Professional Science Master's Track

The College at Brockport, College Senate
TO: Dr. John R. Halstead, College President
FROM: The College Senate: March 23, 2009

SUBJ: Professional Science Master's Track (#37 08-09 GC)

NEW RESOLUTION: Supersedes Res #: 17

RECEIVED MAR 27 2009
The College at Brockport
Office of the President

TO: T.M. Rao, The College Senate President
FROM: John R. Halstead, College President

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2008-2009-17_res.doc
COLLEGE SENATE OFFICE
RESOLUTION PROPOSAL COVER PAGE

DEADLINE FOR SUBMISSIONS: FEBRUARY 28
Incomplete proposals or proposals received after the deadline may not be reviewed until next semester.

INSTRUCTIONS – please, no multiple attachments – each proposal must be submitted electronically as one document.

- Submit only complete proposals. Include support letters from department chair and dean.
- Proposals must be prepared individually in Word format using committee guidelines available at brockport.edu/collegesenate/proposal.html.
- Fill out this cover page for each proposal and insert it electronically as the front page of your document. (/collegesenate/proposal.html)
- Email whole proposal with cover page as one attachment to senate@brockport.edu and facprez@brockport.edu.
- All updates must be resubmitted to the Senate office with the original cover page including routing number.
- Questions? Call the Senate office at 395-2586 or the appropriate committee chairperson.

1. PROPOSAL TITLE: Please be somewhat descriptive, i.e. Graduate Probation/Dismissal Proposal rather than Graduate Proposal.

   Professional Science Master’s Track - Program in Biological Sciences

2. BRIEF DESCRIPTION OF PROPOSAL:

   We propose to establish a Professional Science Master’s as a new track for a Master’s in Biological Sciences. Using the existing requirements for a Plan II Master’s in Biological Sciences, a curriculum has been devised to allow students to receive a Professional Science Master’s that fulfills the requirements established by the Council of Graduate Schools. This new Master’s track in Biological Sciences will prepare students for jobs in the biotech industry that require skills to interface between upper management and the bench scientists. This unique set of skills is highly valued by scientific companies. The proposed PSM program will have numerous benefits for the students, the university, and local businesses.

3. HOW WILL THIS EFFECT TRANSFER STUDENTS:

   No effect

4. ANTICIPATED EFFECTIVE DATE:

   Fall 2009

5. SUBMITTED BY: (contact person)

   Stuart Tsubota
   Biological Sciences
   395-5759
   stsubota@brockport.edu

6. COMMITTEES TO COPY: (Senate office use only)

   Standing Committee
   Enrolment Planning & Policies
   Faculty & Professional Staff Policies
   General Education & Curriculum Policies*
   Graduate Curriculum & Policies
   Student Policies
   Undergraduate Curriculum & Policies

   Forwarded For Approval To
   Committee for approval
   Executive Committee
   GED to Vice Provost
   Senate
   College President
   OTHER

   Dates
   2/12/09
   2/23/09
   N/A
   3/2/09
   3/27/09
   REJECTED - WITHDRAWN

   * follow special Gen Ed procedures for submission of General Education proposals at “How to Submit Proposals” on our Website.

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1. Academic Rationale

This is a proposal for the creation of the Professional Science Master’s (PSM) track in the Master’s of Science in Biological Sciences. The program will be adapted from the existing Master’s Program in the Department of Biological Sciences, specifically the non-thesis plan II option. This program will fill an educational void in our curriculum, attract new students to the University, train students for new employment opportunities, and provide connections between the University and the greater Rochester scientific business community. In addition this new program will align the university with the recommendations of the Sloan Foundation, Council of Graduate Schools, the National Science Foundation, and Congress to develop innovative degree programs in the sciences that address the needs of industry and increase the U.S. competitiveness in the global market place.

2. Mission, Market, and Quality

What is a PSM

In 1997 the Alfred P. Sloan Foundation started an initiative to support the development of a new type of Master’s degree for students in science and math who want to continue their work outside academia. The Ph.D. was seen as too arduous and long for these students and insufficient in its training for careers in scientific industry that required both business and scientific skills. The Sloan Foundation provided funds for universities to develop new graduate programs and out of this work arose the first Professional Science Master’s programs. In 2006, the Council of Graduate Schools took over the primary role of supporting and promoting the creation of PSM programs, with the goal of making PSM programs a normal element of graduate degree programs at universities. There are now over 120 PSM programs in the United States and seven in New York State.

The PSM is a new, innovative, interdisciplinary graduate degree that has been designed to provide students with strong, advanced training in science or mathematics, while at the same time giving them the business and management skills valued by their future employers in scientific industry. These programs are typically two year programs in which the students take graduate courses in science or mathematics, “Plus Courses” in business, management, and finance, and complete an internship with a science-based business, government or non-profit organization. This training will allow graduates to smoothly transition into careers with these organizations. They will uniquely be able to interface between bench researchers and management and provide the interdisciplinary expertise needed by these companies.

National and Local Needs for the Development of PSM Programs

In the past three years, the need to establish and support PSM programs nationally has been recognized by The National Science Foundation (NSF), the U.S. Congress and the President. The National Research Council of The National Academy of Science formed a committee to examine ways to enhance the Master’s degree in the sciences in order to maintain the competitiveness of U.S. scientific industry in the global market. Their findings and recommendations culminated in a report in 2008 entitled Science Professionals: Master’s Education for a Competitive World (ISBN: 0-309-11472-1; http://www.nap.edu/catalog/12064.html). In this publication the National Research Council highly recommends the development of PSM programs.

“Higher education institutions should continue to innovate in and support the development of master’s degree programs in the natural sciences to meet the needs of students seeking science-based careers and of the employers who hire them. PSM programs will provide students with deeper, often interdisciplinary, scientific knowledge and must include opportunities for the development of professional skills and practices through courses, summer internships, and business- or government-sponsored projects that provide an invaluable workplace experience.”

The study also points out that government, industry, and higher education all recommend the creation of PSM programs to help promote U.S. competitiveness in scientific industry.

“These reports represent the collective voice of government, industry, and higher education, and in each case the recommendation to establish and increase the number of PSM programs was seen as a key part of a package designed to address U.S. competitiveness and innovation.”
In recognizing the need to address the ability of the U.S. to compete globally in the STEM areas (Science, Technology, Engineering, and Mathematics), the U.S. Congress passed the America COMPETES Act (Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science). This act was signed into law by the president in 2007. In Section 7034 of The America COMPETES Act, Congress authorized the National Science Foundation to develop grants for four-year universities to specifically create and expand PSM programs.

“The Director shall award grants to 4-year institutions of higher education to facilitate the institutions’ creation or improvement of professional science master’s degree programs that may include linkages between institutions of higher education and industries that employ science-trained personnel, with an emphasis on practical training and preparation for the workforce in high-need fields.”

SUNY PSM Grant

In 2007 SUNY System Administration was awarded an Alfred P. Sloan grant written by Dr. Anne Huot in the amount of $452,000 for the creation of a system-wide network of PSM programs. As part of this grant, in the fall of 2007 the Dean of Graduate Studies, Dr. Susan Stites-Doe was given a charge by The College at Brockport VP of Academic Affairs and Provost, Dr. Anne Huot, to form a committee that would conduct a feasibility study on the development of PSM programs at the college (Appendix A). To execute this charge, a group of faculty and staff members from across campus was formed. This group comprised the PSM Advisory Council (Appendix B). The PSM Advisory Council was also responsible for recruiting professionals from business, industry, and governmental agencies to work with them as formal advisors to the campus. These individuals comprise the Board of Advisors. The resumes of the members of the Board of Advisors appear in Appendix C. The Advisory Council and the Board of Advisors has met three times over the past year, both on campus and off campus. The conclusion from the feasibility study is that there is sufficient demand and resources for the development of a PSM program in Biological Sciences at The College at Brockport. The final report of the Advisory Council may be found in Appendix D.

In assessing the need and demand for a PSM program, the Advisory Council received valuable input from the Board of Advisors. The Advisor Council also surveyed by email 67 local companies for their assessment of the proposal to develop a PSM at Brockport (Appendix E). Six of the companies responded. All respondents indicated that, based on our sketch of the program idea underway, the program concept was sound, the content was appropriate and important, and that they would seriously consider the credential of such a degree credential holder for hire in their organization.

To determine interest in the PSM by prospective students, the Advisory Board Conducted a focus group composed of alumni (Appendix F). From the focus group we learned that the degree program was relevant and attractive to young professionals, that the inclusion of professional development courses and an internship were particularly attractive features to the group. Also, the possibility of taking courses over the summer and/or winter sessions was important.

Given the proposed need and demand for the development of PSM programs in molecular biology and biotechnology, it was important to identify existing programs in the area. To date there are no programs that would compete with the proposed PSM in Biological Sciences and no programs that would provide the same interdisciplinary training provided by the proposed PSM in Biological Sciences. RIT has a program in Bioinformatics which is very computer based. The University at Buffalo has a program in Molecular Chemical Biology, which again is very computer and chemistry based. There are presently no other SUNY campuses offering PSM programs in molecular biology or biotechnology. In fact the only program in the state of New York is a PSM in Biotechnology from St. John’s University. Thus, The College at Brockport is strategically positioned to tap a select population of students and provide a unique professional degree among New York universities.

The faculty of the Department of Biological Sciences met to discuss the prospect of developing a PSM track in the existing Master’s Program. There was unanimous agreement to go forward with the plan. A curriculum for the program was designed, based on the existing Master’s Program in Biological Science. Careful consideration was given to the guidelines set by the National Professional Science Masters Association and by the Council of Graduate Schools Professional Science Masters Initiative. Feedback from the Advisory Council and the Board of Advisors
was also valuable in the design of the curriculum.

The PSM Initiative of the Council of Graduate Schools has established guidelines for the curricula of PSM programs throughout the nation. We asked Dr. Eleanor L. Babco, Senior Consultant and Co-Director of the Professional Master's Initiative, Council of Graduate Schools to evaluate our proposed curriculum. She enthusiastically endorsed the curriculum, saying that it met all of the guidelines set by the National PSM Advisory Board (Section 11).

**Benefits of the PSM Program**

Benefits of this new program are bountiful and range from benefits for the students, benefits for the university, and benefits for the employers of the students.

The PSM provides an alternative for students who want to stay in research, but do not want to go the much longer route of the Ph.D. The PSM increases student success by providing them with the interdisciplinary skills in science and business to fit into a new and needed niche in biotechnology. As Dr. Shaun Martin, Director of Preclinical Development, Vaccinex, Inc, stated in his letter of support (Section 11),

“Too often colleges focus on pumping out good scientists who focus only on the science and do not understand anything about the business of science. On the other side most of the business people in science do not have a science background! When you mix in the influence of finance into daily science it completely changes the scientific landscape.”

