BOARD OF HIGHER EDUCATION

REQUEST FOR COMMITTEE AND BOARD ACTION

COMMITTEE: Academic Affairs	**NO**.: AAC 12-13
	COMMITTEE DATE: November 29, 2011
	BOARD DATE: December 6, 2011

APPLICATION OF UNIVERSITY OF MASSACHUSETTS BOSTON TO AWARD THE BACHELOR OF SCIENCE IN ELECTRICAL AND COMPUTER ENGINEERING

MOVED: The Board of Higher Education hereby approves the application of **University of Massachusetts Boston** to award the **Bachelor of Science in Electrical and Computer Engineering.** One year after graduating the program's first class, the institution shall submit to the Board a status report addressing its success in reaching program goals as stated in the application and in the areas of enrollment, curriculum, faculty, resources, and program effectiveness.

Authority: Massachusetts General Laws Chapter 15A, Section 9(b)

Contact: Dr. Francesca Purcell, Associate Commissioner for Academic and P-16 Policy

BOARD OF HIGHER EDUCATION

December 2011

University of Massachusetts Boston
Bachelor of Science in Electrical and Computer Engineering

INTENT and MISSION

University of Massachusetts Boston (UMB) submitted an expedited proposal to offer a Bachelor of Science in Electrical and Computer Engineering (ECE). UMB currently offers a 2-year engineering program focusing on civil, industrial, mechanical, and electrical engineering. The 2-year program will continue for civil, industrial, and mechanical engineering while the proposed four-year program in electrical engineering will replace the 2-year electrical engineering program and computer engineering will be a new program altogether. The goal of the proposed four-year ECE program is to educate students in an inspirational environment based on well-founded and stimulating curricula, enabling them to begin their professional careers as competent and thoughtful engineers and/or to pursue advanced graduate study in ECE or other related disciplines.

It has long been recognized at the Boston campus that the existing program in engineering is inadequate in serving the needs of our student body. In AY1994-1995, a review of the engineering programs across the UMass system led by a team of external consultants pointed out the need for an engineering presence in the Boston metropolitan area and the importance of developing a full four-year program for this urban constituency. An Engineering Task Force was subsequently appointed to respond to the recommendations of that review; however, the resources necessary to support program development were never allocated.

The proposed ECE program intends add to the depth and breadth to UMass Boston's mission by providing an innovative and high quality education that meets the needs of both traditional and non-traditional students with a publicly supported four-year engineering program; by continuing to promote diversity among students, faculty, and staff; and by conducting educational, scholarly, and service activities that contribute to meeting the needs of a diverse society and the high-tech industry in the Commonwealth of Massachusetts and beyond.

Both electrical engineering (EE) and computer engineering (CE) curricula will seek accreditation from the national Accreditation Board for Engineering and Technology. The EE program will start in AY 2012 and CE program will start in AY 2013.

The proposal was approved by the University of Massachusetts Board of Trustees on May 25, 2011. UMB submitted a Letter of Intent to the Massachusetts Board of Higher Education which was circulated to the public college and university presidents and chancellors. No comments were received.

NEED and DEMAND

The *Job Outlook* from the US Bureau of Labor Statistics[1] sees growth for engineering employment:

> *Overall engineering employment is expected to grow by 11 percent over the 2008–18 decade, about as fast as the average for all occupations. Engineers traditionally have been concentrated in slower growing or declining manufacturing industries, in which they will continue to be needed to design, build, test, and improve manufactured products. However, increasing employment of engineers in engineering, research and development, and consulting services industries should generate most of the employment growth….*
>
> *Competitive pressures and advancing technology will force companies to improve and update product designs and to optimize their manufacturing processes. Employers will rely on engineers to increase productivity and expand output of goods and services. New technologies continue to improve the design process, enabling engineers to produce and analyze various product designs much more rapidly than in the past. Unlike the situation in some other occupations, however, technological advances are not expected to substantially limit employment opportunities in engineering, because engineers are needed to provide the ideas that lead to improved products and more productive processes.*
>
> *Overall job opportunities in engineering are expected to be good, and, indeed, prospects will be excellent in certain specialties. In addition to openings from job growth, many openings will be created by the need to replace current engineers who retire; transfer to management, sales, or other occupations; or leave engineering for other reasons.*

UMB expects that a complete four-year ECE program at UMass Boston will generate strong student demand particularly from the greater Boston area. This expectation is consistent with the recent high volume of inquiries made by nearly 800 potential students that were received in spring of 2010 by the Admissions Office about the engineering option at UMass Boston.

