



UNIVERSITY OF  
**PATRAS**  
ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΑΤΡΩΝ

DEPARTMENT OF PHARMACY

SCHOOL OF HEALTH SCIENCES

UNIVERSITY OF PATRAS  
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POSTGRADUATE PROGRAM: **NANOMEDICINES FOR DRUG DELIVERY- NANOMED (EMJMD)**

COURSE TITLE: **BASIC NANOMEDICINES**  
CODE: **HG4\_NM6**

**NANOMEDICINES FOR DRUG DELIVERY- NANOMED (EMJMD)**  
**COURSE OUTLINE**

**1. GENERAL**

<b>SCHOOL</b>	HEALTH SCIENCES		
<b>ACADEMIC UNIT</b>	DEPARTMENT OF PHARMACY		
<b>PARTICIPATING INSTITUTIONS</b>	-		
<b>TITLE of POSTGRADUATE PROGRAM</b>	NANOMEDICINES FOR DRUG DELIVERY- NANOMED (EMJMD)		
<b>LEVEL</b>	POSTGRADUATE		
<b>COURSE CODE</b>	HG4_NM6	<b>SEMESTER</b>	B'
<b>COURSE TITLE</b>	BASIC NANOMEDICINES		
<b>INDEPENDENT TEACHING ACTIVITIES</b>	<b>WEEKLY TEACHING HOURS</b>	<b>CREDITS</b>	
Courses and Practical's	4	6	
<b>COURSE TYPE</b>	Specialized general knowledge (Nanotechnologies for drug delivery and Targeting, Applications of Nanotechnologies for Drug Delivery), Skills Development.		
<b>PREREQUISITE COURSES</b>	None		
<b>LANGUAGE of INSTRUCTION and EXAMINATIONS</b>	ENGLISH		
<b>COURSE OFFERED to ERASMUS STUDENTS</b>	THIS IS ALREADY AN EMJMD PROGRAM COURSE		
<b>COURSSE (URL)</b>	<a href="https://www.pharmacy.upatras.gr/images/DS/NanoMed/HG4_NM06.pdf">https://www.pharmacy.upatras.gr/images/DS/NanoMed/HG4_NM06.pdf</a>		

**2. LEARNING OUTCOMES**

<b>Learning Outcomes</b>
<p>Upon successful course completion, students will acquire knowledge, skills and abilities related to level 7 of the European Qualifications Framework for Lifelong Learning.</p> <p>In particular, students will:</p> <ol style="list-style-type: none"> <li>1. understand the strategy and logic of applying Nanotechnology for formation of Nanoparticulate drug delivery systems/carriers</li> <li>2. understand the specific requirements in terms of biocompatibility of Nanomedicines</li> <li>3. have been introduced to the techniques and methodology for development of different types of Nanomedicines</li> <li>4. have understood the differences between nanomedicine types and the requirements depending on the specific therapeutic or theragnostic or diagnostic application.</li> <li>5. Have been familiarized with the concept and strategies of drug Targeting (passive/active) by using na-</li> </ol>

nomedicines

6. Have been familiarized with methods to prepare nanomedicines, characterize them and evaluate their performance by in vitro methods

### General Competences

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Working independently
- Team Work
- Decision-making
- Working in an international environment
- Working in an interdisciplinary environment
- Production of free, creative and inductive thinking
- Adapting to new situations