In preparing students for the job market in biotechnology, the program will also connect students with potential employers in the greater Rochester area.

The benefits of the PSM program to the university are numerous. First, it supports the mission of the university to enhance student learning and student success. Second, it places the university at the forefront of universities in supporting national initiatives, such as the America COMPETES Act, to develop PSM programs. Third, it supports President Halstead's strategic goal to expand connections to the greater Rochester business community. In so doing it increases the visibility and reputation of The College at Brockport in the greater Rochester area among business and among potential students. Also given the uniqueness of this program in the state of New York, it will expand the reputation of the university and pool of potential students. Plans are to have the Plus Courses taught at the MetroCenter. This will increase the use of the MetroCenter and make the courses more accessible to students in the working community. The added convenience of the MetroCenter location was enthusiastically endorsed by the Board of Advisors.

The PSM program also has benefits for the Department of Biological Sciences and other departments. The Department of Biological Sciences will gain a new set of graduate students separate from the traditional students in the thesis-based track. In addition a new course offering in Biological Sciences will be a product of the PSM program. This course will open to all graduate students in Biological Sciences. The Plus Courses will also be open to other students with both a science background and an interest in obtaining workplace skills in business and management. In fact plans are in place to package the Plus Courses into a certificate for students who already have a degree in a science or science-related field. Finally, the PSM program in Biological Sciences will serve as a model for the development of PSM programs in other scientific disciplines, e.g. Mathematics, Computational Sciences, and Chemistry.

Local business will benefit by getting employees with training both in cellular and molecular biology and in business and management. These students will fill a need in industry for management employees with training in biotechnology. The PSM program will also provide advancement opportunities for current employees of local biotech companies. Our Board of Advisors said that some of their employees would be interested in and benefit from this PSM program. They also said that their companies would support time off for these employees who choose to enroll in the PSM program.

**3. Entrance Requirements**

The entrance requirements will be the same as those for the existing Master's Program in Biological Sciences with the exception that an introductory course in statistics will be required. The need for this requirement came out
of meetings with the Board of Advisors. On a case-by-case basis, the faculty will allow the requirement for statistics to be fulfilled in the first semester of the program. In such cases the student would be offered conditional admission. The admission requirements are listed below:

- 3.0 Minimum undergraduate GPA on a 4.0 scale
- Two (2) Letters of Recommendation
- GRE General Test
- Statement of Objectives
- Writing Sample: At least three pages illustrating scientific writing skills
4. Program Requirements

The curriculum for the proposed PSM track is based on the existing Biological Science program, and carefully considers guidelines set by the National Professional Science Masters Association and by the Council of Graduate Schools Professional Science Masters Initiative. The program curriculum is also based on consultation with members of our Board of Advisors, who represent the interests of local industry. The proposed curriculum has been reviewed and enthusiastically supported by Dr. Eleanor L. Babco, Senior Consultant and Co-Director Professional Master’s Initiative, Council of Graduate Schools (Section 11).

The curriculum for the proposed PSM is similar to the existing Plan II Master’s in Biological Sciences. Both are non-thesis degree programs designed to target students with different goals and needs than students in the thesis-based Plan I Master’s Program. Like the Plan II Master’s, the PSM will include a culminating experience, which is a requirement of the Commissioner’s regulations of the State of New York Education Department. The major differences between the PSM and the Plan II Master’s are the inclusion of the Plus Courses, the addition of a new required course in Biological Sciences, and an internship in a science-based business, government or non-profit organization. The Plus Courses will feature business and management topics and analytical concepts that will provide students with the background necessary to interface with research scientists and upper management in scientific organizational settings. The new course in Biological Sciences examines the production and marketing of biological products, e.g., pharmaceuticals. The internship is taken in the second year, after the student has completed the Plus Courses. The knowledge obtained in these courses will be applied in a real-life setting during the internship. The listing of the specific requirements for the PSM is presented in a side-by-side comparison with the existing Plan II track in Biological Sciences in Table 1.

The Plus Courses

After examining the purposes of the Plus Courses, the needs of the students, the input from the Board of Advisors, campus resources, and concerns regarding the Department of Business Administration’s accreditation standards (AACSB), we concluded that we could not draw from existing courses to fulfill these requirements. The Plus Courses needed to be designed to fit a new type of science professional. This need for precise tailoring is endorsed by the Council of Graduate Schools, and is a common practice used by Professional Science Masters directors across the U.S. In a recent survey by the National Professional Science Masters Association (NPSMA) of exiting PSM programs (April 2008), 75% of the Plus Courses were newly created courses, and of the existing courses, 30% of them required substantial revisions to meet the specific and unique needs of the PSM students.

Dr. James Cordeiro, Professor of Finance, took leadership over the creation of the Plus courses, and engaged in a best practice survey of the Plus Courses in existing PSM programs. He contacted the directors of several programs in designing the three Plus Courses for our program. He also incorporated the input from our Board of Advisors in designing the courses. The Plus Courses are listed below and descriptions of them appear in Appendix G. Course registration forms have been completed for each course and will be submitted when this proposal has been vetted by the Graduate Curriculum Committee.

1. PSI 601 Management and Communication for Math and Science Professionals
2. PSI 602 Accounting and Finance for Math and Science Professionals
3. PSI 603 Applied Quantitative Analysis for Math and Science Professionals

The PSI designation was recommended by Peter Dowe and Dr. Susan Stites-Doer, and stands for Professional Science.

New Course in Biological Sciences - BIO 655 Processes of Drug Development

As part of the PSM, a new course has been developed by Dr. Adam Rich, Associate Professor in Biological Sciences. This course will examine the production of a new drug from its conception to its marketing. The course will provide the students with an introduction to the pharmaceutical process and show the interactions and communications between scientists and marketing professionals in the development and production of a drug.

It should be stressed that while the Plus Courses and the new BIO course were designed for the PSM in Biological Sciences, enrollment in these courses is not meant to be limited to PSM students. The new BIO course could be taken by any BIO graduate student, and the Plus courses could be taken by other graduate students primarily enrolled in, but not limited to, the sciences. In fact, plans are to package the Plus Courses as a certificate.
for students who may already possess an advanced degree in the sciences. Because the Plus Courses are, by design, intended to serve the needs of future leaders of scientific organizations, the students will need to possess a background in the sciences in order to understand the case studies employed in the Plus Courses and to effectively complete the courses. Therefore, entry to the Plus Course classes will be strictly based on a scientific prerequisite background. Descriptions of the Plus Courses and the new BIO course are given in Appendix G.

**The Internship**

In constructing the PSM Board of Advisors, we targeted companies that would be interested in supporting interns from the program. The companies that we have on board are Bausch and Lomb, Eastman Kodak Co., Vacinnex, Inc., and The Medingen Group, Mercer, and Clerisy Corporation. Students will be encouraged to seek internships at these companies and other companies in the greater Rochester area, although we will not limit the students to serving in internships only with these companies. While we will use our connections to place students in internships, we will also strongly encourage students to find and set up their own internships. To help the students in creating resumes and finding internships, we will work with Claire VanDenBerghe, Director of Career Services, and her staff.

**Assessment of Student Progress**

Each student will have an advisory committee consisting of two faculty members. The purpose of the committee will be to advise the student and monitor the progress of the student through the program and, in particular, through the internship. Since the internship will serve as the culminating experience for the student, each student will be required to hand in a written report on the internship to the advisory committee, and, as part of Graduate Seminar, give an oral presentation on the internship. In addition an evaluation by the industry supervisor will be used in assessing the student’s internship.

The members of the Board of Advisors emphasized that communication skills will be necessary for the jobs taken on by PSM graduates. In the PSM curriculum, there are ample opportunities for the students to present and to get feedback on their presentations. All of the graduate courses in Biological Sciences require oral presentations and/or written projects in the form of lab reports or grant proposals. These requirements, along with the written and oral reports on the internship, will provide the students with the necessary experience to hone their presentation skills.
Table 1: Side-by-Side Comparison of Existing Plan II and PSM

<table>
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<th>Existing Plan II Track in Biological Sciences</th>
<th>Proposed PSM Track in Biological Sciences</th>
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<tr>
<td>At least 15 credits of the total graduate credits must be at 600-700 level</td>
<td>At least 15 credits of the total graduate credits must be at the 600-700 level</td>
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<tr>
<td>BIO 623 DNA Cloning Lab 3</td>
<td>BIO 623 DNA Cloning Lab 3</td>
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<tr>
<td>BIO 635 Cell Culture and Biotechniques 3</td>
<td>BIO 635 Cell Culture and Biotechniques 3</td>
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<td>BIO 692 Graduate Seminar 1</td>
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<tr>
<td>BIO 699 Independent Study 4</td>
<td>BIO 702 Ind. Res. Experience (Internship) 6</td>
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<td>BIO 702 Independent Research Experience 4</td>
<td>BIO 655 Processes of Drug Development 2</td>
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<td><strong>Total</strong> 15</td>
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<tr>
<th>BIO 500-level electives by advisement</th>
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<th>BIO 500-level electives by advisement</th>
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<tr>
<td><strong>Plus Courses - 0 credits</strong></td>
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<td>Plus Courses - 9 credits</td>
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<td></td>
<td></td>
<td>PSI 601 Management and Communications for Science Professionals 3</td>
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<td>PSI 602 Accounting and Finance for Science Professionals 3</td>
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<td>PSI 603 Applied Quantitative Analysis for Science Professionals 3</td>
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<td><strong>Total</strong> 9</td>
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<td><strong>Total Graduate Credits</strong></td>
<td>34-39</td>
<td><strong>Total Graduate Credits</strong></td>
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5. Exit Requirements

Besides the completion of the required and elective courses, a paper based on the internship and an oral presentation on the internship will be required. Successful fulfillment of these requirements will be determined by the student’s advisory committee.

6. Academic Administration Commentary.

Letter of review/comment from the Chair of the Department of Biological Sciences, Dr. Rey Sia.
Letter of review/comment from the Dean of Graduate Studies, Dr. Susan Stites-Doe
Letter of review/comment from the Dean of Letters and Sciences, Dr. Stuart Appelle
To the College Senate,

The Department of Biological Sciences enthusiastically supports the Professional Science Master’s track proposal. As indicated in the proposal, no new resources or staffing in Biological Sciences will be required for implementing the program. However, a new departmental position of Program Director will be created. The Program Director duties will be rotated and incorporated into the normal faculty service duties. Each student enrolled in the track will have an advisory committee of two faculty members. This will lead to an increase in the amount of time faculty spend mentoring students. However, since this is not a thesis degree, the time required will not be as much as that required for a thesis degree.