UMB noted that a recent monster.com search, using the keywords "computer engineering" or "electrical engineering" in "Boston, MA" listed 617 current openings in computer engineering and 259 in electrical engineering. Expanding the location to the state of Massachusetts increased those numbers to 813 in CE and 371 in EE. (For comparison, a similar search on "civil engineering" gave only 78 current openings in the entire state.)

Offering this degree program would provide the only public option for a complete four-year engineering education in the city of Boston; currently there is no public option available. This would remove an important hurdle for those students who wish to major in ECE but who are unable to either afford the tuition of local private institutions or to relocate outside the Boston metropolitan area to one of the other UMass campuses.

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[1] http://www.bls.gov/oco/ocos027.htm#outlook

Currently, all options in the Boston area within Rte.128/I-95 are private institutions. Instead, the ECE program at UMass Boston will complement others by expanding the reach of high quality engineering education to the economically disadvantaged in the urban population of the Boston area.

ADMISSION and ENROLLMENT

UMB plans to apply the following criteria for incoming freshmen directly graduating from high schools as the **minimum** standards in order to be admitted as engineering majors

1) SAT score (1100 combined): Math 600, Critical reasoning 500,
2) A grade point average (GPA) of 3.0 earned in college preparatory courses completed at the time of application; and
3) Four math courses with a grade B or better: Algebra I, Algebra II, Geometry and Trigonometry

Students from other universities or community colleges seeking transfer into the ECE program need to meet the following **minimum** standards

1) A GPA of 3.0 from their college courses,
2) Have taken Calculus I that is equivalent to UMB's Math 140 with a grade B or better, or
3) Have been placed into Math 140 by taking the Math Placement Test after being admitted into UMass Boston.

The EE program will start in AY 2012 and CE program will start in AY 2013. The enrollment projection for the two programs are given separately. The total enrollment at steady state for both programs is projected to be 200.

EE MAJOR PROJECTION (AY2012-AY2015)

	# of Students Year 1	# of Students Year 2	# of Students Year 3	# of Students Year 4*
New Full Time	30	30	30	30
Continuing Full Time	10	25	45	60
New Part Time (FTE)	5	5	5	5
Continuing Part Time (FTE)	5	15	20	20
Totals	50	75	100	115

CE MAJOR PROJECTION (AY2013-AY2016)

	# of Students Year 1	# of Students Year 2	# of Students Year 3	# of Students Year 4*
New Full Time	22	22	22	22
Continuing Full Time		20	33	46
New Part Time (FTE)	5	5	5	5
Continuing Part Time (FTE)	0	2	7	12
Totals	27	49	67	85

CURRICULUM (Attachment A)

The proposed curricula intend to provide a solid foundation in basic science and mathematics as well as the ability to focus on either electrical engineering (EE) or computer engineering (CE) areas. The curricula will require in-depth study in an area outside these two areas for breadth in recognition of the multidisciplinary nature of the real-world problems graduates will face. EE and CE majors will complete 130 credits that consist of 62 credits of ECE courses (including 4 CS courses for CE majors); 18 credits of mathematics courses; 17 credits of basic science (physics and chemistry) courses; 6 credits of freshman English, 18 credits of intermediate seminar and general education, and 9 credits of thematic electives.

The proposed curricula will offer four concentration areas for Electrical Engineering and three concentration areas for Computer Engineering. EE Concentrations: Renewable and Sustainable Energy, Control Systems, Signal Processing and Communication, and Photonics. CE Concentrations; Computer Systems Design; Networks; and VLSI Design.

Student Learning Outcomes

The following learning outcomes are expected of student who successfully completes the Bachelor of Science degree program in either Electrical or Computer Engineering.

- Ability to apply knowledge of mathematics, science and engineering
- Ability to design and conduct experiments, as well as to analyze and interpret data
- Ability to design a system, component or process to meet desired needs within realistic
- Constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- Ability to function on multi-disciplinary teams
- Ability to identify, formulate, and solve engineering problems
- Understanding of professional and ethical responsibility
- Ability to communicate effectively
- Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

- Recognition of the need for, and ability to engage in, life-long learning
- Knowledge of contemporary issues
- Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The educational objectives of the Electrical Engineering undergraduate program are for its graduates to be able to achieve the following goals.

