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.]

**MATHP 452 Computational Bioinformatics (4)**

Four hours of lecture in the lab per week.

Prerequisite: Programming skills, Statistics, Biol 201 recommended, or consent of the instructor.

Basic computational models used in molecular biology and chemistry will be introduced. Topics include algorithms for string alignments, dynamic programming, structural superposition algorithms, computing with differential information, 3D motifs, Hidden Markov Models, phylogenetic trees, statistical/information techniques for pattern recognition, genetic algorithms. Same as COMP 452.

2. **Mode of Instruction.**

<table>
<thead>
<tr>
<th></th>
<th>Units</th>
<th>Hours per Unit</th>
<th>Benchmark Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>4</td>
<td>1</td>
<td>24</td>
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<tr>
<td>Seminar</td>
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<td>Laboratory</td>
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<td>Activity</td>
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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 an elective course for Computer Science and Mathematics majors.

Through this course, students will be able to –

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

This course is not designed to satisfy the University Writing or Language requirements.
4. Is this a General Education Course No
If Yes, indicate GE category:

<table>
<thead>
<tr>
<th>A (English Language, Communication, Critical Thinking)</th>
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<tr>
<td>B (Mathematics &amp; Sciences)</td>
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<tr>
<td>C (Fine Arts, Literature, Languages &amp; Cultures)</td>
</tr>
<tr>
<td>D (Social Perspectives)</td>
</tr>
<tr>
<td>E (Human Psychological and Physiological Perspectives)</td>
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</tbody>
</table>

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

- Basic computational models in molecular biology
- Algorithms for string alignments
- Dynamic programming
- Bioprogramming (Perl, Ruby, Java, MySQL).
- Structural superposition algorithms,
- Computing with differential information
- 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.]


7. List Faculty Qualified to Teach This Course.

Computer Science faculty with expertise in Bioinformatics.

8. Frequency.

a. Projected semesters to be offered: Fall _X__ Spring _X____ Summer ____

9. New Resources Required.

a. Computer (data processing), audio visual, broadcasting needs, other equipment
   Use of existing computer lab.

b. Library needs
   none

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.

__Ivona Grzegorczyk____________________2/15/04_____________________________
Proposer of Course                  Date