



Institution: Southern Oregon University

College/School: College of Arts and Sciences

Department/Program: Professional Science Master's Degree in Applied Mathematics

1. Program Description

a. Proposed Classification of Instructional Programs (CIP) number.

23.0301, Applied Mathematics

b. Brief overview (1-2 paragraphs) of the proposed program, including its disciplinary foundations and connections; program objectives; programmatic focus; degree, certificate, minor, and concentrations offered.

The Southern Oregon University (SOU) Mathematics Department proposes a Professional Science Master's degree in Applied Mathematics. The Professional Science Master's (PSM) program is an innovative and relatively new graduate degree designed to allow students to pursue advanced training in science or mathematics, while simultaneously developing workplace skills that are highly valued by employers (<http://www.sciencemasters.com/>, 2006). PSM programs consist of two years of academic training in an emerging or interdisciplinary area, along with a professional component that includes internships and cross-training in workplace skills such as business, communications, and regulatory affairs. This program encourages students and professionals with various backgrounds to focus on those skills that will augment their technical skills, and at the same time prepare them to effectively contribute in the twenty-first century information driven workforce. This leads to a wider variety of career options than those provided by traditional graduate programs. The Professional Science Master's Program was begun in 1997 with seed money from the Alfred P. Sloan Foundation. Today, the United States has over 220 PSM programs at more than 100 universities and the number of programs is growing rapidly.

In particular, the Professional Science Master's degree in Applied Mathematics will partner with local industry to help provide student internships, so students learn to integrate classroom skills with industry demands. To ensure industry participation, we will create an advisory board with members from external partners. Our students will have training in a variety of technical mathematical areas, and demonstrate the ability to work with other disciplinary experts, build management skills and take on leadership roles in the workplace.

c. Course of study – proposed curriculum, including course numbers, titles, and credit hours.

We welcome students with a Bachelor's degree in mathematics, science, engineering, or a related field. Specifically, students need previous coursework in elementary statistics, calculus, linear algebra, and differential equations. [See entry in *Quality* section specifying entrance requirements.]

The Professional Science Master's Degree in Applied Mathematics is designed to give students advanced training in emerging and marketable areas of industrial mathematics. The mathematics coursework places an emphasis on modeling, data analysis, and numerical methods.

We propose a core curriculum consisting of mathematical modeling, applied complex analysis, numerical linear algebra, optimization, partial differential equations, signals and systems, data analysis, and financial mathematics. The core also includes an internship in business, government, or industry concluding with a written and oral report (in lieu of writing a master’s thesis). Additionally, an applied industrial mathematics seminar guided by a business’s mathematical needs will be an integral part of our curriculum.

Degree Requirements	<u>Credits</u>
Applied Mathematics Topics (Mth 521)	20
Advanced Statistics Topics (Mth 561)	4
Mathematics Elective (Mth 521, 561, or approved)	4
Approved Supporting Electives (see below)	6-8
Applied Industrial Math Seminar (Mth 571)	12
Internship or Research	6
Final Project	3
 TOTAL	 55-57

A typical full-time student’s schedule would look like one shown in Table 1. Each student will complete a minimum of 28 credits of advanced applied mathematics or statistics topics, 6 credits of approved electives, 12 credits of applied mathematics seminar, and 9 credits of internship and final project.

Table 1: A typical PSM student’s schedule

First Year Students:

Fall	Winter	Spring
Apl Mth Topic [Mth 521] (4)	Apl Mth Topic [Mth 521] (4)	Apl Mth Topic [Mth 521] (4)
Bus/CS/Elective (3-4)	Bus/CS/Elective (3-4)	Adv Stat Topic [Mth 561] (4)
Apl Mth Sem [Mth 571] (2)	Apl Mth Sem [Mth 571] (2)	Apl Mth Sem [Mth 571] (2)

Second Year Students:

Fall	Winter	Spring
Apl Mth Topic [Mth 521] (4)	Apl Mth Topic [Mth 521] (4)	Apl Mth or Adv Stat Topic (4) [Mth 521 or 561]
Intern or research (3)	Intern or research (3)	Final project (3)
Apl Mth Sem [Mth 571] (2)	Apl Mth Sem [Mth 571] (2)	Apl Mth Sem [Mth 571] (2)

NOTE: This is *not* a yearly cohort model. First and second year students would be in the same classes together.

Course descriptions:

Applied Mathematics Topics [Mth 521 series]

1. Minimum of five courses, 4 credits each required for degree.
2. Three different Mth 521 topics offered each year with a total of six different topics in any 2-year period.

Mth 521 Topics in Applied Mathematics (4 credits)

- Mathematical Modeling (exists – to be modified)
- Applied Complex Analysis (new)
- Numerical Linear Algebra (new)
- Optimization and Control (exists – to be modified)
- Partial Differential Equations (exists)
- Adaptive Signal Analysis and Processing (new)

Advanced Topics in Statistics [Mth 561 series]

1. Minimum one course, 4 credits required for degree.
2. Two different Mth 561 topics offered each year with a total of four different topics in any 2-year period.

