**ROMANIAN ACADEMY - SCOSAAR**

**DOCTORAL SCHOOL OF LIFE SCIENCES**

**COURSE OUTLINE**

**Discipline Title: *Bioinformatics and Biocomputing in Biological Research at Molecular Level***

**Course coordinator: *Andre-Jose Petrescu***

Academic year: I

|  |  |  |
| --- | --- | --- |
| **Hours per week/Evaluation/Credits** | | |
| **Course/Lab** | **Evaluation method** | **Credits** |
| 4(3/1) | Exam | 15 |

1. **DISCIPLINE OBJECTIVES** (in terms of skills):

|  |  |
| --- | --- |
| Overall Objective | * Developing abilities in handling bioinformatics and biocomputing methods useful in molecular life science research. |
| Obiectivele specifice: | * Developing abilities in handling IT platforms useful in biomedicine * Developing abilities in handling algorithms for the description of molecular biosystems based on deeper physicochemical insights * Developing abilities in modeling biological systems * Skills in integrating modeling with experimental research |

1. **INFRASTRUCTURE**

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| Course location | * + **Lecture/seminar halls, labs** |

1. **SPECIFIC SKILLS**

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| Profesional skills | * In Data Base handling and development * In using Bioinformatics techniques * In modeling biological sistems at molecular level |
| Cross skills | * Using predictive techniques for biomolecular research * Integrating modeling with experiment in molecular life science |

1. **DISCIPLIE CURRICULUM**

***a) Course***

|  |  |  |  |
| --- | --- | --- | --- |
| **Chapter** | **Content** | | **Nr. hours** |
| 1. Biologycal system organisation at molecular level | Compositional, structural and processual complexity in biological systems at molecular level | | 3 |
| 2. Handling and analysis of modern biological data massives | IT representation, management and analysis of 'omics' data | | 4 |
| 3. Physicochemical models of biological systems at molecular level | The physicochemical descrition of biomolecular systems | | 3 |
| 4. Computational assisted biomolecular research | Prediction-validation techniques in biological system research at molecular level | | 4 |
|  | | **Total hours** | **14** |

***b) Labs***

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| **Chapter** | **Content** | | **Nr. hours** |
| 1. Lab 1 | IT operating and programming platforms used in bioinformatics and biocomputing | | 6 |
| 2. Lab 2 | Bioinformatics techniques. | | 2 |
| 3. Lab 3 | Molecular modeling techniques. | | 3 |
| 4. Lab 4 | Molecular simulation techniques. | | 3 |
|  | | **Total hours** | **14** |

1. **EVALUATION**

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| --- | --- | --- | --- |
| **Activity** | **Evaluation criteria** | **evaluation method** | **final mark share** |
| Course/Seminar  Laborator | - Level of concept understanding and handling  - Problem solving skills | Oral Exam  Validation | 50%  50% |
| Evaluation results will be given in marks from 1 to 10. Marks from 6 to 10 will allow the PhD Student to pass and obtain the credits | | | |

1. **COURSE METHODOLOGY**

A more self-actualization, experience-gaining, problem-solving adult oriented education approach combined with structured dialogue & hands-on materials.

1. **CURRICULUM COMPLIANCE TO THE SOCIETAL NEEDS & EXPECTAIONS**

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| * The curriculum develops abilities in the management, handling and analysis of data massives required by modern biomedicine & bioeconomy. * The curriculum hands basic knowledge in computational assisted research of biological systems at molecular level. |

1. **REFERENCES**

Shaik NA, Hakeem KR, Banaganapalli B, Elango R (eds)

***Essentials of Bioinformatics*** Vol. 1, 2, 3 - Springer Nature Switzerland AG, 2019

ISBN 978-3-030-02633-2, 978-3-030-18374-5, 978-3-030-19317-1

Momand J, McCurdy A.

***Concepts in Bioinformatics and Genomics*** - Oxford University Press, 2017

ISBN 9780199936991

Bassi S.

***Python for bioinformatics*** - Boca Raton CRC Press, 2017

ISBN 9781138094376

Bourne PE, Helge W (eds)

***Structural bioinformatics***, Willey-Liss, 2003

ISBN 0-471-20200-2

Schwede T, Peitsch MC. (eds)

***Computational Structural Biology: Methods and Applications*** - World Scientific Publishing, 2008

ISBN 978-981-277-877-2

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| **course coordinator**  **Dr. Andrei-J Petrescu** | **Head of the Doctoral School** |
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