The Professional Science Master’s track is seen as an important opportunity to the local biotechnology community. The track serves as an opportunity for students interested in a multidisciplinary career involving scientific research and business. The Department of Biological Sciences strongly seeks the approval of this track.

Sincerely,

Rey A. Sia
February 9, 2009

Dr. Stuart Tsubota
Department of Biological Sciences
103 Lennon Hall
CAMPUS

Dear Dr. Tsubota:

I write to support the proposed Professional Science Masters track in Biological Sciences. PSM degree programs allow the student to build on an undergraduate science and/or math background by applying their advanced content knowledge at the graduate level to organizational settings that they enter as interns. The degree has currency in terms of our national competitiveness agenda, and the degree has strong support from the Academy of Sciences.

I applaud your work on this degree program and will support the management of plus courses during special sessions, and associated winter and summer-session hiring challenges in any way that I can.

Best wishes,

Susan Stites-Doe, PhD
Dean of Graduate Studies
I approve the attached proposal for a new Masters track offered through the Department of Biological Sciences.

Stuart Appelle, Ph.D.  
Dean, School of Letters and Sciences  
350 New Campus Drive  
The College at Brockport  
State University of New York  
Brockport, New York 14420  

-----Original Message-----  
From: Stuart Tsubota [mailto:stsubota@brockport.edu]  
Sent: Tuesday, February 10, 2009 2:55 PM  
To: Stuart Appelle  
Cc: Karen Kifer  
Subject: PSM proposal - final  

Stu,

I have attached the final version of the PSM proposal. I addressed some of the concerns from the Friday meeting and changed the course designation to PSI.

Sincerely,
Stuart

Stuart Tsubota  
Professor  
Department of Biological Sciences  
The College at Brockport  
350 New Campus Drive  
Brockport, NY 14420  

phone (585) 395-5759  
fax (585) 395-2741  
email stsubota@brockport.edu
7. Drake Library resources and support services

The resources needed from Drake Library and from Academic Computing Services are no different from those currently supplied for the existing Master's tracks in Biological Sciences. The resources currently supplied are sufficient for the implementation of the PSM track.

a. Letter of review/comment from Dr. Mary Jo Orzech, Director, Drake Memorial Library, Library, Information and Technology Services

b. Letter of review/comment from Jeffrey Smith, Director Technology Support Services
February 2, 2009
Dear Stuart:
Thank you for sharing the new proposed track in Biological Sciences for a Professional Science Master’s degree. Drake Memorial Library has reviewed the proposal that combines instruction in science, business, and management. Current library resources are adequate to meet the information needs of students in this track. Going forward, it will be important for on-line access to full-time science and business databases to be kept up-to-date and available for academic success. Drake Library fully supports this proposal.

Sincerely,

Mary Jo Orzech, Ph.D. MLS
Director, Drake Memorial Library
Date: 2/3/2009

To: Dr. Stuart Tsubota

From: Jeffrey S. Smith, Director, Technology Support Services

Re: Information Technology Services support for the Professional Science Master's (PSM) track in the Master's of Science in Biological Sciences.

Technology Support Services is well equipped to support the Professional Science Master’s (PSM) track in the Master’s of Science in Biological Sciences. We look forward to helping with this effort. Among the areas where TSS can be of support are:

- Several teaching labs where students can learn hands-on
- Open access computer labs for students to utilize during non-class time
- Lab computers give students access to all software needed for their coursework
- Technology enhanced classrooms across the campus
- We utilize a world-class course management system
- Wireless network access throughout the campus and residence halls
- Each student has personal file storage that can be accessed from off-campus
- Each student has the ability to create a personal web space
- An outstanding, collaborative working relationship with the Brockport faculty

We are looking forward to working with you to help make this a success. If you have any questions, or need additional information, feel free to contact me.

Sincerely:

Jeffrey S. Smith
Director - Technology Support Services
The College at Brockport
jsmith@brockport.edu
BIO 504 Developmental Biology (A). Covers concept of developmental biology and the techniques and model organisms used to address current questions in the field. Covers developmental topics such as gametogenesis, fertilization, cleavage, organogenesis, cell differentiation, and localized and global signaling. 4 Cr.

BIO 514 Introduction to Immunology (A). Covers current concepts in immunology, structure and functions of the immunoglobulins, role of cell-mediated immunity, protective role of the immune system, and disease and injury related to malfunctions of the immune system. 3 Cr.

BIO 515 Molecular Biology (A). Covers the biosynthesis and function of macromolecules, especially nucleic acids. Includes topics in regulation, molecular virology, transposition and transformation, as well as recombinant DNA methods. 3 Cr.

BIO 520 Mechanisms of Aging (A). Prerequisites BIO 301 and BIO 302. Covers mechanisms of aging at the physiological, cellular, and molecular levels. Discusses aging as a disease that can be treated and prevented. Studies of aging in model organisms are used to provide insights into mechanisms of human aging. Finally, the evolution of aging mechanisms is discussed. 3 Cr.

BIO 526 Recombinant DNA (A). Considers theory and techniques in the recombinant DNA field. Includes topics such as cloning vectors, restriction analysis, PCR methods, and expression of cloned genes in both prokaryotes and eukaryotes. Also considers examples and implications of recombinant DNA methodology in plants and agriculture, as well as in medicine, human genetics and disease. 3 Cr.

BIO 529 Electron Microscopy (A). Covers the theory of electron optics and skills of electron microscopy, and methods of specimen preparation and skills of ultramicrotomy. Strongly emphasizes lab work and stresses technique. 4 Cr.

BIO 555 Neurophysiology (A). Introduction to neurophysiology emphasizing cellular and molecular processes. Biophysical properties and mechanisms used by neurons to code, process, propagate, and transmit information are examined. Neuronal function at the qualitative and quantitative level is covered. Students will quantify the effects of ionic gradients on the resting membrane potential of a neuron, describe its role in neuronal function, and will relate this to general effects on the human nervous system. Current techniques, including electrophysiology and microscopy, will be covered. 3 Cr.

BIO 566 General Endocrinology (A). Covers the relationship between the molecular structure of a hormone and its ability to regulate growth, metabolic and reproductive processes; mechanisms of action at cell and molecular levels; various endocrine diseases. 3 Cr.

BIO 567 Biochemistry I (A). Covers proteins, lipids, carbohydrates, nucleic acids and other biomolecules with an emphasis on buffers, structures, experimental methods, main energy production pathways and biosynthesis. Requires application of concepts and information to experimental data and deduction of structures, functional roles and mechanisms. 3 Cr.

BIO 568 Biochemistry II (A). Emphasizes topics such as metabolic pathways, human nutrition, chromosomes and genes, protein biosynthesis, cell walls, immunoglobulins, muscle contraction, cell motility, membrane transport, and excitatory membranes and sensory systems. Investigates the experimental evidence for the structure and functions of biomolecules. 3 Cr.

BIO 570 Biochemistry Lab (A). *Course fee. Covers biochemical analyses, including preparation, separations and characterization of products from a variety of biological sources. Provides experiments with enzymes and experiments designed to measure inherent changes in the dynamics of living systems. 1 Cr.

BIO 575 Cancer Biology (A). Covers a wide range cancer-related topics from the molecular basis of cancer to the clinical aspects of the disease. Considers cancer pathology, metastasis, carcinogenesis, genetics, oncogenes and tumor suppressors, epidemiology and current cancer treatments. 3 Cr.

BIO 580 Genomes and Proteomes in Biomedicine (A) 3 Cr.

*BIO 595 Memory, Self, and Brain (A). Introduces the student to concepts of how the brain forms the basis of our thoughts, feelings, actions, and sense of self. Covers brain development and the input of genes and environment to this process. Covers the cellular mechanisms of memory, emotion, motivation, and consciousness. 3 Cr.

BIO 622 Biology Seminar (A). Through discussion, deals with recent advances in selected areas of biology based on current literature and guest speakers. May be repeated for up to four credits toward the MS under different subtitles. Approved subtitles include: cellular biology; genetics and molecular biology and biotechnology. 2 Cr.

BIO 623 DNA Cloning Laboratory (A). Explores procedures involved in the isolation and cloning of DNA. Utilizes methods such as bacterial and viral growth, quantization and selection; restriction digestions, gene isolation and cloning, DNA ligase and PCR experiments, as well as site-specific mutagenesis. Also utilizes DNA fingerprinting using non-radioactive detection techniques. 3 Cr.

BIO 635 Cell Culture and Biotechniques (A). Provides independent, hands-on experience in Cell Biology techniques, including tissue culture, fluorescence microscopy, Western blots, DNA isolation and transfection, immunoprecipitation and
signaling assays. Students will utilize these techniques, while embarking on an independent research project. Experimental design and the inclusion of controls will be emphasized. 3 Cr.

*BIO 655 Processes of Drug Development (A), Students will become familiar with common drug development practice. Communication and collaboration between biologists, chemists, and marketing/business professionals is required for success. A problem-based learning approach will begin with an overview of the drug development process, discussing specific examples, and culminating with a development of a hypothetical drug. This course will develop communication, team skills, and a basic understanding of the pharmaceutical process.

BIO 692 Graduate Seminar (A). Required of all graduate students. Provides training in public speaking. Requires each student to present a seminar on some mutually agreeable topic in science that is critiqued for scientific content, style of presentation, quality of visual aids, impact on the audience, etc. 1 Cr. Every Semester

BIO 695 Topics in Biology (A). Current topics to be arranged by instructor in a special field of study. Details reflect student demand, needs and timely topics of interest. 1-3 Cr.

BIO 699 Independent Study (A). Designed individually through consultation between student and instructor to suit the student’s needs and interests and the special competence of the instructor. Additional requirements may be imposed by the department. 1-4 Cr.

BIO 702 Independent Research Experience (A). Requires an independent research experience, but permits a more flexible course of study than does a traditional thesis Program. Designed for Plan II of the MS program with teachers, medical technologists, lab technicians and other employed persons in mind. 1-4 Cr.

*PSI 601 Management and Communication for Math and Science Professionals. Develops key management and communication skills in Professional Science Master's students. Skills are essential for future development as practicing science and engineering professionals who have not been exposed to these in their undergraduate programs. They include development of skills in decision-making, leadership, group dynamics and coverage of salient issues in power and politics, organizational culture and organizational development. Course also covers project management applications and stresses professional communication.

*PSI 602 Accounting and Finance for Math and Science Professionals. Covers key concepts in accounting and finance and develops associated analytical skills for Professional Science Master's students, who have not been exposed to these in their undergraduate programs. Topics include analysis of financial statements, ratio analysis, financial forecasting and planning, operational and capital budgeting, cost-volume-profit analyses and risk and return concepts. Students are also familiarized with online and commercially available sources of financial data and required to conduct financial analyses using Microsoft Excel.