- Apply fundamental principles in Electrical Engineering and fundamental scientific principles and tools to design and develop products and practical solutions for problems in public and private sectors;
- Have an ability to function independently and in multidisciplinary teams with the communication skills and ethical conduct necessary for professional success;
- Demonstrate an understanding of the need for life-long learning, acquiring new knowledge, and mastering emerging technologies and new tools and methods;
- Successfully pursue engineering practice (employment or entrepreneurship) and/or graduate/professional education.

The program educational objectives of the Computer Engineering undergraduate program are for its graduates to be able to achieve the following goals.

- Apply fundamental principles in Computer Engineering and fundamental scientific principles and tools to design and develop products and practical solutions for problems in public and private sectors;
- Have an ability to function independently and in multidisciplinary teams with the communication skills and ethical conduct necessary for professional success;
- Demonstrate an understanding of the need for life-long learning, acquiring new knowledge, and mastering emerging technologies and new tools and methods;
- Successfully pursue engineering practice (employment or entrepreneurship) and/or graduate/professional education.

RESOURCES

The Engineering Program at UMB currently has two full-time faculty members The administration is committed to hiring the necessary additional 8 faculty over the next three hiring cycles as well as two administrative staff members. A new Department of Electrical and Computer Engineering will be established as an academic unit to offer the BS ECE program. The ECE Department will be administered by a fully qualified chairperson with appropriate engineering education background who meets ABET guidelines.

The University is currently exploring a number of new space options for a broad range of needs, and ECE is a high priority among these. The campus is about to undertake construction of a new Integrated Science Complex, and a new General Academic Building will be available the following year. The movement of faculty and programs into the new buildings will provide additional space options. A minimum of two additional laboratories will be needed as well as a full-time technician.

The library resources are adequate.

BUDGET (Attachment B)

Of the 4 year cost of just under $3M, about $1.6M is one-time cost for faculty startup funds, lab equipment and furniture purchases. The remaining $1.4M represents re-occurring costs for salaries and operating expenses. UMB states that these costs can be significantly defrayed by tuition, fees, and the potential for differential fees generated with an initial enrollment target of 200 majors when the program reaches steady state and that additional resources will also be brought in from ECE faculty grant activities.

PROGRAM EFFECTIVENESS

UMB provided the following program goals, objectives, strategies, and timetables:

Goal	Measurable Objective	Strategy for Achievement	Timetable
1. Develop comprehensive EE and CE curricula to provide student access to high quality engineering education leading to B.S. in ECE.	The BS ECE curricula need to receive accreditation from the Accreditation Board for Engineering and Technology (ABET).	Building upon the existing 2+2 EE transfer program and other science programs at UMB, we will develop ECE curricula that provide a solid foundation in basic science and mathematics as well as the opportunity to focus on specific areas within ECE. It also requires an in-depth study in an area outside ECE for breadth in recognition of the multidisciplinary nature of the real-world problems our graduates will face.	Curriculum development starts in Year 1 and continues until all courses are put in place in Year 4.
2. Recruit qualified full-time ECE faculty to implement the EE and CE curricula that include delivery of existing courses and development of higher-level theory, laboratory, and capstone courses.	We will need to hire eight additional full-time faculty members with their terminal degree in ECE.	Including the two existing faculty members in the Engineering Program at UMB, we will reach ten - a minimum number needed to successfully deliver the ECE curricula at UMass Boston. This number is consistent with that of many of the small ECE Departments around the country. These faculty lines will be	Eight ECE faculty will be recruited in four years at the rate of two each year upon approval of the program.