Mth 561 Topics in Advanced Statistics (4 credits)

- Regression Analysis (exists)
- Multivariate Statistical Analysis (exists – to be modified)
- Financial Mathematics (new)
- Actuarial Mathematics (new)

Applied Industrial Mathematics Seminar [Mth 571] (new)

1. Minimum 12 credits required, 2 credits per term.
2. Seminar topics tailored to meet a business or agency's needs for mathematical expertise. May be team-taught by SOU faculty member and a business representative. Focus will be on problem-solving for specific problems faced by that business. The particular business will rotate at least once a year, and potentially every term.
3. All students in program required to enroll in terms they are actively enrolled in program.
4. Students from other SOU graduate programs welcome to enroll, as appropriate for their interests and degree goals.

Supporting Electives

1. 6-8 credits.
2. Business and/or Computer Science courses, typically (see Potential Electives list below).

3. Must be approved by Math PSM coordinator.

We anticipate that our students will have a variety of goals and plans for their future following completion of our degree. Working from these, suitable graduate courses in Computer Science, Business, Environmental Education, Education, and/or Mathematics will be approved for each student.

Internship & Final Project (minimum 9 credits)

This includes a minimum of 180 hours working with a business, industry, nonprofit organization or local, state, or national government agency. The internship plan should focus on an application of mathematics related to the student's plan of study and career objectives. Results of this experience will be captured in a final paper and oral report, which jointly will serve as the capstone and exit assessment for the degree.

Potential Electives

We intend to leverage our program with other graduate programs at SOU, especially the PSM in Computer Science, the Master of Business and Administration (MBA), and the Master in Management (MIM). Discussions with leaders of these programs suggest the following courses in their programs would be suitable electives for our program:

Computer Science

- CS 511 Data Structures (4 credits)
- CS 526 UNIX System Administration (4 credits)
- CS 532 Client-Server (4 credits)
- CS 533 Corporate Web Development (4 credits)
- CS 536 Networks II (4 credits)
- CS 546 Wireless Networks (4 credits)
- CS 550 Compilers (4 credits)
- CS 556 Security I (4 credits)
- CS 557 Security II (4 credits)
- CS 558 Security III (4 credits)
- CS 559 Operating Systems (4 credits)
- CS 560 Advanced Databases (4 credits)
- CS 562 Database Administration (4 credits)
- CS 567 Secure Programming Practices (4 credits)

Business

- MBA 511 Critical Analytical Thinking and Communication (3 credits)
- MBA 512 Marketing Management and Strategies (3 credits)
- MBA 515 Information Systems (3 credits)
- MBA 516 Managerial Accounting for Decision Making 3 credits (3 credits)

- MBA 575 Advanced Organizational Behavior (3 credits)
- MBA 585 Financial Management Practices (3 credits)
- MM 512 Budget and Finance (3 credits)
- MM 513 Strategic Management (3 credits)
- MM 515 Management Information Systems (3 credits)
- MM 516 Organizational Leadership and Communication (3 credits)
- MM 518 Marketing for Public and Private Organizations (3 credits)

Program Delivery

We anticipate that the Applied Mathematics PSM program will be composed of students who are graduating seniors in mathematics or science; working professionals exploring options for pursuing graduate degrees for career growth; and people re-entering the workforce looking to refine professional and technical skills. Thus, a sizable portion of PSM students will be nontraditional, so traditional scheduling and modes of delivery may not always suit this student population.

Initially, most courses will be taught at our main campus in Ashland. In order to accommodate the needs of a variety of students, we plan to offer these courses two to three times per week, in the early morning and/or late afternoon and evening. Once the Applied Mathematics PSM program is established and we have a better understanding of our student demographic and needs, we can explore the possibility of offering classes in the summer as well as at the Higher Education Center in Medford. We will also explore online and hybrid delivery to accommodate scheduling challenges.

Courses offered by the School of Business may be taught at the main campus in Ashland, at the Higher Education Center in Medford, as well as online and through distance learning sites.

Course Delivery Logistics: Net Faculty ELU addition is 34-38 per year

Mth 521 – two new sections	8
Mth 561 – one new section	4
Mth 571 (applied seminar)	6
Advising, internships and capstone	4-8
Coordination	12

The Mathematics Department already offers one Math 421/521 and one Math 461/561 per year, and there is capacity in these courses for our PSM graduate students. Our proposal adds a net of two additional 521 sections and one additional 561 section. The applied industrial mathematics seminar will be 2 credits/ELU per quarter. Advising for internships and capstones will grow as the number of students increases; we estimate 4 ELU initially, growing to 8 ELU at program maturity. All national recommendations as well as numerous consultations with other SOU graduate programs makes clear that a minimum of one course release per quarter is necessary for a coordinator to effectively market the program, coordinate curriculum, supervise graduate students and participating faculty, recruit and network internships and business partners, and manage the program budget. This cost is 12 ELU per year.