*PSI 603 Applied Quantitative Analysis for Math and Science Professionals. Reinforces and builds on understanding of key concepts in statistics and operations research for a Professional Science Master's students who have only taken a single statistics course at the undergraduate level. Topics include review of data types and distributions, classification and presentation, descriptive statistics and correlations, design of experiments and surveys, hypothesis testing, ANOVA, goodness of fit, applied regression analysis, quality control statistics, selected topics in queuing theory and mathematical programming. Course utilizes integrative case studies and the use of Microsoft Excel and commercial statistical packages (e.g., Minitab) for data analyses.

*New courses. Subject to approval by the Office of Academic Affairs.
9. Sequence in which courses will be offered to guarantee completion of requirements in reasonable time.

Below is a sample course schedule for the completion of the PSM track in two years.

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<tr>
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<th>Course</th>
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<td>BIO 5XX elective</td>
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<td>BIO 635 Cell Culture &amp; Biotechniques</td>
<td>3</td>
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<td>Winter 1st year</td>
<td>PSI 601 Management &amp; Communication for Math and Science Professionals</td>
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<td>Spring 1st year</td>
<td>BIO 5XX elective</td>
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<td>BIO 5XX elective</td>
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<td></td>
<td>BIO 623 DNA Cloning Lab</td>
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<tr>
<td>Summer 1st year</td>
<td>PSI 602 Accounting &amp; Finance for Math and Science Professionals</td>
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<tr>
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<td>PSI 603 Applied Quantitative Analysis for Math and Science Professionals</td>
<td>3</td>
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<tr>
<td>Fall 2nd year</td>
<td>BIO 702 Internship</td>
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<tr>
<td>Spring 2nd year</td>
<td>BIO 5XX elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>BIO 655 Processes of Drug Development</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>BIO 692 Graduate Seminar</td>
<td>1</td>
</tr>
</tbody>
</table>

Total Credits: 37

10. Staffing and Resources

All of the BIO courses are currently being taught or will be taught by tenure-track faculty in the Dept. of Biological Sciences. Coverage of these courses will fall under the normal teaching load of this faculty, and no additional resources will be required.

The PSM is a non-thesis track and thus will not require research resources from the current faculty or the Department of Biological Sciences. The increased enrollment in the BIO courses will be modest and current resources will be cover this increase. As stated on pp. 14 and in the letters of support (pp. 15-16), the present library and computer facilities are sufficient for the implementation of the PSM.

In implementing the Plus Courses, it will be important not to overly impose on the Department of Business Administration and Economics or to in anyway jeopardize its AACSB accreditation. This will be accomplished by offering the courses during Special Sessions (i.e., winter and summer sessions) rather than during the Fall and Spring semesters. The classes will be taught either by full-time faculty, who will receive extra compensation for their work or by adjunct faculty. The credentials of these faculty will be endorsed by subject experts in the appropriate field. Dr. Susan Stites-Doe has expressed an interest and willingness to teach Management and Communications for Science Professionals, and Drs. Mihail Barbosu and Jose Maliekal have expressed interest and willingness to teach Applied Quantitative Analysis for Science Professionals. The Special Sessions budget, based on student enrollment, will finance these courses. Thus, no additional resources from other departments will be needed for the instruction of these courses. Dr. John Gardner, interim Chair of the Department of Business Administration and Economics, and Dr. Karen Schuhle-Williams, Director, Special Sessions & Programs and Executive Director, MetroCenter have endorsed this plan (Section 11).

Program Director

To coordinate the program and to serve as the contact person for the program, the job of Program Director will be taken on by one of the faculty in Biological Sciences. The Program Director will play a major role in recruitment, admissions decisions, and advising of the students. An additional role of the Program Director will be to coordinate the internships and to act as a liaison with the industry partners. The job of Program Director will be considered part of the service duties of the faculty member who takes on the job.

In summary, other than the possible hiring of adjuncts for the Plus courses during the Special Sessions, there will be no need for new staff.
11. Letters of Support

a. Award letter to The College of Brockport for funding off of the Sloan Foundation Grant.

b. Dr. Eleanor L. Babco - Senior Consultant and Co-Director Professional Master’s Initiative Council of Graduate Schools. Endorsement of the PSM curriculum in Biological Sciences.

c. Dr. Shaun Martin - Director, Preclinical Research and Development, Vaccinex, Inc. Support for the development of the PSM at Brockport.

d. Dr. Ron Valente – Director, Rochester Film Base Manufacturing Eastman Kodak Company. Support for the development of the PSM at Brockport.

e. Dr. John Gardner - Professor and Interim Chair, Department of Business Administration and Economics. Support for the plan to implement the Plus Courses.

f. Dr. Karen Schuhle-Williams - Director, Special Sessions & Programs and Executive Director, MetroCenter. Support for the plan to implement the Plus Courses.
From: Pandit, Kavita [mailto:Kavita.Pandit@suny.edu]
Sent: Wednesday, January 16, 2008 10:15 AM
To: Sue Stites-Doe
Cc: Kraushaar, Robert; Anne Huot
Subject: PSM Award

Dear Sue:

I am delighted to inform you that your PSM proposal was one of those selected for full funding at the $15,000 level by the PSM Review Committee. The committee was in unanimous agreement that this proposal laid out a very compelling plan to explore the PSM potential and had a strong institutional support and match. An official award letter will soon follow that identifies the expected timeframe and deliverables related to this award. However I wanted to get back to you as soon as possible so that you can begin to plan your activities for Spring semester.

Congratulations, and thank you for your contributions to the SUNY PSM initiative!

Kavita

Kavita Pandit
Senior Vice Provost
SUNY System Administration
518-443-5154
Kavita.Pandit@SUNY.edu
PhD
Dean of Graduate Studies
The College at Brockport
Brockport, NY 14220

Dear Dr. Stites-Doe:

The Council of Graduate Schools (CGS) Professional Science Master’s (PSM) Team has reviewed the proposed PSM in Biological Sciences using the existing Plan II Master’s that you submitted to us. The proposed program meets all of the guidelines established by the National PSM Advisory Board. There should be no difficulty in becoming affiliated with the PSM community, and we encourage you to move ahead.

The guidelines to follow in order to meet the criteria and be designated a PSM are published on the scientemasters.com website and we suggest that you consult these when you submit your application for affiliation. Specifically we examined and found your program meets the following:

- The total credits, including required projects and internships, are equivalent to a standard master's degree (approximately two years, full-time equivalent).
- That the majority of course work is in graduate-level science and/or mathematics courses in one or more disciplines.
- The professional skills component consists of a variety of relevant courses and activities.
- An internship
- An impressive engaged client Board of Advisors.
- The new course in Commercial Production of Biologics being developed should be a big plus to bridging the science and management side of drug development.

Once the PSM is approved, you would also have to attempt to track the career trajectory of every graduate in order to help assess program outcomes and success, and agree to use the name “Professional Science Master’s” and the PSM logo (which CGS will provide) on websites and advertising brochures. However, in turn the program will be listed on CGS national PSM websites and will be included in CGS PSM promotional activities developed by the PSM Advisory Board.

We look forward to continuing our relationship as you move toward becoming a member of the PSM community.

Sincerely yours,
Eleanor L. Babco
Senior Consultant and Co-Director Professional Master’s Initiative
Council of Graduate Schools
Dear Stuart,

Personally, I think this is a great idea. Too often, colleges focus on pumping out good scientists who focus only on the science and do not understand anything about the business of science. On the other side, most of the business people in science do not have a science background! When you mix the influence of finance into daily science, it completely changes the scientific landscape. I will be happy to talk to you or your group on my thoughts on this topic. Others in the company that you may want to approach who may have good input would be our CEO (Maurice Zauderer), CSO (Ernest Smith) or VP Operations (Ray Watkins). I will forward your message to each of them.

I am going to be out of town from Dec 7 through Dec 17 but please feel free to call me any time outside of these dates and I will be happy to help as much as possible.

Regards
Shaun

Shaun C. Martin, Ph.D.
Director Preclinical Development
Vaccinex Inc.
1895 Mt Hope Ave.
Rochester, NY 14620
ph: 585 271 2700 x 123
fax: 585 271 2765
mobile: 585 719 6188
email: smartin@vaccinex.com
Re Professional Science Masters Program:

I think there are possible benefits for someone with this background in Research, Development or Manufacturing, although likely being better suited for the later two. The specific skills that I think would be useful/employable/employable that would supplement a science based masters degree would include:

- Project Management
- Statistics-DOE
- Marketing
- Communication
- Leadership
- Financial Management
- Managerial Accounting
- Intellectual Property Law

I also think that including representatives from business, industry, government in the program planning and administration is also a big positive for this program. As we look forward in developing our own corporate competitiveness for the future, the need for strong leaders with an appropriate level of technical background is exceedingly crucial.

Best Regards,

Ronald R. Valente

Ronald Valente | Director, Rochester Film Base Manufacturing | 2/317/KP | MC:23631 |
Eastman Kodak Company | 1669 Lake Ave Rochester, NY 14652-4421 |
ronald.valente@kodak.com | Office Phone: 585-722-2775 | Fax: 585-477-0667 |

Kodak
MEMORANDUM

Date: December 22, 2008

To: Susan Stites-Doe
Dean of Graduate Studies

From: Dr. John Gardner
Professor and Interim Chair
Department of Business Administration and Economics

Subject: PSM in Biological Science Proposal

From my understanding from your briefing and your email request for support I do not see problems or difficulties that arise from the perspective of the Department of Business Administration and Economics. This is predicated on three key issues. First, no business and economics faculty will be asked to teach the courses in the Fall or Spring terms. We are already stretched extremely thin in terms of faculty resources to meet the mission and the continuous improvement standards of our accreditation body. Second, the program will never have more than 25% of its course requirement from the traditional business discipline as this is a clear problem with our AACSB accreditation standards. Finally, the courses will not be housed in the Department of Business Administration and Economics. Adding to the managerial overhead of the department at this time cannot be supported.

I am appending the email from which I draw my conclusions so that there is no confusion as to what I am evaluating. The email from Susan Stites-Doe is dated December 19, 2007.

State University of New York • College at Brockport • 350 New Campus Drive • Brockport, New York 14420-2965
(585) 395-2623 • FAX (585) 395-2542 • www.brockport.edu
To: Dr. Stuart Tsubota, Professor Biological Sciences

From: Dr. Karen Schuhle-Williams, Director Special Session & Programs
Executive Director, MetroCenter

Date: February 4, 2009

RE: Support for PSM in Biological Sciences

Please accept my sincere support and enthusiasm for the proposed Professional Science Master's (PSM) track in the Master's of Science in Biological Sciences. My support is based on the plan to implement the Plus Course offerings during the Special Sessions (i.e., SummerSession and/or WinterSession), possibly at The College at Brockport MetroCenter.