		allocated by UMB.	
3. Hire one technical staff to maintain the operation of engineering labs and one administrative staff to support the functions of Engineering Office.	We need to hire one technical professional staff member to support all activities of the teaching and research labs and one classified staff to perform the administrative responsibilities of a general office manager.	The Engineering Program currently derives its administrative and technical support from the Physics Department which has currently only one full-time technical professional staff member. These two staff positions will be allocated by UMB.	This is to be completed during the first two years upon the approval of the program.
4. Develop new laboratory facilities that are essential to the addition of third- and four-year ECE curricula.	Four additional labs are needed. One as a learning center for group work and peer learning, another for the student computing center, a third for advanced labs, and a fourth as a project room for capstone designs.	All lab space will be accommodated through renovation of existing space freed up by the addition of new Integrated Science Complex. The expense of lab equipment will be covered by UMB budget.	The new lab space will be allocated in year 1 and renovated in year 2. Necessary equipment will be purchased during year 1 to year 3.
5. Recruit new students, review admission standards, and maintain adequate students-to-faculty ratio.	At steady state, we expect to have a total of 200 majors, 115 in EE and 85 in CE. The objective for reviewing admission standard is to ensure students able to graduate in no more than 10 semesters on a full time basis. We shall maintain a student-to-faculty ratio below 20:1.	We will advertise to area high schools and local community colleges whose student needs we propose to meet. We shall set standards to attract adequately prepared students into the Program. The number of ECE majors should be commensurate with the number of faculty in the program, which will ensure progress of our students and maintain quality of the Program.	These efforts will start immediately once the proposal is approved, and will continue to be adjusted as necessary.
6. Support students' progression to graduation with personalized plans and academic advising.	Each student will have a personalized academic plan for progression towards graduation along a timeline that is agreed upon between student and faculty.	Faculty will conduct academic advising to all freshmen or transfer students to develop individualized plans and a personalized timeline for completion. Such a plan will be reviewed by the student and	This plan will be put in place as soon as we begin to admit freshmen and transfer students.

		their advisor on a regular basis and revised as individual circumstances change.	
7. Secure accreditation from ABET.	The ECE program at UMB will meet the ABET criteria through each of the six-year accreditation cycles.	In preparation for the process, the ECE program will continuously conduct thorough self-study as well as comprehensive review to assess the quality of the program.	ABET accreditation will be applied as soon as the first group of students graduate in year 3.
8. Assess the outcome of the program on graduating well-qualified engineers and of meeting the needs of our student body and the Massachusetts industry.	The ECE program at UMB will provide to the Massachusetts high-tech industry a larger and more diverse workforce, with strong local roots and preparation to successfully compete in the global economy. Success in the program will be measured in many aspects including graduation rate, professional employment, and pursue of advanced study.	Assessment is an important process that should be developed as a sequence of iterative steps and in close relationship with the Massachusetts industry. All faculty teaching in the program will be reviewed annually. All courses will be reviewed individually and necessary changes recommended for continuous quality improvement. Graduates of the program will also have an opportunity to provide feedback on the quality of the program of study. An alumni survey will be conducted to assess students' response to the effectiveness of the program.	The method of assessment will be put in place in year 1, and be employed in all subsequent years.

EXTERNAL REVIEW

The proposed ECE program was reviewed by Dr. Fow-Sen Choa, Professor of Computer Science and Electrical Engineering, University of Maryland Baltimore County; and Dr. Piergiorgio Uslenghi, Distinguished Professor of Electrical and Computer Engineering and Associate Dean of Engineering, University of Illinois at Chicago. The reviewers found that the curriculum matches well with program goals and is compatible with other ECE curricula in the U.S.; that the admissions standards are rigorous and comprehensive; and that the proposed program represents "a laudable effort" to offer the first and only public engineering program in the city of Boston. The reviewers also recommended that UMB add some elective courses in

bio-medical engineering given the Boston-area's large health industry and for all students in the program to participate in summer internships with local industry. The reviewers also noted that the budget was "skeletal" and represented the absolute minimum outlay of resources needed to implement the program. On a related note, the reviewers stated that faculty members in supporting departments are enthusiastic about the proposed program but are fearful that the new resources necessitated by the program will be drawn from their own programs.

The University provided a list of concentration areas and concurred with the reviewer's assessment that the proposed budget represents the minimum outlay of resources needed to implement the program. UMB will develop a concentration area that is closely related to bio-medical engineering to prepare graduates to pursue related employment opportunities and/or graduate study in related fields and will recruit at least two faculty members with adequate expertise to develop this concentration. Students will be encouraged to participate in summer internships. UMB clarified that the proposed BS ECE program will not drain resources from other supporting departments. UMass Boston intends to continue normal hiring practices in all departments in the College of Science and Mathematics.

STAFF ANALYSIS and RECOMMENDATION

After careful review and consideration of the proposal and all supporting documentation, staff recommendation is for approval of the Bachelor of Science in Electrical and Computer Engineering.

One year after graduating the program's first class, the institution shall submit to the Board a status report addressing its success in reaching program goals, as stated in the application, and in the areas of enrollment, curriculum, faculty, resources, and program effectiveness.