Importantly, ALL Applied Mathematics PSM students will be taking the same classes each year. The prerequisite structure is such that both first and second year students can step into all mathematics courses including the seminar, making efficient use of instructional resources. Through

electives we also leverage other successful and vital graduate course offerings with capacity in the School of Business, the Computer Science Department, and potentially other SOU graduate programs.

An additional 1.0 FTE faculty is needed to deliver this program. Our budget plan details the cost implications of an immediate hire of an Associate Professor effective fall, 2012. A more realistic scenario is to use adjunct backfill and/or temporary hire for the first year or two of the program, and make the permanent hire for 2014-15. This would significantly reduce the costs in the initial years.

d. Ways in which the program will seek to assure quality, access, and diversity.

QUALITY

Entrance Requirements

- Bachelor's degree with 3.0 GPA or higher in the last 90 quarter credits of undergraduate work.
- Completion (with B or higher) of the equivalent of
 - 1 year of one variable calculus
 - 1 quarter of multivariable calculus
 - 1 quarter of linear algebra
 - 1 quarter of calculus-based probability or statistics
 - 1 quarter of differential equations
- GRE exam (general, not subject area)
- Written essay
- Minimum TOEFL score for non-native English speakers
- Interview

The foundation of a quality Applied Mathematics PSM program is the high caliber of Ph.D. faculty already present in the SOU Mathematics Department. We intend to build on our undergraduate program in Mathematics as well as on the strengths of other graduate programs at SOU, including the PSM in Applied Computers Science, Master of Business Administration, Master in Management, and Master of Science in Environmental Education. We have a proven track record of success in both mathematics and business at SOU which will serve us well in expanding those programs to serve the PSM in Applied Mathematics.

The spirit of a PSM program is to work closely with industry. Working with regional industry partners who are likely to provide internships and employ our graduates is critical. Thus, the program features an advisory board consisting of leaders from local companies to assist in curriculum development and to provide regular feedback regarding the effectiveness of the program and to assess the performance of the student interns.

In addition, Southern Oregon University conducts periodic reviews of each academic program in order to improve the quality of the program for their majors as well as the University community it serves. SOU's systematic program review process encourages self-study and planning within programs and aligns programs to the Master Academic Plan of the University.

The PSM in Applied Mathematics will utilize a number of assessment components. Formal course evaluations by students will lead to continual improvement of course content and delivery. Student feedback from the mid-program evaluation will be actively reviewed to ensure that we maintain high standards. Our business partners will provide invaluable input as to how our students are functioning in the workplace environment via a supervisor evaluation form. These forms will provide regular assessments which will lead to ongoing improvement by helping us focus on workplace skills that we should emphasize. Towards the end of year two, students will prepare a final project which includes a written report documenting their internship/research experience, along with an oral presentation. These will demonstrate student technical writing and communication skills. Exit and alumni surveys will provide additional feedback.

ACCESS

Our core mathematics courses will be offered at the main campus in Ashland. They will meet two to three times a week in either the early morning or late afternoon/early evening to provide access to working adult students. We may consider allowing students to take their business and management courses online through Oregon State University, where they currently have four PSM programs in place.

Entrance requirements will include a Bachelor’s degree, plus a transcript or other evidence that the student has mastered calculus, differential equations, linear algebra, and some calculus-based probability and statistics. An essay will also be required of entering students, as well as an appropriate TOEFL score of students for whom English is not their native language.

We are seeking one (1.0 FTE) Graduate Teaching Assistant (GTA) for this program initially which, among other goals, will provide financial support for our graduate students. As the program matures and the income permits, we would like this to rise to 2 and ultimately 3 GTA’s. We will apply for grants which provide scholarship funding. Additionally we’ll develop an FAQ sheet which will provide answers to common questions, including how to apply for scholarship and other financial support for graduate study in the PSM.

DIVERSITY

SOU has a close working relationship with the Rogue Valley Latino Chamber Network. We intend to utilize this relationship to recruit minority students to our program and enhance diversity in our enrollment.

We intend to actively recruit women and other underrepresented groups. The Mathematics Department has been very successful in attracting and retaining female students in the mathematics Bachelor’s degree program, and hopes to duplicate that success in the PSM.

e. Anticipated fall term headcount and FTE enrollment over each of the next five years.

We estimate the following enrollment pattern.

Applied Math PSM	2012-13	2013-14	2014-15	2015-16	2016-17 +
Headcount	6	13	17	20	22
SCH	168	359	469	552	604

f. Expected degrees/certificates produced over the next five years. 33

We assume a growing enrollment with minimal attrition. We expect 6 students entering in 2012-13, with 5 of those obtaining a degree by the end of 2013-14. We expect 8 students will enter in 2013-14, with 7 of those obtaining a degree by the end of 2014-15. We expect 10

students will enter in 2014-15, with 8 of those obtaining a degree by the end of 2015-16. We expect 12 students will enter in 2015-16, with 10 of those obtaining degree by the end of 2016-17. The total number of degrees granted over this five year period is estimated at about **33**.

g. Characteristics of students to be served (resident/nonresident/international; traditional/nontraditional; full-time/part-time; etc.)

