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**UNIVERSITY TEACHING GRANT
APPLICATION**

NAME: Joseph D. Andrade

RANK: Professor

DEPARTMENT: Bioengineering

CHAIR: R. Normann

CAMPUS ADDRESS: 2480 M.E.B.

PHONE: 1-4379

When would the grant activities be undertaken? Spring Quarter, 1996

SUMMARY OF PROJECT (not more than 150 words):

I propose to develop and pilot a new course, "Novel Biological Phenomena With Potential Engineering Application: Bio-Based Engineering," Spring Quarter, 1996, designed primarily for advanced undergraduates in biology, chemistry, physics, and engineering. This course will bridge biology and engineering using topics which are not well developed in existing courses. One of the objectives is to show that there are now well known biological phenomena which can be applied to practical engineering problems. Another objective is to motivate the students to look beyond their immediate disciplines for ideas and inspiration.

The course is planned to focus on four key topics, developed by the instructor with the aid of faculty colleagues and student teams:

Photons in Biology

Water in Biology

Heat in Biology

Electricity and Magnetism in Biology.

DATE: 1/10/96

SIGNATURE: 

SEND TO: University Teaching Committee
120 Park Bldg.

UNIVERSITY TEACHING GRANT

BUDGET

Supplies and Travel

1. Supplies (please specify):

<u>Lab Supplies for Demonstrations & Experiments</u>	<u>\$ 500.00</u>
<u>Literature Searching & Retrieval Supplies</u> <u>and Assistance</u>	<u>\$ 500.00</u>
<u>_____</u>	<u>\$ _____</u>
<u>_____</u>	<u>\$ _____</u>
<u>_____</u>	<u>\$ _____</u>

2. Travel Costs (please specify):

<u>Hastings Laboratory</u>	<u>\$ 650.00</u>
<u>Jelinski Laboratory</u>	<u>\$ 650.00</u>
<u>University of California -- Davis Laboratory</u>	<u>\$ 250.00</u>
<u>_____</u>	<u>\$ _____</u>
<u>_____</u>	<u>\$ _____</u>

TOTAL (\$3,000 Maximum)

\$ 2,550.00

*University Teaching Committee Proposal
January 1996*

Novel Biological Phenomena With Potential Practical Applications:

Bio-Based Engineering

Bioengineering 595

Spring, 1996

J.D. Andrade, Principal Instructor

Objectives and Rationale:

1. To research, design, develop, and preliminarily implement a new course for advanced undergraduates in biology, chemistry, physics, and engineering.
2. To bridge biology and engineering using topics which are not well developed in existing courses.
3. To demonstrate that there are not well known biological phenomena which can be applied to practical engineering problems.

The basic rationale is that biology has had nearly 4 billion years to develop an enormous diversity of reactions, structures, and even phenomena, many of which are relatively unknown or unapplied

Design of Course:

The precise selection of topics will be based in part on student interests and backgrounds and on participating faculty interests. A tentative topic list and schedule is:

- | | |
|---------|--|
| Week 1: | Life science - physical science; biochemistry, biophysics, biomedical engineering -- toward bio-based engineering: Projects and Case Studies |
| Week 2: | Topic 1 - Photons in Biology: Vision and Photosynthesis |
| Week 3: | Topic 1 - Photons in Biology: Photon Production-Bioluminescence |
| Week 4: | Topic 2 - Water in Biology: Drought Resistance and Anhydrobiosis |
| Week 5: | Topic 2 - Water in Biology: Water Purification and Collection |

- Week 6: Topic 3 - Heat in Biology: Thermogenesis and Thermophilia
Week 7: Topic 3 - Heat in Biology: Collection and Dissipation
- Week 8: Topic 4 - Electricity and Magnetism in Biology: Electroreception and Sensing
Week 9: Topic 4 - Electricity and Magnetism in Biology: Magnetoreception and Sensing
Week 10: Biological Backwaters -- Critical Engineering needs and problems

The instructor proposes to visit experts in several of the areas during the month of March in order to fully develop the topics.

In the case of Topic 1 he would work with Dr. J. Woody Hastings in the Department of Biology at Harvard. In the case of Topic 3 he would work with Dr. Lynn Jelinski of the Biotechnology Program and College of Engineering at Cornell University. Dr. Jelinski has offered an undergraduate biophysics course in which topic 3 was a major component. In the case of Topic 2, he expects to visit with the group at the University of California Davis that has done much of the pioneering work in anhydrobiosis.

It may also be possible to induce these experts to come to campus during the first several weeks of the course in late March and have a quick, fast-paced set of lectures and discussions on these topics. It is highly probable that this would work with Woody Hastings, as he has been to Utah several times in the past and is quite fond of the area, particularly if the snow conditions are good.

Joe Andrade has also talked with Lynn Jelinski in the past about visiting and it is likely that she could participate as well. If this is the case, then the funds budgeted for travel would also be used for the travel and expenses of these speakers.

*Announcing a new course
inspired by the
Whitaker Bio-Based Engineering Program
Dept. of Bioengineering*

From Biology to Engineering: *Novel Biological Phenomena with Potential Engineering Application*

Instructor: J.D. Andrade

**Bioengineering 595 - 4; Special Topics
Spring, 1996**

**Tuesdays & Thursdays, 5:00 - 6:30 p.m.
3 credit hours**

Prerequisites: Upper Division or graduate standing in science, math, engineering, or other technical major.

- Week 1:** Life science - physical science; biochemistry, biophysics, biomedical engineering -- toward bio-based engineering: Projects and Case Studies
- Week 2:** Topic 1 - Photons in Biology: Vision and Photosynthesis
- Week 3:** Topic 1 - Photons in Biology: Photon Production-Bioluminescence
- Week 4:** Topic 2 - Water in Biology: Drought Resistance and Anhydrobiosis
- Week 5:** Topic 2 - Water in Biology: Water Purification and Collection
- Week 6:** Topic 3 - Heat in Biology: Thermogenesis and Thermophilia
- Week 7:** Topic 3 - Heat in Biology: Collection and Dissipation
- Week 8:** Topic 4 - E and M in Biology: Electroreception and Sensing
- Week 9:** Topic 4 - E and M in Biology: Magnetoreception and Sensing
- Week 10:** Biological Backwaters -- Critical Engineering needs and problems