Attachment A: Undergraduate Program Curriculum Outline:

Computer Engineering

Major Required (Core) Courses (# Total courses required = *18*)		
Course Number	Course Title	Credit Hours
ECE187S	Intro to Computing	2
ECE 188S	Intro to ECE	2
ECE 231	Circuit Analysis I	3
ECE 271	Circuits lab I	1
ECE 232	Circuit Analysis II	3
ECE 272	Circuits lab II	1
ECE 241	Digital Systems with Lab	4
ECE 365	Electronics I with Lab	4
ECE 321	Signals and Systems	3
ECE xxx	Ethics & Impacts of Engin	3
ECE xxx	Senior Design Project I	3
ECE xxx	Senior Design Project I	3
ECE xxx	CE Concent Elective (1)	3
ECE xxx	CE Concent Elective (2)	3
ECE xxx	CE Concent Elective (3)	3
ECE xxx	ECE Elective (1)	3
ECE xxx	ECE Elective (2)	3
ECE xxx	ECE Elective (3)	3
	Sub Total Core Credits	50
Other Required Courses in Related Subject Areas (# Total courses required = 15)		
Course Number	Course Title	Credit Hours
CS 119	Comp Language Suppl	2
CS 210	Interm Comp w/ Data Str	4
CS 240	Programming in C	3
CS 341	Comp Arch & Org	3
MATH 140	Calculus I	4
MATH 141	Calculus II	4
MATH 241	Calculus III	4

Math 260	Linear Algebra	3
MATH 310	Diff. Equations	3
PHY 113	Fundamental Physics I	4
PHY 114	Fundamental Physics II	4
PHY 181	Physics Lab I	2
PHY 182	Physics Lab II	2
CHEM 115	Chemical Principles I	3
CHEM 117	Chemical Principles Lab I	2
	Sub Total Related Credits	47

Elective Courses (# Total courses required = *3*)		
Course Number	Course Title	Credit Hours
xxx	Thematic Elective (1)	3
xxx	Thematic Elective (2)	3
xxx	Thematic Elective (3)	3
	Sub Total Elective Credits	9

Distribution of General Education Requirements Attach List of General Education Offerings (Course Numbers, Titles, and Credits)	# of Credits
Arts and Humanities, including Literature and Foreign Languages	15
Mathematics and the Natural and Physical Sciences (Intermediate Seminar)	3
Social Sciences	6
Sub Total General Education Credits	24

Curriculum Summary	
Total number of courses required for the degree	44
Total credit hours required for degree	130

Prerequisite or Other Additional Requirements:

Electrical Engineering

Major Required (Core) Courses (# Total courses required = *21*)		
Course Number	Course Title	Credit Hours
ECE187S	Intro to Computing	2
ECE 188S	Intro to ECE	2
ECE 231	Circuit Analysis I	3
ECE 271	Circuits lab I	1
ECE 232	Circuit Analysis II	3
ECE 272	Circuits lab II	1
ECE 241	Digital Systems with Lab	4
ECE 365	Electronics I with Lab	4
ECE 366	Electronics II with Lab	4
ECE 321	Signals and Systems	3
ECE 322	Prob & Random Proc.	3
ECE 331	Fields and Waves	3
ECE xxx	Ethics & Impacts of Engin	3
ECE xxx	Senior Design Project I	3
ECE xxx	Senior Design Project I	3
ECE xxx	EE Concent Elective (1)	3
ECE xxx	EE Concent Elective (2)	3
ECE xxx	EE Concent Elective (3)	3
ECE xxx	ECE Elective (1)	3
ECE xxx	ECE Elective (2)	3
ECE xxx	ECE Elective (3)	3
	Sub Total Core Credits	60
Other Required Courses in Related Subject Areas (# Total courses required = 12)		
Course Number	Course Title	Credit Hours
MATH 140	Calculus I	4
MATH 141	Calculus II	4
MATH 241	Calculus III	4
Math 260	Linear Algebra	3
MATH 310	Diff. Equations	3
PHY 113	Fundamental Physics I	4