We expect a mix of full-time and part-time students, with the majority being professional students seeking to upgrade their education. The vast majority of our students will be Oregon residents from our local region, with some international students as well.

h. Adequacy and quality of faculty delivering the program.

Our faculty provides expertise in diverse backgrounds of Applied Mathematics such as Differential Equations, Partial Differential Equations, Probability and Statistics, Mathematical Modeling, Numerical Analysis, Complex Analysis, Optimization, and Graph Theory. Two of our faculty, Dr. Daniel Kim and Dr. Kemble Yates, have done extensive consulting. The faculty in the supporting Computer Science and Business disciplines add considerable expertise to our program. All of our Ph.D. faculty are qualified to teach graduate level classes in their areas of expertise.

i. Faculty resources – full-time, part-time, adjunct.

MATHEMATICS

Dr. John Anton (Visiting Professor, Mathematics)-(Ph.D Applied Mathematics, Brown University) – his interests include a wide variety of mathematical applications in industry; he has created, developed, and managed multiple high tech companies; authored numerous successful grant applications; and taught adjunct graduate courses in applied mathematics for Santa Clara University.

Dr. Lisa Ciasullo (Associate Professor of Mathematics)-(Ph.D. Mathematics, Washington State University, 1989) – her interests include approximation theory, ordinary and partial differential equations, applied complex analysis, numerical analysis, and numerical linear algebra.

Dr. Sherry Ettlich (Professor of Mathematics)-(Ph.D. Mathematics, University of Oregon, 1985)-her interests are in the preservice training of K-12 teachers, alternative pedagogical approaches to undergraduate education; the theoretical training of upper division mathematics majors; and abstract algebra.

Dr. Curtis Feist (Associate Professor of Mathematics)-(Ph.D. Mathematics, University of California at Davis, 1998)-his interests include topology, real and complex analysis, linear algebra, abstract algebra, logic and foundations of higher mathematics.

Jim Hatton (Instructor, Mathematics)-(M.S. Operations Research, Stanford University, 1968)-his interests are in teaching basic mathematics as well as systems theory, and applications of partial differential equations in geology.

Dr. Daniel Kim (Professor of Mathematics)-(Ph.D. Mathematics, University of Oregon, 1995)- his interest are in asymptotics of test statistics and large deviations, reliability analysis, and biostatistics, as well as classroom activities in probability and statistics. He has frequently consulted for local businesses, health professionals, and other SOU faculty.

Dr. Dusty Sabo (Professor of Mathematics)-(Ph.D. Mathematics, University of Idaho, 1996)-his areas of expertise are rado numbers, combinatorics, and graph theory. He also has an interest in calculus pedagogy and discrete mathematics.

Dr. Kemble Yates (Professor of Mathematics)-(Ph.D. Mathematics, Washington State University, 1987)-his mathematical areas of expertise include differential equations, partial differential equations, numerical analysis, mathematical modeling, and probability and statistics. He has been a mathematical consultant and served as an expert witness in that capacity. He was a visiting professor at the Institute of Theoretical

Physics at the University of Oregon in 2001, and at both Murdoch University and Curtin University of Technology, in Perth, Australia in 2009. He is the long-time co-director of the State of Jefferson Congress.

BUSINESS

Dr. Andy Dungan (Professor of Management) – (Ph.D. University of Oregon, 1995) research interests focus on teaching and learning and the balance of power in the classroom. Other research interests include leadership, organizational development, and management of nonprofit institutions.

Dr. Charles W. Jaeger (Associate Professor of Marketing) (PhD Stanford University, 1991) with research interests that include Marketing and changes in traditional marketing, entrepreneurship and direct and interactive marketing, spam, cyber-crime and cyber-terrorism, structural analysis using LISREL for modeling attitudes and behaviors, and management coaching techniques. He was formerly with Stanford Data Center, IBM, Apple, and Silicon Valley start-ups in management roles, including C.E.O. Dr. Jaeger is a special Consultant to C.E.O. to Harry & David for e-commerce and Internet marketing and is a Certificated Community College Teacher in Computer Science, State of California. He was a speaker at over 200 industry conferences, a member of the Board of Directors, PowerMate Software LLC Alltrax, Inc.

John Kinard (Senior Instructor of Management) – (MAT SOU, 2000, MBA, Harvard Graduate School of Business, 1972) interests include marketing and small business management. He held ownership/management positions with several different manufacturing companies during a twenty year career in private business.

Dr. Michael Naumes (Professor of Psychology) (PhD University of Cincinnati in 1979, MA from University of Cincinnati in 1975) with research interests that include the effects of learning styles on small group performance. This includes topics of group cohesion, group performance, heterogeneity of learning styles present in the group as well as how cohesion and group membership is measured. Training readiness for students to be successful involves long term simulation of a complex organization using "the Organization Game". Courses taught include Personal/Social Adjustment, Group Dynamics, Group Facilitation, Organizational Psychology, Creative thinking and Creative Problem Solving.