The College's Special Sessions are administered as a cost center, thus precluding tapping individual department resources to pay faculty instruction costs for the Plus Courses. Stipend rates are based on a per student/enrollment formula, allowing pro-rated stipends for under-enrolled courses and supplemental payments for over-enrolled courses.

The MetroCenter has the potential to be an excellent geographic “fit” for the Plus Courses, as it provides commuting students with centralized, easy access to a College facility, often within walking distance of those working in downtown Rochester. Its central location, with quick access to major expressways, provides easy-on and easy-off access for those commuting regionally. The MetroCenter caters to adult students, featuring 18 classrooms, three computer labs and state-of-the-art instructional technology resources. There are student lockers, conference rooms, administrative offices, designated departmental offices, a career services satellite center, the library commons, and a student lounge with vending services that accept Easy Money. Classrooms are outfitted with training style furniture and instructional amenities. Offering the Plus Courses downtown, supports President Halstead's initiative to enhance our reputation and visibility to the Rochester business community.

Please feel free to contact me if you need more information. Thank you for your consideration of including the MetroCenter and Special Sessions and Programs in this exciting, progressive program.
APPENDIX A

Charge of the PSM Advisory Council:

1. To assess the fit of the PSM program concept to the SUNY Brockport campus, and to determine the feasibility of launching one or more programs. In assessing the question of fit the advisory team may wish to use the following questions as a guide:
   a. Would our graduates fill human resource demand needs in the regional labor market surrounding the greater Rochester standard metropolitan area?
   b. Is such a program sustainable over the long run, given our resources, indications of labor market demand, and faculty interests?

2. To examine, in particular, existing Masters programs to determine their viability for adaptation as a PSM program.

3. To assess the human resource needs of the surrounding labor market as it pertains to their interest in employing persons that carry PSM credentials. Part of this process will entail gathering a directory of corporations that may be interested in employing PSM interns and, later, employ graduates. Survey methodology may be necessary for this step in our process.

4. To explore the extent to which SUNY Brockport can work within the SUNY system initiative created as a result of the Sloan Grant award, as a means of garnering and sharing resources, and bringing sustainability to the PSM program/s.

It is expected that the team submit a final report to the Provost by 2/1/08.
### Professional Science Masters (PSM) Program Advisory Council Members

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<th>email address</th>
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<td>115b Hartwell,</td>
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<td>132 Smith Hall</td>
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<td>Claire Vandenberghe</td>
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<td>101 G Rakov</td>
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<td>Director, Career Services</td>
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The College at Brockport Professional Science Masters Board of Advisors: 2008

Cathy Brill
Director, Talent Acquisition & Development, Eastman Kodak Company
- Masters Degree in Engineering and Manufacturing Management, Clarkson University
- Currently, Leader of Global Strategic HR Programs supporting Kodak’s transformation
- 15 years in engineering, manufacturing, quality and operations management

Kraig M. Kummer, FSA
Kraig Kummer is a Principle in the Rochester, NY office of Mercer, the world’s largest human resource consulting firm specializing in employee benefits, compensation and human capital strategy. The company, headquartered in New York City, has more than 13,000 employees serving clients from 145 offices in 41 countries and territories. Mr. Kummer leads the retirement business in Rochester. He consults with retirement plan sponsors on the design, funding and administration of defined benefit pension plans. He also provides actuarial valuation and related advisory service to both public and private sector employers sponsoring postretirement benefit plans other than pensions (OPEB) in particular postretirement medical plans. Mr. Kummer joined the company’s Boston office in 1985 as a consulting actuary, later transferring to the investment consulting practice where he advised clients on Guaranteed Investment Contracts, Group Annuity Contracts and other insured products. He transferred to Mercer’s Rochester office in 1990. Mr. Kummer holds a bachelor of science degree in business administration from Bucknell University. He is a Fellow of the Society of Actuaries and an enrolled actuary under the Employee Retirement Income Security Act (ERISA).

Mary E. Maida, PhD
President and CEO, The Medingen Group and Clerisy Corporation
- 2001 Ph.D. in molecular neuroscience, University of Rochester School of Medicine
- She established The Medingen Group, LLC to provide medical professionals with the means to incubate and transfer their privately held intellectual property (IP) into the marketplace. In recent years, the Medingen Group has expanded to provide scientific, medical and clinical Due Diligence for Academic Institutions, Medical Institutions and Financial Institutions. The Medingen Group has grown to now serve as a research and development incubator for academic/medical institutions as well as medical professionals.

- While at U of R Dr. Maida worked in the laboratory that discovered the Cox 2 gene found to contribute to the causation of certain cancers, e.g., prostate cancer. She now serves as an adjunct faculty member in the Neuroscience at U of R.

Shaun Martin, Ph.D.
Director, Preclinical Research and Development, Vaccinex, Inc.: 
- Ph.D. in physiology, University of Liverpool, UK
- Dr. Martin joined Vaccinex in 2005 as its Director of Pre-Clinical Research and is part of the team responsible for directing the transition of discovery-stage antibodies into lead drug candidates suitable for pre-clinical development. Dr. Martin has broad expertise in designing bio-safety programs for large therapeutic molecules, including antibodies, and has significant experience in facilitating the complex processes involved in evaluating the pharmacology and toxicology of therapeutic drug candidates.
- Prior to joining Vaccinex, he was Senior Director, Business Development for MDS Pharma Services, one of the world's largest Contract Research Organizations ("CRO"). He did post-doctorate research at the University of Liverpool where he investigated intracellular cell signaling mechanisms and the control of insulin secretion and thyroid function. He later joined the University of Rochester School of Medicine as a Post-doctoral Fellow in Pharmacology, conducting research in the areas of receptor pharmacology and intracellular signaling mechanisms.
Michael Schrader, Vice President
Global Engineering, Global Operations & Engineering Bausch & Lomb
• The Executive Program, University of Michigan Business School, 2000
• BS Chemical Engineering, Lafayette College
• Leader for a Global Technical staff that provides product development, process/capital engineering, pilot line operations and factory support for the manufacture of medical devices including contact lens, intraocular lens/inserters, lens solutions, and ocular pharmaceutical solutions.
• Staff size: 250 people in five centers in the US and Europe

Ron Valente, Director
Rochester Film Base Manufacturing Eastman Kodak Company
• 1998 Ph.D. in organic chemistry, University of Rochester
• Responsible for managing a $300M product bill associated with the manufacture of all Polyester and Acetate photographic film base for Eastman Kodak. Responsible for overall financial performance of the Division, personnel, Health / Safety / Environment (HSE), inventory, capital, Sarbanes Oxley (SOX) compliance and execution of Annual Strategic plans to deliver on all manufacturing commitments.
Background:
Early in the 2007/ 2008 academic year the graduate dean was charged with forming an advisory council to conduct a feasibility study on the possibility of creating one or more Professional Science Masters programs on campus.

Summary of Accomplishments:

1. **Formation of advisory committee**
   - The council met 10 times as a group over the course of the semester, and additional meetings were held in sub-groups.

2. **Formation of external Board of Advisors**
   - The Advisory Council met with the Board of Advisors at Bausch and Lomb Headquarters in April. Key learning points from that meeting include the following:
     a) The local manufacturing sector represented by Bausch and Lomb and Kodak is having a very difficult time acquiring needed talent from the region and is very enthusiastic about the PSM program concept.
     b) They have very high expectations about what a PSM graduate should be prepared to do in terms of “big picture” management potential and readiness in the organization.
     c) They support the development of tailored courses intended for each individual PSM program idea over the notion of an “off the shelf” courses in, e.g., Public Administration.
     d) They support longer term placement in internships over short term placement.

3. **Lead program idea arrived at by the Council: PSM in Biological Science**
   - Adaptation of existing non-thesis option in Biological Sciences to begin enrolling students in fall, 2010. This start date could be escalated to fall, 2009 if the plus course design work evolves more rapidly than is initially anticipated, and SUNY and SED approval were fast tracked.
   - The program will be expected to be small in size, and its growth would be dependent on faculty resources and student demand for the degree.

4. **Brainstorming future program development ideas:**
   - Bio/ Chemistry PSM
   - Chemistry PSM
   - Applied Mathematics
   - Biology/ Mathematics
   - Computational Science

5. **Funding:** The College at Brockport received a grant from SUNY/ Sloan, and participated in two separate PSM, Fund for the Improvement of Postsecondary Education (FIPSE) grant proposals that were submitted in the spring of 2008.

6. **Faculty support from the SUNY/Sloan grant:**
   - Two faculty members are receiving funding from the Sloan grant to make progress on the development of a PSM in Biological Sciences:
     - Dr. James Cordeiro is working on the development of Plus Courses.
     - Dr. Stuart Tsubota is working on documents that will be submitted to SUNY System Administration for approval of the program concept.

7. **Market demand for the degree**
   - The Council believes that the market area is supportive of PSM programs in general. An email survey was developed by the Science Faculty on the Council, and distributed to a collection of 53 Bio and Life
Sciences companies in the Rochester area. Results from that survey caused us to be optimistic about the receptivity of the market to the program idea.

- The most positive feedback about the program idea was received from the Board of Advisors itself, as noted above.

8. **Summer, 2008 work with the Board of Advisors:**
   - The external board of advisors expressed an interest in being actively involved, and would like to place our interns as soon as possible, even prior to the start of the PSM program development.
   - A “spin off” free-standing certificate idea is blooming for the “plus” course configuration. Dr. James Cordeiro will explore the viability of this concept as part of his work with the committee.

9. **Next steps in support of the PSM initiative on campus:**
   - It is recommended that the campus use the SUNY/Sloan funding to participate in the National PSM Association first annual conference to be hosted in the fall of 2008.
     - The NPSMA 2008 Annual Conference will be held on Thursday, November 13 and Friday, November 14 at the Georgia Tech Hotel and Conference Center in Atlanta.
   - Dr. Stites-Doe has been asked to serve on the SUNY PSM Executive Committee.
     - Interaction with other PSM program directors across SUNY campuses will be critical to evaluation of our cross-fertilization of the PSM regional collaboration element that was built into the Sloan grant award made to SUNY.
Subject line: Inquiry from Science faculty at The College at Brockport

Dear Colleague:

A small group of science faculty from The College at Brockport have been charged with exploring the potential demand for Professional Science Master’s degree programs. We are writing to you as a member of the biotech, environmental science, life science, and/or related industry community in the Rochester area to ask you (2) simple questions, which appear below.

