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**COURSE: ORGANIC CHEMISTRY APPLIED TO BIOLOGICAL PROCESSES**

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**ACADEMIC YEAR: 2017-2018**

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**TYPE OF EDUCATIONAL ACTIVITY: : free choice**

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**TEACHER: Prof. Brigida Bochicchio**

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phone: 0971-205481

mobile (optional):

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Language: Italian (English on request)

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ECTS: **6** ( lessons and  
tutorials/practice)n. of hours: **48** (lessons and  
tutorials/practice)Campus: **Potenza**  
Dept./School: **Department of  
Sciences**  
Program: **Pharmacy (LM-13)**Semester: **II nd**

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**EDUCATIONAL GOALS AND EXPECTED LEARNING OUTCOMES**

The main object of the course is to interpret the main biological and biochemical processes in terms of organic chemistry. The course is mainly focused on the comprehension of the mechanism of action of enzymes.

After having completed the course, the student should:

- 1) Demonstrate knowledge of mechanism of action of main enzymes;
  - 2) Visualize of mechanism of action of main enzymes and their 3D structure through software;
  - 3) Articulate scientific information through oral communication;
  - 4) Articulate scientific information through written communication.
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**PRE-REQUIREMENTS**

Students should have good knowledge of the basic principles of Organic Chemistry.

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**SYLLABUS**

1. **Introduction to Bioorganic chemistry.** Electrostatic and hydrophobic forces in proteins: **5 hours.**
  2. **Introduction to Enzyme chemistry.** Proximity Effects in Organic Chemistry; Molecular Recognition and the Supramolecular Level Enzyme Chemistry. Introduction to Catalysis. Introduction to Enzymes. Multifunctional Catalysis and Simple Models. **2 hours**
  3. **Bioorganic Chemistry of amino acids and polypeptides.** Chemistry of the living cells; Analogy between Organic Reactions and Biochemical Transformations, Chemistry of the Peptide Bond; Natural alpha-aminoacids: structure, reactivity, chirality. Asymmetric Synthesis of alpha-aminoacids. Merrifield's synthesis of peptides; Ribosomal and non-ribosomal Peptide bond formation;; Primary, Secondary, Tertiary, Quaternary structure of Polypeptides and Protein. **21 hours**
  4. **Spectroscopic techniques and secondary structure of Polypeptides and Proteins;** CD, FT-IR and the molecular Dynamics Simulations as useful tools to investigate the conformational space of polypeptides. **5 hours.**
  5. **Serin Proteases.** Mechanism of action of alpha-chymotrypsin. **3 hours.**
  6. **Metallo-enzymes.** Metal Ions in Proteins and Biological Molecules: Carboxypeptidase A and the role of Zinc. Carbonic-anhydrase. **3 hours.**
  7. **The Bioisosters.** Molecular Adaptation, Molecular Recognition and Drug Design. Agonist, antagonist, antimetabolites. Examples. **2 hours.**
  8. **Bioorganic Chemistry of Phosphate applied to the study of the polynucleotides and of ribonuclease A enzyme.** The mechanism of action of ribonucleaseA enzyme: Basic Considerations; Energy Storage; Hydrolytic Pathways and Pseudorotation.. **5 hours.**
  9. **Carbohydrates applied to the study of lysozyme.** Carbohydrates: structure, reactivity, chirality. **1 hour**
  10. **Hydrolytic Enzymes:** mechanism of action of lysozyme. **1 hour**
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**TEACHING METHODS**

Theoretical lessons. Classroom tutorials, Technical visits of pharmaceutical companies (if possible).

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**EVALUATION METHODS**

The aim of the final examination is to evaluate the level of achievement of the educational goals.

The final examination consists of an oral examination starting with a subject of student choice.

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TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL

-Hermann Dugas, Bioorganic Chemistry, Springer.

-A. Liljas, L. Liljas, J. Piskur, G. Lindblom, P. Nissen, M. Kieldgaard. Textbook on structural biology. World Scientific.

-Original Scientific Papers

-Teacher's Notes Course slides will be available from a shared folder, whose link will be furnished to the students attending the classroom.

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INTERACTION WITH STUDENTS

At the beginning of the course the teacher will describe the educational goals, the syllabus and the examination methods to the students and ask for the institutional e-mails of the attending students. All course information will be sent only to **institutional** e-mail addresses provided by students.

Office hour: on Wednesday and Thursday from 16.00 to 17.00; alternatively, by email appointment

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EXAMINATION SESSIONS (FORECAST)<sup>1</sup>

*05/02/2018; 12/03/2018; 18/06/2018; 16/07/2018; 17/09/2018; 15/10/2018;12/11/2018*

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SEMINARS BY EXTERNAL EXPERTS    YES x    NO

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FURTHER INFORMATION

Students are strongly encouraged to attend all lessons.

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<sup>1</sup>Subject to possible changes: check the web site of the Teacher or the Department/School for updates.