UNIVERSITY OF THE PACIFIC

GRADUATE COURSE APPROVAL FORM

Please fill in all information. After all required signatures are obtained on page two, send to Research and Graduate Studies, Knoles Hall, 2nd Floor. Research and Graduate Studies will then forward to the Academic Affairs Committee, Office of the Provost, Anderson Hall, 2nd Floor.

Date: August 8, 2006

Contact Person: Dieter Cremer
Department: Chemistry
Phone: 946-2601

Please mark one:
ADDITION x
REVISION
DELETION

School or College: COP
Department: Chemistry
Course Number: PCSP 204
Title: Introduction to Nanotechnology
Units: 4
Minimum Number of Students: 4

Prerequisites: Graduate standing or permission of instructor

If replacing a course, old course title and number:

Catalog Description: Molecular nanotechnology (MNT) is a rather young discipline which came up in the 90s. Nevertheless, MNT has gained so much importance in the last years that universities at all rankings have introduced or are going to introduce MNT teaching programs. Predictions say that MNT will change our lives and society more than computer technology and electricity have done together. The course will provide a systematic overview of MNT. Applications of MNT, as they are already in use today and as they are planned for the future will be discussed. Also, the implications of MNT for our society will be considered. Prerequisite: Graduate standing or permission of instructor.

Please attach a syllabus.

What are the reasons for the new course (e.g., student needs, major, etc.), program changes or deletion of the program?
Important course for the new nanotechnology track.

If approved, when will this be implemented?
Spring, 2007
What is the anticipated impact on resources (Faculty, funds, library materials, etc.)?
None.
Describe any special facilities, furnishings, or technology needs. List software needs, if any.
None.

APPROVAL PROCESS

1. Action by department requesting addition/change:
   Approved by: [Signature]
   Date: 10/20/06

2. Action by the Curriculum and/or Graduate Studies Committee of the School/College:
   Approved by: [Signature]
   Date: 10/20/06

3. Action by the Dean of the School/College:
   Approved by: [Signature]
   Date: 10/20/06

4. Action by the Dean of the Library:
   Approved by: [Signature]
   Date: 10/20/06

5. Action by the Director of Educational Technology Services (if computer lab, software needed):
   Approved by: [Signature]
   Date: N/A

6. Action by the Registrar:
   Approved by: [Signature]
   Date: 11/13/06

7. Action by the Graduate Studies Committee (as appropriate):
   Approved by: [Signature]
   Date: 11/16/06

8. Action by the Academic Affairs Committee:
   Approved by: [Signature]
   Date: 

After approval by the Academic Affairs Committee, information regarding new, revised, or deleted courses is sent to the Registrar for listing in or modifying the catalog.

Form revised: 9/4/03
## COURSE SYLLABUS FORM

### Routing Sheet

**Course Name:** Introduction to Nanotechnology  
**Course Number:** PCSP 204

<table>
<thead>
<tr>
<th></th>
<th>Department</th>
<th>CurComm</th>
<th>Faculty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Statement of justification of course is acceptable.</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Statement of staffing requirements is acceptable.</td>
<td>✗</td>
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<tr>
<td>3.</td>
<td>Statement of estimated class enrollment is acceptable.</td>
<td>✗</td>
<td></td>
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<tr>
<td>4.</td>
<td>Statement of anticipated impact on classroom facilities, equipment, and budgets is acceptable.</td>
<td>✗</td>
<td></td>
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<tr>
<td>5.</td>
<td>Appropriate course number.</td>
<td></td>
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<tr>
<td>6.</td>
<td>Appropriate course title.</td>
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<tr>
<td>7.</td>
<td>Appropriate department.</td>
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<tr>
<td>8.</td>
<td>Appropriate unit value and hours.</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Appropriate prerequisites.</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Evaluation methodology is appropriate, including honor statement.</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Relevant terminal competencies are appropriate (mandatory for required courses, recommended for elective courses, not applicable for graduate courses).</td>
<td>✗</td>
<td></td>
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<tr>
<td>13.</td>
<td>Course goals are appropriate.</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Course objectives are appropriate.</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Course outline, including didactic sequence and time allotment, is appropriate. Treatment of the subject material is complete and of appropriate breadth and depth.</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Course outline contains no unnecessary duplication of other course content.</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Consideration of text (s) is appropriate.</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Instructor contact information is indicated on the syllabus.</td>
<td>✗</td>
<td></td>
</tr>
</tbody>
</table>
Complete this section for Experimental Courses (149 or 249)

Approval recommended by Department

Approval by Curriculum Committee

Complete this section for Permanent Status Courses

Approval recommended by Department

Approval by Curriculum Committee

Approval by Faculty

1.) JUSTIFICATION FOR THE COURSE: Molecular nanotechnology (MNT) is a rather young discipline which came up in the nineties. Nevertheless, MNT has gained so much importance within the last years that universities at all rankings have introduced or are going to introduce MNT teaching programs. Predictions say that MNT will change our lives and society more than computer technology and electricity have done together. The course is essential for the new track Molecular Nanotechnology.