The following background information will help you answer our questions by highlighting the key features of Professional Science Masters (PSM) programs:

- PSM programs prepare students for careers in business, government, or nonprofit organizations, where workforce needs are increasing.
- PSM programs combine rigorous Masters level academic training in the sciences and mathematics, with highly-valued management skills training, e.g. writing and communication skills, regulatory affairs, technology transfer, essentials of financial management, etc.
- Graduates are expected to be able to easily interact with researchers and managers throughout the enterprise, especially with marketing, finance, and legal professionals.
- Each PSM student completes an internship in a business, non-profit or governmental agency or organization.
- Because of the addition of an internship and additional courses in management, PSM programs are longer than other science and math programs, and are typically two-years in length.
- In terms of scale, there are currently over 100 PSM programs in the U.S., offered by over 50 colleges and universities.
  - See [http://sciencemasters.com](http://sciencemasters.com) for additional information.

We would appreciate your response to these two questions; please feel free to respond to this email message to do so conveniently.

1. In general, would you say that the PSM would be a good hiring criterion for your organization; i.e. would you hire students with a PSM degree?
2. Would your organization be suitable for the placement of a Professional Science Masters student intern?

We would also be pleased to speak with you about this program idea at any time. You may reach Dr. Susan Stites-Doe, Dean of Graduate Studies at the following phone number and email address.

Sincerely yours,

Steve Godleski, PhD, Chemistry Department Chair
Stuart Tsubota, PhD, Biological Science Department Chair
Stanley Radford, PhD, Physics Department Chair
Susan Stites-Doe, PhD, Dean of Graduate Studies, sstites@brockport.edu  585-395-2525
APPENDIX F

Career Connection Focus Group:
Friday, 10/3/08 at 10:45 (location TBD)

Alumni:
- Ms. Holly Cicconi-Eggleston, ITT
- Mr. Bob Confer, Confer Plastics
- Mr. Wayne Didas, Eastman Kodak
- Mr. Darren Fitch, Abbott
- Ms. Lauren Kerwawycz, Xerox
- Mr. Chris Lindner, IBM
- Mr. Matt Mullen, Lockheed Martin
- Mr. Jeff Tighe, BAE Systems
- Ms. Shelli Ulrich, GE

Faculty members: (As schedules permit)
- Dr. James Cordeiro, Business Administration and Economics
- Dr. Adam Rich, Biological Sciences
- Dr. Steven Godleski, Chemistry
- Dr. Eileen Daniel, Health Sciences and Associate Dean, School of Professions
- Dr. Jose Maliekal, Earth Sciences and Associate Dean, School of Letters and Sciences
- Dr. Susan Stites-Doe, Business Administration and Economics, Dean of Graduate Studies, Chair of the PSM Advisory Committee

Agenda:
1. Welcome and Introductions
2. Overview of the PSM degree path
3. Discussion questions:
   a. Potential utility of degree programs in your organizations
   b. Kinds of “plus” professional development courses of greatest value to you
   c. Potential value to your organization of 3-course certificate program comprised of plus courses
   d. Who in their organizations we might be able to interact with for sharing information as we roll out the certificate program and PSM program for your employees
   e. Other comments/ questions
APPENDIX G

Course description of the Plus Courses and the new BIO course

1. PSI 601 Management & Communication for Math and Science Professionals
2. PSI 602 Accounting & Finance for Math and Science Professionals
3. PSI 603 Applied Quantitative Analysis for Math and Science Professionals
4. BIO 655 Processes of Drug Development
**College Course Registration Form**

This form is used to register all courses. It must be signed by the department chair and the school dean who will send it forward to the Registrar’s Office. Registration of General Education courses requires an additional *Supplemental Course Registration Form* and the appropriate *Student Learning Outcomes Checklist*. Approval by the Faculty Senate’s General Education Committee is necessary for all General Education courses.

Data entry fields are shaded. Some fields have limits on numbers and spaces that can be entered. Some areas have drop-down menus with options that can be selected by clicking your choice. Save the blank form before using it and then save each course form with an individual file name. Go back to the saved blank for each new form but save with a different name after filling in data.

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### Action concerns a new course

<table>
<thead>
<tr>
<th>Discipline</th>
<th>PSI</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>601</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Action concerns an existing course: Discipline | Number

---

**Course Submitted by:** Dr. James Cordeiro  
**Department:** Business Administration & Economics (for PSM Program)

Chairperson’s Approval: __________________________ Date:

Dean’s Approval: __________________________ Date:

---

1. Action requested:
   - Registration of new course
   - Revision of content for existing course
   - Registration of general course listing under which related titles can be taught (umbrella courses)
   - Registration of topics course for specific semester (if checked, complete item 2 below)
   - Change of course title – Previous Title:
   - Inactivation of existing course registration (course will not be taught in near future)
   - Other – Describe:

2. Complete for registration of topics courses or umbrella courses:
   a. General course registration: Discipline: Number:
   b. General registration title:
   c. Specific course title for semester offered (topics course title):
   d. Topics course registration is for: WINTER SESSION Year: 2010

3. a. Undergraduate listing: Discipline: Number:
   b. Graduate listing: Discipline: PRO Number: 601

4. a. Official course title: Management & Communication for Math and Science Professionals
   b. Course start date: WINTER SEMESTER YEAR: 2010

5. Abbreviated course title (restricted to 16 spaces) PSCI_Mgtcomm

6. a. Semester hours of credit assigned to course (invariable): 3
   b. Can this course have variable credit? No [x] Yes - Credit range to semester hours
   c. Is this course is repeatable for multiple credit? No [x] Yes - Credit Maximum =

7. Type of Course: NON-LIBERAL ARTS

8. General Education Information: (Complete only for General Education courses)
   a. General Education Knowledge Area (choose one if applicable): NONE
   b. Additional student learning outcomes: (check all codes that are currently approved)

   - Contemporary Issues (I)
   - Upper Level Writing (U)
   - Both Contemporary Issues and Upper Level Writing (J)
   - Scholarship on Women (W)
   - Diversity (D)
   - Science & Technology (E)
   - Other World Civilizations (Non-Western) (O)

9. If cross-listed in another discipline(s), give discipline(s)/number(s):
   If there are pre-requisites that are enforced, give discipline(s)/number(s):
   If there are co-requisites, give discipline(s)/number(s):
10. a. Approximate total number of seats/semester expected: 15
    b. How many sections do you expect to offer per semester: 1

11. Sections of this course are (check one): taught by one instructor ☒ taught by a team ☐

12. Planned frequency of offering: EVERY WINTER

13. Grading (check any that apply):
    ☒ Letter grade ☐ Pass/Fail (S/U) ONLY ☐ Approved for IP grade
    ☐ Course requires a minimum grade of ☐ for General Education or the major

14. If this course requires any special scheduling arrangements with regard to time or room/space, please comment on this in the space provided:

15. If this course is required for any degrees/programs, please list them below:
    PSM (Professional Science Masters) in Biological Sciences

16. Write a brief course description for the College Catalogs. Reflect content as accurately as possible using 65 words or less (about 500 characters. Use action verbs and omit “This course covers…” and similar phrases.

   Develops key management and communication skills in professional science masters students. Skills are essential for future development as practicing science and engineering professionals who have not been exposed to these in their undergraduate programs. They include development of skills in decision-making, leadership, group dynamics, and coverage of salient issues in power and politics, organizational culture and organizational development. Course also covers project management applications and stresses professional communication.

17. For all courses, please attach the following information:
    (a) a list of major course objectives
    (b) a topical outline of course
    (c) a list of methods used to evaluate student performance
    (d) a list of instructional materials used – give bibliographic citations of texts, critical readings, films, e
    (e) a current course syllabus, if possible
    (f) a brief statement detailing the additional work required of graduate students in a “swing course.”

For General Education courses only, attach also:
    (g) Supplemental General Education Course Registration Form
    (h) Student Learning Outcomes Checklist (for specific codes requested).
(a) Major Course Objectives

The course is intended to develop key management and communication skills in professional science masters students. These skills are essential for future development as practicing science and engineering professionals. Students will typically not have not been exposed to these in their undergraduate programs.

The course focuses on the development of specific skills in decision-making, leadership, group dynamics. It also includes coverage of salient issues in organizational power and politics, organizational culture and organizational development.

The course also covers project management applications using project management software such as Microsoft Project and stresses professional communication including the enhancement of technical writing skills and reflective writing, case analyses and team reports.

Prerequisites: None.

Frequency of Offering: At least once a year (initially in Summer Session).

(b) Topical Outline

1. Team development and management; effective group dynamics.
2. Effective decision-making by individuals and teams in organizations. (will also include coverage of cognitive biases and other hidden pitfalls in effective individual and team decision-making).
3. Effective leadership (will also include coverage of ethical dilemmas and other ethical issues faced by individuals and groups in organizations).
4. Power and politics in organizational life.
5. Topics in organizational culture.
6. Topics in organizational development.
7. Project management as a management tool including basic Microsoft-Project software applications.
8. Individual communication skills (memos, reports, reflections case analyses).
9. Group communications (reports and presentations based on group analyses).

(c) List of methods used to evaluate student performance.

Students will be assigned letter grades on the basis of:

(a) attendance and class participation
(b) performance on individual tests and assignments (including reports and case analyses)
(c) team participation, verbal and written analyses and presentations.
(d) List of instructional materials used.

Textbooks:

Instructors will supplement textbook coverage of course topics by utilizing lecture, class discussion and case analyses along with group participation. Computer demonstrations (e.g., Microsoft Project), multimedia presentations and guest speakers may be used as appropriate.

(e) Current course syllabus (if possible). The course is not being currently taught.

(f) Brief statement detailing additional work required of graduate students in swing courses. This is not applicable as the course is not a swing course.

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1 Alternative texts for the communication section are:


3. 
College Course Registration Form

This form is used to register all courses. It must be signed by the department chair and the school dean who will send it forward to the Registrar’s Office. Registration of General Education courses requires an additional Supplemental Course Registration Form and the appropriate Student Learning Outcomes Checklist. Approval by the Faculty Senate’s General Education Committee is necessary for all General Education courses.

Data entry fields are shaded. Some fields have limits on numbers and spaces that can be entered. Some areas have drop-down menus with options that can be selected by clicking your choice. Save the blank form before using it and then save each course form with an individual file name. Go back to the saved blank for each new form but save with a different name after filling in data.