Dr. Raj Parikh (Dean of School of Business)-(Ph.D. Accounting, Finance, and Management Science, State University of New York, Buffalo 1982)-he has three additional professional qualifications: Certified Management Accountant (CMA), Certified Financial Manager (CFM), and Chartered Financial Analyst (CFA).

COMPUTER SCIENCE

Dr. Lynn Ackler (Adjunct Assistant Professor of Computer Science) – (Ph.D Mathematics, Lehigh University, 1971) spearheaded the development of Computer Science interdisciplinary track for computer security and information assurance. He teaches a variety of courses in the area of computer security and computer forensics. Specifically: security fundamentals including cryptography, local area network security and secure system administration. The computer forensics sequence consists of file system forensics, live system forensics and a practicum that results in expert witness testimony in a court room setting. Graduate research activities include secure internet communications systems and live forensic examination techniques. Dr. Ackler collaborates extensively with the Departments of Criminology and Biology, and local organizations such as the Fish and Wildlife Service Forensics Laboratory in Ashland.

Dr. Dan Harvey (Associate Professor of Computer Science) – (PhD Computer Engineering, University of Texas at Arlington 2001) has significant industry experience; he was the president of a value-added reseller for thirteen years before changing careers to university-level teaching. His research interests are in the areas of parallel programming and computational linguistics, and he has numerous publications and conference presentations in these areas. He spearheaded the ACORNS project, which is a long term project involving faculty and graduate students that supports tribal efforts to revitalize their languages and cultures. Most of the tribes in the Western States, and in British Columbia, are aware of this project and many are actively using it. He teaches graduate level classes in computational linguistics, operating systems, and parallel programming.

Dr. Kevin Sahr (Associate Professor of Computer Science) – (PhD University of Oregon 2005) has over ten years of prior experience as a professional software engineer. His research, conducted in close collaboration with industry, has focused on developing data structures for location based systems. He teaches graduate level courses in spatial databases and computer graphics.

Dr. Dan Wilson (Professor of Computer Science) – (PhD, University of Oregon, 1988) was a research associate on a project funded by National Institute on Disability and Rehabilitation Research to establish an online information exchange for federal rehabilitation and independent living agencies. He came to Southern Oregon University in 1989 where he is a Professor of Computer Science. His current research interests are assistive technologies and instructional systems. He has received grants from Microsoft Corporation and the Engineering and Technology Industry Council of Oregon for curriculum improvement.

j. Other staff.

Mary Ann Wright (Mathematics Department Office Manager; Administrative Program Assistant for the SOU Accelerated Baccalaureate Program)-(BS Business Education, NMSU, M.S. CIS/Business, Southern Oregon University, 2003)-she designs, implements and trains on Data Bases, is fluent with Banner, website design, and report and file transfer processes. She coordinates accounting systems, student payroll, class scheduling, awards, marketing, confidential records, student advising and registration, guest speakers, special program administration, scholarships and evaluations facilitator. Mary Ann has extensive experience in marketing a program and advising students for the Accelerated Baccalaureate Program, and this will translate well to assisting the Mathematics Department launch its PSM degree. She also trains students and faculty to use campus software and data bases, and serves as the departmental I.T. specialist for personal computer issues.

k. Facilities, library, and other resources.

Besides the general university computer labs, we have a small computer lab dedicated to mathematics students in the SOU Mathematics department. All classrooms utilize up-to-date multi-media and Internet technology. The classroom and lab facilities are adequate for this program.

Our department received a library report of Mathematics holdings [see Appendix B]. Hannon Library has purchased fewer new books in recent years, including two years with no purchases due to one-time budget reductions. The collection is becoming increasingly dated. Interlibrary loan and Orbis do give access to some advanced technical books held at other libraries.

SOU subscribes to 12 mathematics journals, many in the area of teacher education. We have Academic Search Complete which accesses more than 100 mathematics journals, and is useful for receiving full text research articles.

Hannon Library's holdings of books and journals relating to Mathematics are minimally adequate to support a graduate-level program in applied mathematics at this time. We need funds to purchase current books, subscribe to new journals, and maintain our licensed subscription to the ACM database. These amounts are included in our Budget Outline [see Appendix A].

Anticipated start date.

We anticipate that the new program will start in the Fall of 2012.

2. Relationship to Mission and Goals

The mission of Southern Oregon University, approved by the Oregon University System Board and vetted by the Northwest Commission on Colleges and Universities (NWCUU) during its 2008 accreditation review, commits SOU to deliver “academic programs, partnerships, public service, outreach, sustainable practices, and economic development activities that address regional needs such as health and human services, business, and education” [<http://www.sou.edu/president/mission.html>]. Southern Oregon University's 2009-2014 Master Plan calls for a substantial expansion of the University's science and technology offerings [<http://www.sou.edu/president/pdf/MAP%205%20Final%205-27-09.pdf>]. SOU has a PSM in Applied Computer Science that was established in 2010. The proposed PSM in Applied Mathematics is a natural next step.