PHY 114	Fundamental Physics II	4
PHY 181	Physics Lab I	2
PHY 182	Physics Lab II	2
CHEM 115	Chemical Principles I	3
CHEM 117	Chemical Principles Lab I	2
CS 119	Comp Language Suppl	2
	Sub Total Related Credits	37
Elective Courses (# Total courses required = *3*)		
Course Number	Course Title	Credit Hours
xxx	Thematic Elective (1)	3
xxx	Thematic Elective (2)	3
xxx	Thematic Elective (3)	3
	Sub Total Elective Credits	9
Distribution of General Education Requirements Attach List of General Education Offerings (Course Numbers, Titles, and Credits)		# of Credits
Arts and Humanities, including Literature and Foreign Languages		15
Mathematics and the Natural and Physical Sciences		
Social Sciences		9
	Sub Total General Education Credits	24
Curriculum Summary		
Total number of courses required for the degree	44	
Total credit hours required for degree	130	
Prerequisite or Other Additional Requirements:		

All majors are required to select a concentration area from which three concentration electives (9 credits) are chosen. These courses are listed as ECE xxx, CE Concent Elective (1,2,3). Furthermore, all majors are required to take three additional electives (9 credits) either for further in-depth study in the chosen concentration area or for another concentration area in EE or CE. These courses are listed as ECE xxx, ECE Elective(1,2,3). All these elective courses are new and to be developed with the addition of new faculty.

The three thematic electives are for in-depth study in a field outside ECE, and are drawn from one of the following fields that are currently in place within the CSM at UMass Boston: (1) Biology (2) Physics (3) Chemistry (4) EEOS, (5) Computer Science, and (6) Management.

There are totally 24 credits distributed between 8 courses to meet the general education requirements. Included in Arts and Humanities are ENGL 101, ENGL 102, one Arts, one Humanities, and one World Language or World Culture course. At least, two courses (6 credits) are in Social and Behavioral Sciences. In addition, all majors are required to take Intermediate Seminar for 3 credits.

Attachment B:

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NEW ACADEMIC PROGRAM BUDGET

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One Time/ Start Up Costs		Annual Expenses			
	Cost Categories	Year 1	Year 2	Year 3	Year 4
	Full Time Faculty *(Salary & Fringe)*	$239,633	$517,822	$812,487	$1,088,078
	Part Time/Adjunct Faculty *(Salary & Fringe)*				
	Staff	$149,017	$153,487	$158,092	$162,835
	General Administrative Costs	$27,448	$54,896	$82,344	$109,792
	Instructional Materials, Library Acquisitions				
	Facilities/Space/Equipment	$215,000	$225,000	$127,000	$225,000
	Field & Clinical Resources(start up)	0	$300,000	$300,000	$300,000
	Marketing				
	Other (Specify)(TA stipend)	$60,000	$60,000	$60,000	$60,000
	TOTALS	$691,098	$1,311,205	$1,539,923	$1,945,705

One Time/Start-Up Support		Annual Income			
	Revenue Sources	Year 1	Year 2	Year 3	Year 4
	Grants	$200,000	$400,000	$600,000	$800,000
	Tuition (non state)	0	$68,376	$107,448	$146,520
	Fees	0	$660,508	$1,108,512	$1,558,246
	Departmental(differential) fees	0	$61,600	$99,200	$133,600
	Reallocated Funds	0			
	Other (specify)	0			
	TOTALS	$200,000	$1,190,484	$1,915,160	$2,638,366

Notes:
Full time faculty cost is based on the salary and fringe of two faculty positions per year for three years (years 2-4) with a 3% cost of living each year after the first year. Please note two existing faculty members will be part of the program. Their salaries and fringe are listed starting in yr1 **Staff** cost is based on the salary and fringe of two staff positions with a 3% cost of living increase per year after the first year. **General Administrative** cost is based on approximately

$13,724 per faculty member per year. **Facilities/space/ Equipment** reflects the cost of furniture and renovations of the teaching labs and two faculty research labs per year for three years. **Start up** cost is based on $150,000 per faculty for two faculty hires per year for three years. **Stipend** cost is based on $60,000/yr for three teaching assistants per year for four years.

Income categories: **Grant** revenue is based on an average of $100,000 per faculty member per year. **Tuition** revenue is based on out of state tuition using the following formula X (# of out of state students) * $407 per semester * 12 credits. Seven students yr 2, eleven students yr 3, fifteen students yr 4. **Fee** revenue is based on seventy seven students enrolled yr 2, one hundred twenty four students enrolled yr 3, and one hundred sixty seven students enrolled yr 4. **Differential fees** are based on a per student fee of $400 per semester.