### 3. SYLLABUS

#### LECTURES

1. Introduction to "Basic nanomedicine" –Types and properties of Nanocarriers
2. Introduction to nanomedicine/ Implication of Nanosize on biocompatibility/cytotoxicity
3. Characterisation of nanocarriers – Requirements for applications in Therapeutics
4. Nanomedicine for Anti-infectious therapy. The case of Liposomes
5. Zeta sizer: Malvern formation/demonstration
6. Phytodrug delivery systems
7. Hybrid Nanomedicines for special applications Attachement /Intergration of Nanomedicines on surfaces, Medical devices, Biomaterials
8. Nanoparticles and Formulation of proteins –What are the advantages?
9. Liposomes (preparation and drug loading methods)
10. Polymeriv NP (Preparation and drug loading methods)
11. Liposome applications for Drug Delivery
12. Nanocrystals for Drug Delivery – Applications for oral delivery
13. In vitro methods to evaluate nanomedicine activity (cell culture models, monolayers, FACS, Confocal microscopy etc.)
14. Morphological assessment methods of nanomedicines
15. Nanomedicines and Vaginal route –Liposomes, Other types
16. Nanomedicines and Pulmonary route- Liposomes, Other Types
17. Nanomedicines and Ocular delivery – Liposomes, Other Types
18. Administration of nanoparticles to the skin
19. Nanomedicines and Localized delivery
20. Current Naonamedicine Products – Bottlenecks in the field – Room for Innovations
21. Liposomes for Nucleic acid Delivery
22. Developpment and optimisation of non viral carriers for gene therapy
23. Polymers for nanocarriers design
24. Production of nanoparticles by supercritical fluids
25. Protein corona: opportunities and challenges for nanomedicine design
26. Nanomedecine in inflammatory diseases
27. Nanomedicines for Pain management
28. Nanomedicines for Cancer
29. Regulatory requirements for the registration of medicinal products: procedures and CTD for marketing authorization

Practical courses on Liposomes, nanoparticles, nanoemulsion preparation, characterization and in

vitro evaluation (integrity, drug release kinetics, size distribution, zeta potential).

Practical Courses:

- Liposomes preparation and characterization (size and zeta potential) 1
- Liposomes preparation and characterization (size and zeta potential) 2
  
- Nanoemulsion preparation and characterization (group 1)
- Nanoemulsion preparation and characterization (group 2)
  
- Microemulsion/Nanoemulsion preparation and characterization group 1
- Microemulsion/Nanoemulsion preparation and characterization group 2
  
- Stability test nanosizer group 1
- Stability test nanosizer group 2

**PUBLIC PRESENTATIONS**

Oral presentation on practicals

#### 4. TEACHING and LEARNING METHODS - EVALUATION

<b>DELIVERY</b>	Face to face	
<b>USE of INFORMATION and COMMUNICATIONS TECHNOLOGY</b>	<ul style="list-style-type: none"> <li>• Use of ICT - e-class platform</li> <li>• Communication with students</li> </ul>	
<b>TEACHING METHODS</b>	<p><b>Activity</b></p> <p>Lectures</p> <p>Presentations of Practical</p> <p>Practical Courses</p> <p>Self Study</p> <p><b>Course Total</b> <b>(25 hours of work-load per ECTS credit)</b></p>	<p><b>Semester Workload</b></p> <p>65</p> <p>20</p> <p>20</p> <p>45</p> <p><b>150</b></p>
	<p>Language of Evaluation: English</p> <p>Written exams</p> <ul style="list-style-type: none"> <li>• Multiple choice questionnaires, Short answer questions, Open ended questions (70% of final grade)</li> </ul> <p>Public Presentation</p> <ul style="list-style-type: none"> <li>• Presentation of a Case study (English) (30% of final grade)</li> </ul>	

#### 5. RECOMMENDED BIBLIOGRAPHY

***Suggested Bibliography:***

1. Nanomedicine for the Treatment of Disease: From Concept to Application. (2019). United States: Apple Academic Press.
2. Advances and Challenges in Nanomedicine. (2019). (n.p.): Frontiers Media SA.
3. Nanomedicine for Bioactives: Healthcare Applications. (2020). Singapore: Springer Nature Singapore.
4. Igarashi, E. (2018). Nanomedicines and Nanoproducts: Applications, Disposition, and Toxicology in the Human Body. United States: CRC Press.
5. Gregoriadis, G. (2018). Liposome Technology: Volume III: Targeted Drug Delivery and Biological Interaction. United Kingdom: CRC Press.
6. Liposomes: Methods and Protocols. (2023). Germany: SPRINGER-VERLAG NEW YORK.
7. Liposomes in Drug Delivery: What, Where, How and When to Deliver. (2024). United Kingdom: Elsevier Science.
8. Grumezescu, A. M. (2019). Nanomaterials for Drug Delivery and Therapy. Netherlands: Elsevier Science.

***Related Academic Journals:***

Nature Nanotechnology  
J, Controlled Release  
ACS Nano  
Inter. J. Pharmaceutics  
J. Pharm. Sciences  
J. Liposome Research  
Nanomedicine  
Int. J. Nanomedicines  
Pharmaceutics