

NEW COURSE PROPOSAL

PROGRAM AREAS BIOLOGICAL AND PHYSICAL SCIENCES, MATH AND COMPUTER SCIENCE

1. Catalog Description of the Course. *[Include the course prefix, number, full title, and units. Provide a course narrative including prerequisites and corequisites. If any of the following apply, include in the description: Repeatability (May be repeated to a maximum of ___ units); time distribution (Lecture ___ hours, laboratory ___ hours); non-traditional grading system (Graded CR/NC, ABC/NC). Follow accepted catalog format.]*

COMP 532 COMPUTATIONAL BIOINFORMATICS (3)

Three hours of lecture in the lab per week.

Prerequisite: Admission to the Computer Science or Mathematics Graduate Program and consent of the instructor.

Contemporary computational models used in molecular biology and structures simulations will be introduced. Topics include dynamic programming, statistical/ information techniques for pattern recognition, algorithms for string alignments, structural superposition algorithms, computing with differential information, 3D motifs, Hidden Markov Models, phylogenetic trees, genetic algorithms.

2. Mode of Instruction.

	Units	Hours per Unit	Benchmark Enrollment
Lecture	<u>3</u>	<u>1</u>	<u>24</u>
Seminar	<u> </u>	<u> </u>	<u> </u>
Laboratory	<u> </u>	<u> </u>	<u> </u>
Activity	<u> </u>	<u> </u>	<u> </u>

3. Justification and Learning Objectives for the Course. (Indicate whether required or elective, and whether it meets University Writing, and/or Language requirements) *[Use as much space as necessary]*

The course is graduate course for students in MS in Computer Science and MS in Applied Mathematics programs.

Through this course, students will be able to –

- Analyze bio-data by building data models
- Apply data mining and Artificial Intelligence methods to extract patterns
- Apply statistical methods to analyze patterns of similarities in bio-sequences
- Apply simulations tools to present central concepts
- Perform independent research on computational projects
- Use technological resources and publically available bio- data bases
- Explain protein classification, structure and function
- Design and implement software solutions in bioinformatics
- Work on current/industrial problems in teams.
- Organize and express ideas clearly and convincingly in oral, electronic, visual, and written forms, and as an interactive computer simulation..

4. Is this a General Education Course **NO**

If Yes, indicate GE category:

A (English Language, Communication, Critical Thinking)

B (Mathematics & Sciences)	
C (Fine Arts, Literature, Languages & Cultures)	
D (Social Perspectives)	
E (Human Psychological and Physiological Perspectives)	

5. Course Content in Outline Form. *[Be as brief as possible, but use as much space as necessary]*

- Current computational models in molecular biology
- Strategies and role of computational methods in modern medicine
- Algorithms for string alignments
- Dynamic programming
- Bioprogramming (Perl, Ruby, Java, MySQL).
- Structural superposition algorithms,
- Computing with differential information
- Analysis of 3D motifs
- Hidden Markov Models
- Phylogenetic trees
- Statistical/ information techniques for pattern recognition
- Genetic algorithms
- Microarrays
- Proteomics

6. References. *[Provide 3 - 5 references on which this course is based and/or support it.]*

- 1) Bioinformatics: Sequence and Genome Analysis, David W. Mount, Cambridge Univ Pr ; ISBN: 0521629713 ; (1999)
- 2) Bioinformatics: The Machine Learning Approach, by Pierre Baldi, Sren Brunak, MIT Press; ISBN: 026202506X ; 2nd edition (2001)
- 3) DNA Microarrays and Gene Expression : From Experiments to Data Analysis and Modeling by Pierre Baldi G., Wesley Hatfield, Wesley G. Hatfield, Cambridge University Press; ISBN: 0521800226 ; (2002)

7. List Faculty Qualified to Teach This Course.

Computer Science and Mathematics faculty with expertise in Bioinformatics.

8. Frequency.

- a. Projected semesters to be offered: Fall ☒ Spring ☒ Summer ☐

9. New Resources Required.

- a. Computer (data processing), audio visual, broadcasting needs, other equipment
Use of existing computer labs.
- b. Library needs
Bioinformatics resources
- c. Facility/space needs
none

10. Consultation.

Attach consultation sheet from all program areas, Library, and others (if necessary)

11. If this new course will alter any degree, credential, certificate, or minor in your program, attach a program modification.

No.

Ivona Grzegorzcyk

October 27,03

Proposer of Course

Date