



## ЦЕНТЪР ЗА ОБУЧЕНИЕ – БАН

1000 София  
ул. „Сердика“ № 4  
<http://edu.bas.bg>

email: [tdc-phd@cu.bas.bg](mailto:tdc-phd@cu.bas.bg)  
тел.: 02 987 31 67  
02 979 52 60

### Basic Information:

Course Title: **Micro- and nanofibrous polymer materials – preparation by electrospinning, characterization and applications**

Lecturer: Assoc. Prof. Mariya Spasova, PhD

Phone: 02 979 3468

Email: [mspasova@polymer.bas.bg](mailto:mspasova@polymer.bas.bg)

Total Teaching Hours: 30 lecture hours

### Annotation (up to 150 words)

The aim of the course is to present the production and characterization of micro- and nanofibrous polymer materials using the cutting-edge electrospinning technology. Special attention is paid to the enormous possibilities for diverse applications of electrospun polymeric materials in various fields – as efficient filtration devices, non-traumatic wound dressings, drug delivery carriers, scaffolds for tissue regeneration that mimic the extracellular matrix of natural tissues and organs; as well as in the manufacture of protective military clothing, cosmetics, nanosensors, and electronics.

The course is intended for training PhD students in professional field 4.2. Chemical Sciences (Polymers and Polymeric Materials). However, due to its interdisciplinarity, it is also suitable for undergraduate and graduate students, PhD students, postdoctoral researchers, and young scientists working in the fields of (bio)polymers, materials science, engineering sciences, chemical technologies, medicine, pharmacy, biotechnology, ecology, biophysics, and related areas. Since the transfer of the technology from laboratory to industrial can easily be carried out, the course is also of interest to industry specialists and managers.

### Course content (brief description by topics or modules)

#### Module 1. Electrospinning

Section 1. Basic concepts, conditions, and equipment for electrospinning.

Section 2. Methods for characterization of micro- and nanofibers.

#### Module 2. Micro- and nanofibrous materials from synthetic and natural polymers

Section 1. Preparation, properties, and potential applications of micro- and nanofibrous materials from synthetic (non-ionic) polymers.

Section 2. Preparation, properties, and potential applications of micro- and nanofibrous materials from natural polymers.

#### Module 3. Hybrid micro- and nanostructured materials

Section 1. Preparation, properties, and potential applications of hybrid micro- and nanostructured materials.

### Teaching and assessment methods

Teaching – lecture presentations.

Assessment – presentation on a selected topic and an oral examination.

### Competencies acquired as a result of training (3–5 points)



## **ЦЕНТЪР ЗА ОБУЧЕНИЕ – БАН**

1000 София  
ул. „Сердика“ № 4  
<http://edu.bas.bg>

*email:* [tdc-phd@cu.bas.bg](mailto:tdc-phd@cu.bas.bg)  
*тел.:* 02 987 31 67  
02 979 52 60

- 
1. Acquisition of knowledge on electrospinning as a modern method for producing polymer fibrous materials – basic concepts, process parameters, types of equipment, and collectors.
  2. Acquisition of knowledge on methods for characterization of electrospun materials – SEM, XPS, XRD, contact angle measurements, mechanical testing, etc.
  3. Acquisition of knowledge on the preparation, properties, and potential applications of fibrous materials from synthetic (non-ionic) polymers and biodegradable aliphatic polyesters.
  4. Acquisition of knowledge on the preparation, properties, and potential applications of hybrid fibrous polymer materials.

### **Literature:**

1. A. L. Andradý, Science and Technology of Polymer Nanofibers, Wiley, 2008.
2. Nanofibers: Fabrication, Performance, and Applications, Editor: W. N. Chang, ISBN 978-1-60741-947-1, © 2009 Nova Science Publishers, Inc.
3. Chapter "N-Carboxyethylchitosan-Based Polymer Materials", Dilyana Paneva, Rosica Mincheva, Elena Yancheva, Nevena Manolova, Olya Stoilova, Philippe Dubois, Iliya Rashkov, in Chitosan: Manufacture, Properties, and Usage, Editor: Samuel P. Davis, 2011.