevas | ipapapar@med.uoa.gr; | Associate Professor, School of Medicine, NKUA |
| | | | 6 Introduction to lipidic structures, liquid crystals and mRNA vaccin | C. Demetzos | demetzos@pharm.uoa.gr; | Professor, Department of Pharmacy, NKUA |
| | | | 3.7 Introductions to Polymers in Pharmaceutics | E. Iatrou | iatrou@chem.uoa.gr; | Professor, Department of Chemistry, NKUA |
| | | | 3.8 Introduction to modified release systems for drug delivery | M. Vlachou | vlachou@pharm.uoa.gr | Associate Professor, Department of Pharmacy, NKUA |
| | | | 3.9 Introduction to skin pathology and nanoparticulate's penetration mechanism | M. Rallis | rallis@pharm.uoa.gr; | Associate Professor, Department of Pharmacy, NKUA |
| | | | 3.10.a Nanovaccines - mRNA based vaccines | C. Demetzos | demetzos@pharm.uoa.gr; | Professor, Department of Pharmacy, NKUA |
| | | | 3.10.b Nanovaccines - mRNA based vaccines | S. Hatziantoniou | sohatzi@upatras.gr; | Associate Professor, School of Pharmacy, University of Patras |
| | | | 3.11 Nanomolecular diagnostics and in vitro diagnostics | M. Gazouli | mgazouli@med.uoa.gr; | Professor, School of Medicine, NKUA |
| | | | 3.12 Natural biopolymers in drug delivery | L. Tziveleka | ltziveleka@pharm.uoa.gr; | |
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| **3rd Meeting with Professors, Saturday 10/01/2026, 10:00-14:00<br>Meeting link: https://uoa.webex.com/meet/esiomou** | | | | | | |

| **3rd Meeting with Professors, Saturday 10/01/2026, 10:00-14:00<br>Meeting link: https://uoa.webex.com/meet/esiomou** | | | | | | |
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| **Lesson 4: Basic applications of nanotechnology in therapy (6 ECTS)** | | | | | | |
| 10 | 12/01/2026 | 18/01/2026 | 4.1 Applications of nanotechnology in pharmacology | C. Dalla | cdalla@med.uoa.gr; | Associate Professor of Pharmacology, Neuropsychopharmacology group Medical School, NKUA |
| | | | 4.2 Nanogels and polymeric micelles | E. Iatrou | iatrou@chem.uoa.gr; | Professor, Department of Chemistry, NKUA |
| | | | 4.3 Nanoparticulate formulations and skin diseases | M. Rallis | rallis@pharm.uoa.gr; | Associate Professor, Department of Pharmacy, NKUA |
| | | | 4.4 Introduction and applications to theranostics | D. Mouzakis | demouzakis@sse.gr; | Professor, Division of Mathematics and Engineering, Hellenic Army Academy |
| | | | 4.5 Applications of nanotechnology in biophotonic therapy | V. Kouloulias, N. Lagopati | vkouloul@ece.ntua.gr; | Professor, School of Medicine, NKUA<br>Assistant Professor, School of Medicine, NKUA |
| | | | 4.6 Applications of nanotechnology in nuclear therapy and in Radiotherapy | V. Kouloulias [1h], K. Platoni [1h] | vkouloul@ece.ntua.gr; kplatoni@med.u | Professor, School of Medicine, NKUA |
| 11 | 20/01/2025 | 26/01/2025 | 4.6.a Introduction to radiotherapy: Physicist's contribution | K. Platoni | kplatoni@med.uoa.gr; | Associate Professor, School of Medicine, NKUA |
| | | | 4.6.b Introduction to radiotherapy: Doctor's contribution | V. Kouloulias | vkouloul@ece.ntua.gr; | Professor, School of Medicine, NKUA |
| | | | 4.7 Applications of nanotechnology in Orthopaedics | O. Savvidou | olgasavvidou@gmail.com; | Professor, School of Medicine, NKUA |
| | | | 4.8 Applications of nanotechnology in Surgery | G. Theothoropoulos | georgetheors@live.com; | Professor, School of Medicine, NKUA |
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| **4th Meeting with Professors, Saturday 24/01/2026, 10:00-14:00<br>Meeting link: https://uoa.webex.com/meet/esiomou** | | | | | | |
| **Lesson 5: Theranostics and regenerative medicine (6 ECTS)** | | | | | | |
| **12** | **26/01/2026** | **01/02/2026** | 5.1 Lipidic nanocarriers: Liposomes, chimeric lipidic nanoparticles and stimuli responsive | **C. Demetzos** | demetzos@pharm.uoa.gr; | Professor, Department of Pharmacy, NKUA |
| | | | 5.2 Physical properties of stimuli responsive biomaterials | **D. Mouzakis** | dmouzakis@sse.gr; | Professor, Division of Mathematics and Engineering, Hellenic Army Academy |
| | | | 5.3.a Smart biomaterials | **D. Mouzakis** | dmouzakis@sse.gr; | Professor, Division of Mathematics and Engineering, Hellenic Army Academy |
| | | | 5.3.b Smart biomaterials | **E. Iatrou** | iatrou@chem.uoa.gr; | Professor, Department of Chemistry, NKUA |
| | | | 5.4 Biosensors, nanocrystals, quantum dots, magnetic nanoparticles II (applications) | **D. Mouzakis** | dmouzakis@sse.gr; | Professor, Division of Mathematics and Engineering, Hellenic Army Academy |
| **13** | **02/02/2026** | **08/02/2026** | 5.5 Application of smart biomaterials in regenerative medicine. Types of embryonic, fetal and adult stem cells | **M. Roubelaki** | roubel@med.uoa.gr; | Associate Professor, School of Medicine, NKUA |
| | | | 5.6 Implementation of M.Sc. Thesis | **G. Mastorakos** | mastorakg@gmail.com; | Professor, School of Medicine, NKUA |
| | | | | **N. Drakoulis** | drakoulis@pharm.uoa.gr; | Associate Professor, Department of Pharmacy, NKUA |
| | | | | **Th. Papaioannou** | thepap@med.uoa.gr; | Professor, School of Medicine, NKUA |
| | | | 5.7 Applications of Nanotechnology in interventional radiology | **S. Spiliopoulos** | stavspilliop@med.uoa.gr; | Assistant Professor, School of Medicine, NKUA |
| | | | 5.8 Nanobubbles | **M. Vavouranakis** | vavouran@otenet.gr; | Assistant Professor, School of Medicine, NKUA |
| | | | | | | |
| **5th Meeting with Professors, Saturday 07/02/2026, 10:00-14:00<br>Meeting link: https://uoa.webex.com/meet/esiomou** | | | | | | |
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| **14** | **21/02/2026** | | **Future perspectives and challenges - Students' project** | **C. Demetzos** | demetzos@pharm.uoa.gr; | Professor, Department of Pharmacy, NKUA |
| **15** | **22/02/2026** | | **Examination of Unit 2** | | | |