The Oregon University System supports creation of appropriate PSM programs at its member institutions. Initial PSM programs were established in the early 2000's at Oregon State University. In 2008, OUS committed to nurturing more PSM programs system-wide. This effort included a successful grant application to the Sloan Foundation for supporting and coordinating PSM expansion and development at the OUS campuses [<http://oregonpsm.org/>].

The state of Oregon is making a difficult economic transition from a primary resource-based economy to a sustainable high technology-based economy. Graduate programs with a clear mandate to provide technical knowledge valued by industrial partners is a natural response by the Oregon University System to the economic needs of the state's citizens and its businesses.

3. Accreditation

- a. **Accrediting Bodies.** The Northwest Commission on Colleges and Universities (NWCCU) is the accrediting body for Southern Oregon University as a whole, including its graduate programs [<http://www.nwccu.org/>]. Professional Science Master's degrees can be affiliated with the National Professional Science Master's Association (NPSMA), a national organization of like-minded programs. [<http://www.npsma.org/>]. There is no discipline-specific accrediting body for our program.
- b. **Meeting accreditation standards.** We anticipate no difficulty qualifying for affiliation in the National Professional Science Masters Association. We are following its guidelines and philosophy in developing our program, and will apply for affiliation after approval by the Provost Council and by the Academic Strategies Committee of the Oregon State Board of Higher Education. SOU's Applied Computer Science PSM applied for and received this affiliation in 2010 [<http://www.sciencemasters.com>].

- c. **Undergraduate program accreditation.** SOU's Mathematics major is not accredited by a Mathematics accrediting body; the major is accredited implicitly through SOU's institutional NWCCU accreditation.
- d. **Accreditation outlook.** As there is no commonly recognized mathematics accreditation body, there is no plan to seek accreditation. However, the SOU Mathematics Department is an institutional member of the Mathematical Association of America (MAA) and active in the American Mathematical Society (AMS), and these are the relevant national organizations for mathematicians and mathematics programs. Both have web sites and journals which provide forums for sharing insight and guidance for best practices. [<http://www.ams.org/> and [http://www.maa.org/careers/ web sites](http://www.maa.org/careers/web_sites/)].

4. Need

- a. **Evidence of Market Demand.** The SOU Mathematics Department is approached at least 3-5 times per year about whether a graduate mathematics program exists. A recent article in Money Magazine finds that the top 15 paying jobs in the United States today all require extensive mathematical knowledge and skills [<http://finance.yahoo.com/college-education/article/107402/most-lucrative-college-degrees.html?mod=edu-collegeprep>]. In a survey of 200 jobs in America, the Wall Street Journal finds that mathematicians rank number one in job satisfaction, when considering factors such as environment, income, employment outlook, physical demands and stress [http://online.wsj.com/article_email/SB123119236117055127-1MyQjAxMDI5MzAxODEwOTgyWj.html] (January 6, 2009, Wall Street Journal).

Potential Business Partners

We have received positive feedback from several businesses. We have letters of support from TreeStar (an Ashland hi-tech software firm), Symantic, and Harry & David [see Appendix C]. We also have active conversations going with Hewlett-Packard, Intel, and Pacific Crest Transformers. Further outreach to potential business and agency partners is ongoing.

- b. **Other similar OUS programs.** At this time, there are no other applied mathematics PSM degrees approved or proposed by OUS institutions. There is, however, a consortium of Professional Science Master's degree programs in the state of Oregon with which we are actively participating.
- c. **Improving educational attainment in the region and state.** The Oregon economy – and particularly the southern Oregon economy – requires an ever increasingly technically trained and skilled workforce. This is true currently and looking forward, to attract the kinds of businesses that will sustainably build the economy.
- d. **Civic and cultural demands of citizenship.** We do not anticipate our program will contribute directly towards this need.

5. Outcomes and Quality Assessment

- a. **Expected learning outcomes of the program.**

PSM Applied Mathematics graduates will:

- Master a rich variety of applied mathematical techniques for problem modeling and solution in practical settings.
- Become skilled at project development and completion.

- Develop effective teamwork skills by completing projects in groups.
- Communicate information effectively in written, oral, and graphic form.
- Gain practical experience and independence by completing an internship or independent research project.

b. Learning outcomes assessment.

In addition to a variety of learning assessments of the students during their coursework, the students will be given an exit survey on their program experience. The results of this survey will also be used to make improvements in and find new directions for course content, course delivery, business applications for the seminar, the internship, and the capstone. We will ask all businesses involved in either the seminar or supervising internships to fill out a brief reflection on their respective experiences. We will also plan on keeping tabs on graduates and asking for information about their employment success and reflections on our program.

c. Program performance indicators.

Our overall goal is to develop a network of business and agency partners who share a stake in the success of our program and our students. Key indicators of our success will be number of students successfully completing the program, number of graduates with jobs within 6 months of completing the program, and number of internships offered by businesses and agencies.

d. Research and/or scholarly work expectations of program faculty.

All tenure-track faculty in the Mathematics Department are expected to have an active scholarly program and maintain currency in their fields. We expect there will be a number of research papers and successful grant applications directly related to the implementation of this degree program.