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**Action concerns a new course**

**Discipline PSI Number 602**

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**Action concerns an existing course:**

**Discipline Number**

---

**Course Submitted by:** Dr. James Cordeiro

**Department:** Business Administration & Economics (for PSM Program)

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**Chairperson’s Approval:** ___________________________ Date:

**Dean’s Approval:** ___________________________ Date:

---

1. **Action requested:**
   - ☑ Registration of new course
   - ☐ Revision of content for existing course
   - ☐ Registration of general course listing under which related titles can be taught (umbrella courses)
   - ☐ Registration of topics course for specific semester (if checked, complete item 2 below)
   - ☐ Change of course title – Previous Title:
   - ☐ Inactivation of existing course registration (course will not be taught in near future)
   - ☐ Other – Describe:

3. **Complete for registration of topics courses or umbrella courses:**
   - a. General course registration: Discipline: Number:
   - e. General registration title:
   - f. Specific course title for semester offered (topics course title):
   - g. Topics course registration is for: SUMMER SESSION Year: 2010

3. a. ☐ Undergraduate listing: Discipline: Number:
   b. ☑ Graduate listing: Discipline: PRO Number: 602

4. a. Official course title: Accounting and Finance for Math and Science Professionals
   b. Course start date: SUMMER SEMESTER YEAR: 2010

6. **Abbreviated course title (restricted to 16 spaces) PSCI_AccFin**

6. a. Semester hours of credit assigned to course: (invariable): 3
   b. ☑ Can this course have variable credit: No ☑ Yes - Credit range to semester hours
   c. Is this course is repeatable for multiple credit? ☑ No ☑ Yes - Credit Maximum =

7. **Type of Course:** NON-LIBERAL ARTS

9. **General Education Information:** (Complete only for General Education courses)
   - a. General Education Knowledge Area (choose one if applicable): NONE

   b. Additional student learning outcomes: (check all codes that are currently approved)
      - Contemporary Issues (I)
      - Upper Level Writing (U)
      - Both Contemporary Issues and Upper Level Writing (J)
      - Scholarship on Women (W)
      - Diversity (D)
      - Science & Technology (E)
      - Other World Civilizations (Non-Western) (O)

10. If cross-listed in another discipline(s), give discipline(s)/number(s):
    If there are pre-requisites that are enforced, give discipline(s)/number(s):
    If there are co-requisites, give discipline(s)/number(s):
10. a. Approximate total number of seats/semester expected: 15  
b. How many sections do you expect to offer per semester: 1

11. Sections of this course are (check one): taught by one instructor ☒ taught by a team ☐

12. Planned frequency of offering: EVERY SUMMER

14. Grading (check any that apply):  
☒ Letter grade ☐ Pass/Fail (S/U) ONLY ☐ Approved for IP grade  
☐ Course requires a minimum grade of ☒ for General Education or the major

14. If this course requires any special scheduling arrangements with regard to time or room/space, please comment on this in the space provided:

15. If this course is required for any degrees/programs, please list them below:  
   PSM (Professional Science Masters) in Biological Sciences

16. Write a brief course description for the College Catalogs. Reflect content as accurately as possible using 65 words or less (about 500 characters). Use action verbs and omit “This course covers...” and similar phrases.  

   Covers key concepts in accounting and finance and develops associated analytical skills for professional science masters students who have not been exposed to these in their undergraduate programs. Topics include analysis of financial statements, ratio analysis, financial forecasting and planning, operational and capital budgeting, cost-volume-profit analyses and risk and return concepts. Students are also familiarized with online and commerically available sources of financial data and required to conduct financial analyses using Microsoft Excel.

18. For all courses, please attach the following information:  
   (i) a list of major course objectives  
   (j) a topical outline of course  
   (k) a list of methods used to evaluate student performance  
   (l) a list of instructional materials used – give bibliographic citations of texts, critical readings, films, e  
   (m) a current course syllabus, if possible  
   (n) a brief statement detailing the additional work required of graduate students in a “swing course.”

For General Education courses only, attach also:  
   (o) Supplemental General Education Course Registration Form  
   (p) Student Learning Outcomes Checklist (for specific codes requested).
Addendum for PSI 602 -- Accounting and Finance for Math and Science Professionals

(g) Major Course Objectives

The course is intended to develop necessary knowledge in accounting and finance in professional science masters students. Since accounting and finance underlies key decisions and reporting in scientific and engineering enterprises, this knowledge is essential for future development as practicing science and engineering professionals who have not been exposed to these in their undergraduate programs.

Content coverage includes coverage of financial statement (balance sheet, income statement, and statement of cash flows), analysis of financial statements using ratio analysis, financial planning and forecasting, time value of money techniques, discounted cash flow analysis and valuation (net present value, internal rate of return, etc...), operating and capital plans and budgeting, cost-volume-profit and leverage analyses, and cost allocation systems.

The content coverage is reinforced by mandatory projects that involve the analysis of firm-level financial data acquired from online sources as well as commercial financial databases such as COMPUSTAT. The course also stresses professional communication including the enhancement of technical writing skills and case analyses and individual and team reports.

Prerequisites: None, other than basic familiarity with Microsoft Excel.

Frequency of Offering: At least once a year (initially in Summer Session).

(h) Topical Outline

12. Financial planning concepts and techniques.
14. Time value of money concepts and techniques: future values, present values, annuities, net present value concepts and applications.
15. Discounted cash flow analysis and valuation: basic valuation model, applications to net present value, profitability index, internal rate of return
17. Cost-volume-profit and leverage analyses.
18. Operational planning and budgeting.
19. Cost allocation systems.
20. Risk, return, diversification and asset pricing concepts.
21. Individual and team data analysis and reporting (memos, reports, case analyses).

(i) List of methods used to evaluate student performance.

Students will be assigned letter grades on the basis of:

(a) attendance and class participation
(b) performance on individual tests and assignments (including reports and case analyses)
(c) team participation, verbal and written analyses and presentations.

(j) List of instructional materials used.

Textbooks:

Instructors will supplement textbook coverage of course topics by utilizing lecture, class discussion and case analyses along with group participation. Computer demonstrations of financial analysis techniques using Microsoft Excel and of acquisition of data from online sources (EDGAR, yahoo.com, corporatelibrary.com, and COMPUSTAT), multimedia demonstrations, and guest speakers may be used as appropriate.
(k) **Current course syllabus (if possible).** *The course is not being currently taught.*

(l) **Brief statement detailing additional work required of graduate students in swing courses.** *This is not applicable as the course is not a swing course.*
College Course Registration Form

This form is used to register all courses. It must be signed by the department chair and the school dean who will send it forward to the Registrar’s Office. Registration of General Education courses requires an additional Supplemental Course Registration Form and the appropriate Student Learning Outcomes Checklist. Approval by the Faculty Senate’s General Education Committee is necessary for all General Education courses.

Data entry fields are shaded. Some fields have limits on numbers and spaces that can be entered. Some areas have drop-down menus with options that can be selected by clicking your choice. Save the blank form before using it and then save each course form with an individual file name. Go back to the saved blank for each new form but save with a different name after filling in data.

Action concerns a new course  Discipline PSI Number 603
Action concerns an existing course: Discipline Number

Course Submitted by: Dr. James Cordeiro
Department: Business Administration & Economics (For PSM Program)

Chairperson’s Approval: ___________________________ Date:
Dean’s Approval: ___________________________ Date:

1. Action requested:
   - ☑ Registration of new course
   - ☐ Revision of content for existing course
   - ☐ Registration of general course listing under which related titles can be taught (umbrella courses)
   - ☐ Registration of topics course for specific semester (if checked, complete item 2 below)
   - ☐ Change of course title – Previous Title:
   - ☐ Inactivation of existing course registration (course will not be taught in near future)
   - ☐ Other – Describe:

4. Complete for registration of topics courses or umbrella courses:
   a. General course registration: Discipline: Number:
   h. General registration title:
   i. Specific course title for semester offered (topics course title):
   j. Topics course registration is for: SUMMER SESSION  Year: 2010

3. a. ☐ Undergraduate listing: Discipline: Number:
   b. ☑ Graduate listing: Discipline: PRO Number: 603

   b. Course start date: SUMMER  SEMESTER  YEAR: 2010

7. Abbreviated course title (restricted to 16 spaces) PSCI_Mgtcomm

6. a. Semester hours of credit assigned to course (invariable): 3
   b. Can this course have variable credit ☐ No ☑ Yes - Credit range to semester hours
   c. Is this course is repeatable for multiple credit? ☐ No ☑ Yes - Credit Maximum =

7. Type of Course: NON-LIBERAL ARTS

10. General Education Information: (Complete only for General Education courses)
   a. General Education Knowledge Area (choose one if applicable): NONE
   b. Additional student learning outcomes: (check all codes that are currently approved)
      ☐ Contemporary Issues (I) ☐ Upper Level Writing (U)
      ☐ Both Contemporary Issues and Upper Level Writing (J)
      ☐ Scholarship on Women (W) ☐ Diversity (D)
      ☐ Science & Technology (E) ☐ Other World Civilizations (Non-Western) (O)

11. If cross-listed in another discipline(s), give discipline(s)/number(s):
    If there are pre-requisites that are enforced, give discipline(s)/number(s):
    If there are co-requisites, give discipline(s)/number(s):
10. a. Approximate total number of seats/semester expected: 15
     b. How many sections do you expect to offer per semester: 1

11. Sections of this course are (check one): taught by one instructor ☒ taught by a team ☐

12. Planned frequency of offering: EVERY SUMMER

15. Grading (check any that apply):
    ☒ Letter grade ☐ Pass/Fail (S/U) ONLY ☐ Approved for IP grade
    ☐ Course requires a minimum grade of ☐ for General Education or the major

14. If this course requires any special scheduling arrangements with regard to time or room/space, please
    comment on this in the space provided:

15. If this course is required for any degrees/programs, please list them below:
    PSM (Professional Science Masters) in Biological Sciences

16. Write a brief course description for the College Catalogs. Reflect content as accurately as possible using 65 words or less
    (about 500 characters. Use action verbs and omit “This course covers…” and similar phrases.

    Reinforces and builds on understanding of key concepts in statistics and operations research for a professional science masters
    students who have only taken a single statistics course at the undergraduate level. Topics include review of data types and
    distributions, classification and presentation, descriptive statistics and correlations, design of experiments and surveys, hypothesis
    testing, ANOVA, goodness of fit, applied regression analysis, quality control statistics, selected topics in queuing theory and
    mathematical programming. Course utilizes integrative case studies and the use of Excel and commercial statistical packages
    (e.g. Minitab) for data analyses.

19. For all courses, please attach the following information:
    (q) a list of major course objectives
    (r) a topical outline of course
    (s) a list of methods used to evaluate student performance
    (t) a list of instructional materials used – give bibliographic citations of texts, critical readings, films, e
    (u) a current course syllabus, if possible
    (v) a brief statement detailing the additional work required of graduate students in a “swing course.”