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| **UNIT 3: Nano-toxicity and Regulatory aspects (20 ECTS)** | | | | | | |
| **Lesson 6: Toxicity aspects & Current Nanodrugs (5 ECTS)** | | | | | | |
| **16** | **02/03/2026** | **08/03/2026** | 6.1 Potential cause of nanotoxicity | **M. Rallis** | rallis@pharm.uoa.gr; | Associate Professor, Department of Pharmacy, NKUA |
| | | | 6.2 Interaction of nanoparticles | **M. Gazouli** | mgazouli@med.uoa.gr; | Professor, School of Medicine, NKUA |
| | | | 6.3 Distribution of nanoparticles (different organs and the role of physiochemical characteristics) | **M. Gazouli** | mgazouli@med.uoa.gr; | Professor, School of Medicine, NKUA |
| | | | 6.4 Toxicity studies | **E. Katifelis** | e.ktor@hotmail.com; | Post doc Researcher, Shool of Medicine, NKUA |
| | | | 6.5 Nanoparticles and Human Body | **E. Katifelis** | e.ktor@hotmail.com; | Post doc Researcher, Shool of Medicine, NKUA |
| **17** | **09/03/2026** | **15/03/2026** | 6.6 Nanodrugs in clinical practice | **N. Pippa** | nstpippa@pharm.uoa.gr; | Professor, Department of Pharmacy, NKUA<br>Επίκουρη Καθηγήτρια, Τμήμα Φαρμακευτικής, ΕΚΠΑ |
| | | | 6.7 Advanced nanoparticle systems | **P.Bouziotі** | bouziotі@rrp.demokritos.gr; | Research Director at the Institute of Nuclear and Radiological Sciences & Technology, Energy & Safety (INRASTES) of the National Center for Scientific Research "Demokritos" |
| **Lesson 7: Advanced topics (5 ECTS)** | | | | | | |
| **18** | **16/03/2026** | **22/03/2026** | 7.1 AI in nanomedicine | | | |
| | | | 7.2 AI motives (image analysis, volatile analysis) | **N. Lagopati** | nefeli.lagopati@gmail.com; | |
| | | | 7.3 3D printing and bionanomimetics | **N. Lagopati** | nefeli.lagopati@gmail.com; | |
| | | | 7.4 Neural Networks and Complexity | **Michael Chanias** | mhanias@physics.ihu.gr | Αναπλ. Καθηγητής, Τμήμα Φυσικής, Διεθνές Ελληνικό Πανεπιστήμιο |
| | | | 7.5 Application of chaos theory in pharmacy | **Stavros Stavrinides** | s.stavrinides@ihu.edu.gr | Καθηγητής, Τμήμα Φυσικής, Διεθνές Ελληνικό Πανεπιστήμιο |
| | | | | | | |
| **Lesson 8: Enviromental aspects** | | | | | | |
| **19** | **23/03/2026** | **29/03/2026** | 8.1 Anti-polution technologies | **N. Lagopati** | nefeli.lagopati@gmail.com; | |
| | | | 8.2 Nanoenergy fingerprinting | **N. Lagopati** | nefeli.lagopati@gmail.com; | |
| | | | | | | |
| **Lesson 9: Ethics and regulatory aspects (5 ECTS)** | | | | | | |
| **19** | **23/03/2026** | **29/03/2026** | 9.1Nanomaterials and Manufacturing: framing the ethical issues | **D. Mouzakis** | dmouzakis@sse.gr; | Professor, Division of Mathematics and Engineering, Hellenic Army Academy |
| | | | 9.2 Regulatory issues of nanomedicines and nanocosmetics & applications of nanotechnology in cosmeotology | **C. Gardikis** | c.gardikis@gmail.com | Research And Development Director at APIVITA SA |
| **6th Meeting with Professors, Saturday 04/04/2026, 10:00-14:00** | | | | | | |