6. Program Integration and Collaboration

- Closely related programs in other OUS universities and Oregon private institutions.** There are no other PSM mathematics degree programs in Oregon. There are other PSM programs in other disciplines in Oregon: Applied Computer Science, SOU; Applied Biotechnology, OSU; Applied Physics, OSU; Applied Systematics in Botany, OSU; and Environmental Sciences, OSU. More traditional mathematics and statistics Master's degrees programs exist at Oregon State University, University of Oregon, and Portland State University.
- Complementariness with other similar programs in Oregon.** The applied mathematics PSM at SOU should occupy its own niche in graduate mathematics education, and offer students a nice additional choice for expanding their mathematics training and employability.
- Collaboration.** The applied mathematics PSM at SOU will work closely with other SOU graduate programs to leverage curricula and marketing resources. It will also stay connected to the OUS PSM consortium to share information and internship opportunities.
- Impacts on other programs.** SOU's geographical location as well as the uniqueness of the program make a direct competition with other programs unlikely.

7. Financial Sustainability [see *Budget Outline* in Appendix A]

a. Business plan.

The program can be launched within existing resources. As the program matures and the number of students reaches the target level of 20, we will need one (1.0 FTE) additional faculty member. While the Budget Outline assumes an Associate Professor is hired for Fall of 2012, the more realistic scenario is for the department to assign existing faculty to the program for one or two years while backfilling their undergraduate teaching assignment with adjunct hires. All faculty will be strongly encouraged to apply for grant funding to facilitate research and graduate student support. When revenue generated by the program allows, additional library resources will be allocated.

A \$15,000 grant proposal by department faculty was recently funded by the OUS consortium of PSM programs. The monies will provide summer stipends for curriculum development during summer, 2011.

b. Plans for development and maintenance of unique resources (buildings, laboratories, technology) necessary to offer a quality program in this field.

The Mathematics Department already has the faculty and curricular capacity to commence this program. The department recently purchased several copies of *Mathematica*, which we intend to integrate into our research and our advanced courses. Eventually, some dedicated space for graduate students will need to be found. No other special resources are anticipated to be needed.

c. Targeted student/faculty ratio (student FTE divided by faculty FTE).

When program matures, this target is 10.

d. Recruitment.

A Mathematics Department faculty member will be given a one course per term release during academic year 2011-12 to oversee the launch of the program. An important part of the charge will be to visit colleges and universities in Oregon to market the new degree. We will seek television, radio, and newspaper interviews announcing the program during academic year 2011-12 and going forward. A web page dedicated to attracting students and giving information about the program will be added to the SOU site by Fall, 2011. The department is already an active and successful participant in SOU's unique Accelerated Baccalaureate Degree program (in which qualified entering college students can get a Bachelor's degree in 3 years), and will incorporate materials advertising the PSM degree to all of its publicity and marketing efforts.

External Review (if the proposed program is a graduate level program, follow the guidelines provided in *External Review of new Graduate Level Academic Programs* in addition to completing all of the above information)

Budget Outline Form

Estimated Costs and Sources of Funds for Proposed Program

Total new resources required to handle the increased workload, if any. If no new resources are required, the budgetary impact should be reported as zero.

Institution: Southern Oregon University

Program: Professional Science Master in Applied Mathematics

Academic Year: 2012-2013

Indicate the year: X___ First ___ Second
 ___ Third ___ Fourth

Prepare one page each of the first four years

	Column A	Column B	Column C	Column D	Column E	Column F
	From Current Budgetary Unit	Institutional Reallocation from Other Budgetary Unit	From Special State Appropriation Request	From Federal Funds and Other Grants	From Fees, Sales and Other Income	LINE ITEM TOTAL
Personnel						
Faculty (Include FTE)	56,000					
Graduate Assistants (Include FTE)	9,450					
Support Staff (Include FTE & OPE)	0					
Fellowships/Scholarships	0					
OPE	31,723					
Nonrecurring	0					
Personnel Subtotal	91,173					
Other Resources						
Library/Printed	1,000					
Library/Electronic	1,500					
Supplies and Services	0					
Equipment	0					
Other Expenses	8,000					
Other Resources Subtotal	10,500					
Physical Facilities						
Construction	0					
Major Renovation	0					
Other Expenses	0					
Physical Facilities Subtotal	0					
GRAND TOTAL	107,673					

Budget Outline Form

Estimated Costs and Sources of Funds for Proposed Program

Total new resources required to handle the increased workload, if any. If no new resources are required, the budgetary impact should be reported as zero.