    For General Education courses only, attach also:
    (w) Supplemental General Education Course Registration Form
    (x) Student Learning Outcomes Checklist (for specific codes requested).
Addendum for PSI 603 -- Applied Quantitative Analysis for Math and Science Professionals

(m) Major Course Objectives

The course is intended to develop necessary knowledge in applied quantitative analysis in professional science masters students. Since applied quantitative analysis (principally applied statistics and operations research) underlies key decisions and reporting in scientific and engineering enterprises, this knowledge is essential for future development as practicing science and engineering professionals who may have taken at most a single statistics course in their undergraduate programs.

Course topics include review of data types and distributions, classification and presentation, descriptive statistics and correlations, design of experiments and surveys, hypothesis testing, goodness of fit, ANOVA, applied multiple regression analysis, quality control statistics, selected topics in queuing theory and mathematical programming.

The content coverage is reinforced by mandatory projects that involve the analysis of relevant statistical and operational data acquired from primary and secondary sources. Course utilizes integrative case studies and the use of Excel and commercial statistical packages (e.g. SPSS) for data analyses. It also stresses professional communication including the enhancement of technical writing skills, case analyses and individual and team reports.

Prerequisites: One undergraduate statistics course; familiarity with Microsoft Excel.

Frequency of Offering: At least once a year (initially in Summer Session).

(n) Topical Outline

22. Data types and approaches to data analysis.
23. Summarizing and describing data and data relationships: univariate and multivariate descriptive statistics, graphical presentation of data and relationships, cross-tabulations.
24. Design of experiments in science and engineering.
25. Data and sampling distributions; hypotheses testing.
27. Simple regression models including tests of regression assumptions.
28. Multiple regression analyses and modeling including tests of assumptions.
29. Statistics for quality control and six-sigma analyses, process control charts.
30. Introduction to applied mathematical programming.
31. Applied queuing theory.
32. Individual and team data analysis and reporting (reports, case analyses).

(o) List of methods used to evaluate student performance.

Students will be assigned letter grades on the basis of:

(a) attendance and class participation
(b) performance on individual tests and assignments (including reports and case analyses)
(c) Team participation, verbal and written analyses and presentations.

(p) List of instructional materials used.

Textbooks:


Instructors will supplement textbook coverage of course topics by utilizing lecture, class discussion and case analyses along with group participation. Computer demonstrations of statistical techniques using Microsoft Excel and Minitab, multimedia demonstrations, and guest speakers may be used as appropriate.

(q) Current course syllabus (if possible). The course is not being currently taught.

(r) Brief statement detailing additional work required of graduate students in swing courses. This is not applicable as the course is not a swing course.
College Course Registration Form

This form is used to register all courses. It must be signed by the department chair and the school dean who will send it forward to the Registrar’s Office. Registration of General Education courses requires an additional Supplemental Course Registration Form and the appropriate Student Learning Outcomes Checklist. Approval by the Faculty Senate’s General Education Committee is necessary for all General Education courses.

Data entry fields are shaded. Some fields have limits on numbers and spaces that can be entered. Some areas have drop-down menus with options that can be selected by clicking your choice. Save the blank form before using it and then save each course form with an individual file name. Go back to the saved blank for each new form but save with a different name after filling in data.

Action concerns a new course  Discipline BIO Number 655
Action concerns an existing course: Discipline Number

Course Submitted by: Adam Rich
Department: Biological Sciences

Chairperson’s Approval: __________________________ Date:
Dean’s Approval: __________________________ Date:

1. Action requested:
   ☒ Registration of new course
   ☐ Revision of content for existing course
   ☐ Registration of general course listing under which related titles can be taught (umbrella courses)
   ☐ Registration of topics course for specific semester (if checked, complete item 2 below)
   ☐ Change of course title – Previous Title:
   ☐ Inactivation of existing course registration (course will not be taught in near future)
   ☐ Other – Describe:

5. Complete for registration of topics courses or umbrella courses:
   a. General course registration: Discipline Number:
   k. General registration title:
   l. Specific course title for semester offered (topics course title):
   m. Topics course registration is for: SPRING SEMESTER Year: 2010

3. a. ☐ Undergraduate listing: Discipline Number:
   b. ☒ Graduate listing: Discipline: Bio Number: 655

   b. Course start date: FALL SEMESTER YEAR: 2010

8. Abbreviated course title (restricted to 16 spaces) drug discovery

6. a. Semester hours of credit assigned to course (invariable): 3
   b. Can this course have variable credit ☐ No ☐ Yes - Credit range to semester hours
   c. Is this course is repeatable for multiple credit? ☒ No ☐ Yes - Credit Maximum =

7. Type of Course: LIBERAL ARTS

11. General Education Information: (Complete only for General Education courses)
   a. General Education Knowledge Area (choose one if applicable): NONE
   b. Additional student learning outcomes: (check all codes that are currently approved)
      ☐ Contemporary Issues (I) ☐ Upper Level Writing (U)
      ☐ Both Contemporary Issues and Upper Level Writing (J)
      ☐ Scholarship on Women (W) ☐ Diversity (D)
      ☐ Science & Technology (E) ☐ Other World Civilizations (Non-Western) (O)

12. If cross-listed in another discipline(s), give discipline(s)/number(s):
    If there are pre-requisites that are enforced, give discipline(s)/number(s):
    If there are co-requisites, give discipline(s)/number(s):
10. a. Approximate total number of seats/semester expected: 12
    b. How many sections do you expect to offer per semester: 1

11. Sections of this course are (check one): taught by one instructor ☐ taught by a team ☐

12. Planned frequency of offering: EVERY OTHER YEAR

16. Grading (check any that apply):
    ☑ Letter grade ☐ Pass/Fail (S/U) ONLY ☑ Approved for IP grade
    ☐ Course requires a minimum grade of for General Education or the major

14. If this course requires any special scheduling arrangements with regard to time or room/space, please comment on this in the space provided:

15. If this course is required for any degrees/programs, please list them below:

16. Write a brief course description for the College Catalogs. Reflect content as accurately as possible using 65 words or less (about 500 characters. Use action verbs and omit “This course covers...” and similar phrases.

    Drug development requires collaboration between biologists and chemists, as well as marketing and business professionals. Careers in the pharmaceutical industry require excellent communication skills and teamwork. Students will develop an understanding of drug development from the perspective of biologists, chemists, and marketing beginning with the selection of a suitable drug target for treatment of a specific disease. Examples from industry will be covered and students will work together to identify a drug target and will produce a drug development plan for a hypothetical company.

20. For all courses, please attach the following information:
    (y) a list of major course objectives
    (z) a topical outline of course
    (aa) a list of methods used to evaluate student performance
    (bb) a list of instructional materials used – give bibliographic citations of texts, critical readings, films, e
    (cc) a current course syllabus, if possible
    (dd) a brief statement detailing the additional work required of graduate students in a “swing course.”

For General Education courses only, attach also:
    (ee) Supplemental General Education Course Registration Form
    (ff) Student Learning Outcomes Checklist (for specific codes requested).
Principles of Drug Discovery

This course will focus on processes of drug development beginning with selection of a suitable drug target for a specific disease. Drug development requires collaboration between biologists and chemists, as well as marketing and business professionals. Careers in the pharmaceutical industry require excellent communication skills, and the ability to work in teams. Students will develop an understanding of the drug development process from the perspective of biologists, chemists, and marketing. Emphasis will be placed on the goals of each group, and an understanding of management challenges. A problem-based learning approach will be utilized, beginning with an overview of the drug development process, examination of specific case studies, and culminating with teams working together on a mock drug development project.

level: graduate
prerequisites: general biology, general chemistry
recommendations: human physiology, cell biology

Course Objectives: To examine the principles of the drug discovery including what constitutes a good drug target and the processes that are necessary to identify a selective, safe, and effective drug. This course will provide an introduction to principles of drug discovery and will include the business, marketing, and scientific perspectives. Students will gain an overview of this process, and will develop critical reasoning skills and communication skills. Weekly assignments will include short (1-2 page) essays. Students may be asked to present their essay to the class. Students will work in teams on a class project to develop a development plan for a specific target to treat a disease. Presentation of the plan will be filmed and the class will critically review this film.

- Verbal Communication
- Effective writing
- Presentation
- Critical Reasoning

Grades
Attendance/ preparation 10%
Participation 10%
Weekly Assignments 50%
Presentation 30%

Instructional Materials
Relevant material from the literature will be selected by the instructor because a textbook is unavailable.
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Assignment</th>
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</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introduction to drug development: career opportunities.</td>
<td>review top 200 drugs (internet) <a href="http://www.drugs.com/top200.html">http://www.drugs.com/top200.html</a></td>
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<tr>
<td>Week 2</td>
<td>Case study: The Motilin Receptor</td>
<td>review drug companies</td>
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<tr>
<td>Week 3</td>
<td>Drug Safety: cardiovascular, liver, blood pressure toxicity</td>
<td>drug failure case study: BMS</td>
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<tr>
<td>Week 4</td>
<td>Case study: GSK and Ally</td>
<td>Ethical issues exist in industry</td>
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<td>Week 5</td>
<td>Who pays for drugs and how much are they worth?</td>
<td>Chronic versus transient treatments: what is in the best interests of the company?</td>
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<tr>
<td>Week 6</td>
<td>Diseases: potential markets</td>
<td>Develop SWOT for diseases (be prepared to present to entire class)</td>
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<td>Week 7</td>
<td>Develop a strategy: SWOT (Strengths, weaknesses, opportunities, threats)</td>
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<td>Week 8</td>
<td>Present SWOT: class chooses a disease</td>
<td>Review disease and current treatment options</td>
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<td>Week 9</td>
<td>Biochemical/ cell-based, in vivo assays. High throughput versus low throughput</td>
<td>What is a dose response curve? What mistakes may occur? How can this data be evaluated with an eye to human disease?</td>
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<tr>
<td>Week 10</td>
<td>Toxicity: when is the right time to begin testing compounds in tox screens?</td>
<td>Refine Development Plan</td>
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<td>Week 11</td>
<td>Results from 1000 top compounds: each team chooses 3</td>
<td>Develop a presentation to gain resources from management: what resources will be necessary to indentify lead compounds? What are the risks?</td>
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<tr>
<td>Week 12</td>
<td>Present revised S.W.O.T. to class, obtain feedback. Careers: How are employees chosen and once you receive an offer how do you negotiate?</td>
<td>Revise presentation</td>
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<tr>
<td>Week 13</td>
<td>Film presentation Life Cycle management: patent life</td>
<td>Review and edit film</td>
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<tr>
<td>Week 14</td>
<td>Mock Job Interviews Clinical Trials: what’s involved</td>
<td>Review Job Interview: How can you do better?  Create a SWOT for this course</td>
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<tr>
<td>Week 15</td>
<td>Wrap up: Present Mock developed drug (this may be filmed)</td>
<td>Students take home a DVD with video of final presentation, and also a hardcopy of the developed SWOT</td>
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