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| **6th Meeting with Professors, Saturday 04/04/2026, 10:00-14:00<br>Meeting link: https://uoa.webex.com/meet/esiomou** | | | | | | |
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| **20** | **18/04/2026** | | **Future perspectives and challenges - Students' project** | **M. Gazouli** | mgazouli@med.uoa.gr; | Professor, School of Medicine, NKUA |
| **21** | **19/04/2026** | | **Examination of Unit 3** | | | |
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| **22** | **23/05/2026** | | Presentation of Dissertation Protocols (students' presentations) | **C. Demetzos, M. Gazouli** | | |
| | **24/05/2026** | | Presentation of Dissertation Protocols (students' presentations) | **C. Demetzos, M. Gazouli** | | |
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| **Dissertation Thesis (25 ECTS)** | | | | | | |
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| **23** | **05/09/2026** | | **Repeat Examination** | | | |

## Learning Outcomes

The learning outcomes of the MSc in Nanomedicine are described by specific knowledge, skills and competences. More specifically, the curriculum of the MSc in Nanomedicine aims to provide advanced knowledge in the developing field of nanotechnology applications in medicine, with the aim of providing a critical understanding of the basic theories and principles. Indicatively, the skills expected to be acquired by students include the ability to evaluate the application of different types of nanoparticles in various medical specialties as well as the ability to interpret the legislative and ethical framework related to the use of nanoparticles in medicine.

In summary, upon successful completion of the MSc in Nanomedicine, students will be able to

- have an understanding of the role of key scientific fields (i.e. physics, chemistry, biology, etc.) in the development of nanomedicine,
- have an understanding of the basic types of nanoparticles and nanosystems, and the physicochemical mechanisms underlying them,
- have the ability to understand the application of different types of nanoparticles and nanosystems in different medical disciplines,
- have an understanding of the basic principles of imaging techniques used in modern medicine and the corresponding applications of nanoparticles,
- have an understanding of concepts such as pharmacokinetics, pharmacodynamics and how drug stability is achieved,
- have become familiar with nanoparticles contribution in the synthesis of mRNA vaccines,
- have an understanding of the importance of the term nanotoxicity and the causes of it,
- have knowledge of the legal and ethical framework governing the use of nanotechnology in medical techniques.

## Evaluation of the courses and teachers by postgraduate students

At the end of each semester, postgraduate students evaluate each lesson and each teacher based on an appropriate questionnaire/form. The relevant form covers topics such as the content of the courses, the relationship between teachers and students, the evaluation of the projects completed, the way of teaching and learning results, as well as other parameters. The teacher's evaluation by the postgraduate students is based on the criteria of their knowledge and their teaching ability, their preparation, the use of the most up-to-date bibliography, their willingness to answer questions, timely grating and return of papers and written examinations, and observance of course hours. Teachers' assessment by postgraduate students is carried out under the responsibility of the IPSP Secretariat and the completed anonymous forms are stamped in a special envelope. The analysis of the evaluation forms with the observations of the postgraduate students and the comparative tables are also prepared under the responsibility of the Secretariat. The tables prepared are handed over to the SIC and to the Director of the IPSP. The Director of the IPSP informs each teacher about the outcome of the evaluation process, and changes are taken place when its needed.