2.) STAFFING NEEDS: Graduate faculty

3.) ESTIMATED CLASS ENROLLMENT: minimum of 4 students

4.) ANTICIPATED IMPACT ON CLASSROOM FACILITIES: A lecture/discussion room will be needed for this course.

5.) ANTICIPATED IMPACT ON ELECTRONIC TECHNOLOGY: Current ET facilities are adequate.
**COURSE SYLLABUS**

Pharmaceutical and Chemical Sciences Graduate Program  

**Course Number**  
PCSP 204

**Course Title**  
Introduction to Nanotechnology

**Department**  
Chemistry

**Instructor(s)**  
Dieter Cremer

**Number of Weeks**  
13

**Maximum Enrollment**  
30

**Unit Value**  
4

**Lecture Hours per Week**  
4

**Laboratory Hours per Week**  
0

**Discussion Hours per Week**  
4

**Number of Labs per Semester**  
0

**Experiential Hours per Week**  
0

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**Course Description**

The course will provide an overview of MNT. It will show that the nano regime is so different from other regimes because both classical and quantum effects can be active thus leading to unique properties of nano devices. MNT is a highly interdisciplinary science, which will be reflected in the course by making reference to physics, chemistry, biology, pharmacy, and engineering. Applications of MNT, as they are already in use today or as they are planned for the future, will be discussed.

**Prerequisites**  
Graduate standing or permission of instructor

**Teaching Methodology**

Lectures combined with exercises, assigned readings, class discussions and student presentations.

**Evaluation Methodology**

The University Honor Code is an essential element in academic integrity. It is a violation of the Honor Code to give or receive information from another student during an examination, to use unauthorized sources during an examination, or to submit all or part of someone else's work or ideas as one's own. If a student violates the Honor Code, the faculty member may refer the matter to the Office of Student and Professional Affairs. If found guilty, the student may be penalized with failure of the assignment or failure of the course. The student may also be reprimanded or suspended from the University. A complete statement of the Honor Code may be found in the Student Handbook, "TIGER LORE".

Attendance is expected at all class sessions.

Class assignments may be retained by the instructor to assess how the learning objectives of the course are met.

The instructor may be contacted during office hours or by email, phone, or via Blackboard.com.

**Weighting of Assignments:**

<table>
<thead>
<tr>
<th>Assignment Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam</td>
<td>40%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>30%</td>
</tr>
<tr>
<td>Exercises</td>
<td>20%</td>
</tr>
<tr>
<td>Student presentations</td>
<td>10%</td>
</tr>
</tbody>
</table>

**Assignment of Grades:**

- A: 90%
- B: 80%
- C: 70%
- D: 60%
- F: <60%
### OBJECTIVES

**Objectives of the course:** The course will be presented in such a way that students from different areas (physics, engineering, chemistry, pharmacy, biology, etc.) will be able to follow it. The *general goal* of the course is to provide an updated overview of molecular nanotechnology. Apart from this, the course pursues a number of specific goals:

First, it will characterize MNT as a bottom-up approach, clearly to be distinguished from other scientific activities in the nano range, which follow the top-down strategy. The present and future goals of MNT have to become clear and its nature as a typical crossover discipline.

Second, it will provide a basic understanding of the physical laws and effects that are active in the nano-world. The relationship between these laws and the extraordinary properties of nano-devices will be outlined.

Third, it will provide an insight into the tools and fabrication lines nowadays used in nanotechnology.

Fourth, it will emphasize the design concepts and strategies used today and in the near future to build molecular machines.

Fifth, it will demonstrate how the applications of MNT will influence science of tomorrow and will change many aspects of our lives. The impact of MNT on our society will be discussed.
### COURSE SYLLABUS

Pharmaceutical and Chemical Sciences Graduate Program

Course Date: August 8, 2006

#### GOALS

| a)  | The student should be able to characterize the major top-down and bottom-up strategies. |
| b)  | The student should be able to outline the physical laws active in the nano-range and as they differ from those in the micro-range. |
| c)  | The student should be able to outline the basics of the electronic structure of atoms and molecules. Also, the student should know what forces act between atoms and/or molecules when they are assembled. |
| d)  | The student should be able to characterize the physics of a quantum dot, a quantum wire, and a quantum well. |
| e)  | The student should be able to outline and explain the most important technical tools of MNT. |
| f)  | The student should be able to analyze the major fabrication strategies of nano-particles. |
| g)  | The student should describe the role and functioning of smart materials. |
| h)  | The student should be able to define the fundamental theory of electron and energy transfer. |
| i)  | The student should be able to analyze the functioning of molecular switches. |
| j)  | The student should be able to outline the problems and principles of solar energy conversion. |
| k)  | The student should be able to outline the basic principles of molecular machines. |
| l)  | The student should be able to give an overview of the mechanical like motions of molecules created by special design concepts. |
| m)  | The student should be able to characterize the properties of carbon nanotubes and their role for engineering nano-electronic devices. |
| n)  | The student should be able to define the basic principles of a quantum computer. |
| o)  | The student should be able to outline the consequences that MNT has for our society. |