Institution: Southern Oregon University

Indicate the year: First Second
 Third Fourth

Program: Professional Science Master in Applied Mathematics

Academic Year: 2014-2015

	Column A	Column B	Column C	Column D	Column E	Column F
	From Current Budgetary Unit	Institutional Reallocation from Other Budgetary Unit	From Special State Appropriation Request	From Federal Funds and Other Grants	From Fees, Sales and Other Income	LINE ITEM TOTAL
Personnel						
Faculty (Include FTE)	56,000					
Graduate Assistants (Include FTE)	18,900					
Support Staff (Include FTE & OPE)	0					
Fellowships/Scholarships	0					
OPE	32,085					
Nonrecurring	0					
Personnel Subtotal	106,985					
Other Resources						
Library/Printed	1,000					
Library/Electronic	1,500					
Supplies and Services	0					
Equipment	0					
Other Expenses (Marketing)	8,000					
Other Resources Subtotal	10,500					
Physical Facilities						
Construction	0					
Major Renovation	0					
Other Expenses	0					
Physical Facilities Subtotal	0					
GRAND TOTAL	117,485					

Budget Outline Form

Estimated Costs and Sources of Funds for Proposed Program

Total new resources required to handle the increased workload, if any. If no new resources are required, the budgetary impact should be reported as zero.

Institution: Southern Oregon University

Indicate the year: First Second
 Third X Fourth

Program: Professional Science Master in Applied Mathematics

Academic Year: 2015-2016

	Column A	Column B	Column C	Column D	Column E	Column F
	From Current Budgetary Unit	Institutional Reallocation from Other Budgetary Unit	From Special State Appropriation Request	From Federal Funds and Other Grants	From Fees, Sales and Other Income	LINE ITEM TOTAL
Personnel						
Faculty (Include FTE)	56,000					
Graduate Assistants (Include FTE)	18,900					
Support Staff (Include FTE & OPE)	0					
Fellowships/Scholarships	0					
OPE	32,085					
Nonrecurring	0					
Personnel Subtotal	106,985					
Other Resources						
Library/Printed	1,000					
Library/Electronic	1,500					
Supplies and Services	0					
Equipment	0					
Other Expenses (Marketing)	8,000					
Other Resources Subtotal	10,500					
Physical Facilities						
Construction	0					
Major Renovation	0					
Other Expenses	0					
Physical Facilities Subtotal	0					
GRAND TOTAL	117,485					

Notes: The budget plans above assume immediate hire of an Assoc. Prof. in Year 1 of the degree. Years 1 and 2 assume 1.0 FTE of GTA, while years 3 and 4 assume 2.0 FTE of GTA.

Appendix B: Library Report

MEMORANDUM

TO: Kemble Yates
FROM: Paul Adalian, Dean of University Library; Jim Rible, Science Librarian
DATE: Feb 16, 2010
SUBJECT: Resources to support proposed Graduate Program in Applied Mathematics

The review process for new programs and certificates examines adequacy of resources needed to sustain a quality offering.

BOOKS

Hannon Library's collections include very few books in advanced mathematics. Performing searches in our Library catalog using the titles of some of the proposed courses as keywords, e.g. "actuarial," "applied linear algebra," "cytometry" reveals either zero results or a few books that are over 10 years old. Despite the importance of currency for math courses, we have purchased fewer new books in recent years, including two years with no purchases due to one-time budget reductions. Virtually any book used to support this program would require the use of interlibrary loan.

PRINT JOURNALS

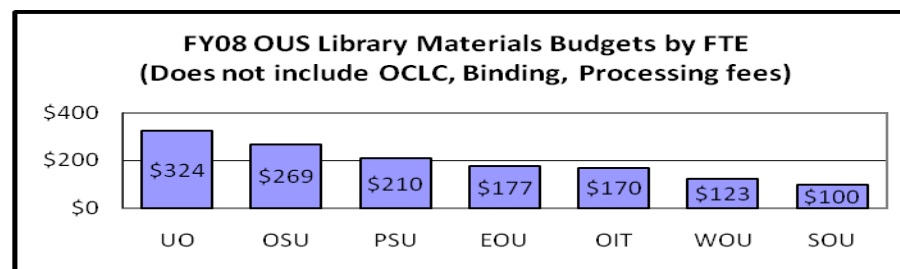
We currently subscribe to only 12 math journals, mostly in the field of teacher education.

DATABASES AND ONLINE JOURNALS

Hannon Library does not provide access to any math specific databases like *Mathematical Reviews*, but access to Academic Search Complete contains indexing and access to over 100 math journals covering a variety of topics in applied mathematics. Electronic databases containing the full text of journals have mitigated the loss of many of our print subscriptions. Academic Search Complete contains the full text of over 100 math journals and our subscriptions to online journal packages from academic publishers Springer and Wiley provide for improved access to advanced math topics.

GENERAL STATEMENT OF NEED

Hannon Library's overall materials budget to purchase resources to support academic programs has decreased over years despite introduction of new programs. Hannon Library spends less on materials per FTE than any other OUS school.



ADEQUACY OF LIBRARY HOLDINGS TO SUPPORT PROPOSED PROGRAM

Hannon Library's holdings of books and journals are barely adequate to support a Graduate Program in Applied Mathematics. We need funds to purchase current books (particularly e-books). We request a one-time allocation of \$1,000 to strengthen this area.

Thank you for the opportunity to review and respond to the proposal.

Appendix C: Industry Letters of Support

&&&& I will insert our three letters (from TreeStar, Symantic, and Harry & David here. &&&&&