## Supporting documents and grant award procedure

The SIC decides to award scholarships to Postgraduate Students according to the available scholarship funds and grants scholarships with the criteria mentioned above for the selection of PS candidates or for their postgraduate studies.

## Human Resources

**Director of IPSP Nanomedicine**

**Efstathios Efstathopoulos**, Professor, Medical Physics,
2nd Dept. of Radiology, Medical School, National and Kapodistrian University of Athens
Hellenic Society of Nanotechnoloy in Health Sciences (HsnanoHS), Founding member, President
Hellenic Chess Federation, President

**Deputy Director of IPSP Nanomedicine**

**Constantinos Demetzos**, Professor, Pharmaceutical Nanotechnology
Director in the Laboratory of Pharmaceutical Technology, Faculty of Pharmacy, National and Kapodistrian University of Athens
Hellenic Pharmaceutical Society (HPS), President

## Instructors

### A

### B

**Bouzioti Pinelopi**, Director of Research, National Centre for Scientific Research "DEMOKRITOS"

### C

**Chatziioannou Sofia**, Professor, School of Medicine, NKUA
**Chanias Michael,** Professor, Department of Physics, International University of Greece

### D

**Dalla Christina,** Professor, School of Medicine, NKUA
**Demetzos Constantinos**, Professor, Faculty of Pharmacy, NKUA
**Dokoumetzidis Aristidis**, Assoc. Professor, Faculty of Pharmacy, NKUA
**Drakoulis Nikolaos**, Assoc. Professor, Faculty of Pharmacy, NKUA

## E

**Efstathopoulos Efstathios**, Professor, School of Medicine, NKUA

## F

**Filippiadis Dimitrios**, Assoc. Professor, School of Medicine, NKUA

## G

**Gazouli Maria**, Professor, School of Medicine, NKUA
**Gaitanis Anastasios**, Staff Research Scientist (PhD), BRFAA
**Gardikis Constantinos**, Director of Research and Development (PhD) , APIVITA

## H

**Hatziantoniou Sofia**, Associate Professor of Pharmaceutical Technology, Department of Pharmacy, School of Health Sciences University of Patras

## I

**Iatrou Hermis**, Professor, Faculty of Chemistry, NKUA

## K

**Karalis Evangelos**, Assoc. Professor, Faculty of Pharmacy, NKUA
**Katifelis Ektoras**, Postdoctoral Researcher, School of Medicine, NKUA
**Kouloulias Vasilios**, Professor, School of Medicine, NKUA

## L

**Lagopati Nefeli**, Assist. Professor, School of Medicine, NKUA

## M

**Mastorakos Georgios**, Professor, School of Medicine, NKUA
**Mouzakis Dionisios**, Professor, Department of Military Sciences Sector of Mathematics and Engineering Applications, Hellenic Army Academy

## P

**Palaiodimou Lina,** Medical Doctor, Department of Neurology II, Attikon University Hospital.
**Pantelis Evangelos**, Assoc. Professor, School of Medicine, NKUA
**Papaioannou Theodoros**, Professor, School of Medicine, NKUA
**Papaparaskevas Joseph**, Assoc. Professor, School of Medicine, NKUA

**Pippa Natassa**, Assist. Professor, Faculty of Pharmacy, NKUA
**Platoni Kalliopi**, Assoc. Professor, School of Medicine, NKUA
**Ploussi Agapi**, Researcher (PhD), School of Medicine, NKUA

## R

**Rallis Michael**, Assoc. Professor, Faculty of Pharmacy, NKUA
**Roubelaki Maria**, Assoc. Professor, School of Medicine, NKUA

## S

**Savvidou Olga**, Assoc. Professor, School of Medicine, NKUA
**Sgouros Spyros**, Assist. Professor, School of Medicine, NKUA
**Spiliopoulos Stavros**, Assist. Professor, School of Medicine, NKUA
**Spyratou Ellas**, Postdoctoral Fellow, School of Medicine, DUT
**Stavrinides Stavros,** Professor, Department of Physics, International University of Greece

## T

**Theodoropoulos George,** Professor, School of Medicine, NKUA
**Tsivgoulis Georgios**, Professor, School of Medicine, NKUA
**Tsoukalas Dimitrios**, Professor, Faculty of Physics, Scool of Applied Mathematical and Physical Sciences, NTUA
**Tziveleka Leto**, Postdoctoral Fellow, Faculty of Pharmacy, NKUA

## V

**Vavouranakis Emmanouil**, Assoc. Professor, School of Medicine, NKUA
**Vlachou Marilena**, Assoc. Professor, Faculty of Pharmacy, NKUA