CONNECTICUT BOARD OF REGENTS FOR HIGHER EDUCATION
Connecticut State Colleges & Universities
*APPLICATION FOR **NEW PROGRAM APPROVAL***

SECTION 1: GENERAL INFORMATION

Institution: Central Connecticut State University	Date of Submission to CSCU Office of the Provost:
Most Recent NECHE Institutional Accreditation Action and Date: Accredited April 12, 2019	
Program Characteristics Name of Program: Mechanical Engineering Degree: Title of Award *(e.g. Master of Arts)* Master of Science in Mechanical Engineering (MSME) Degree Certificate: *(specify type and level)* Two embedded Official Certificate Program (OCP) possibilities below. Anticipated Program Initiation Date: Fall 2021 Anticipated Date of First Graduation: December 2022 Modality of Program: X On ground Online Combined If "Combined", % of fully online courses? Locality of Program: X On Campus Off Campus Both	**Program Credit Distribution** # Credits in General Education: 0 # Credits in Program Core Courses: 15 # Credits of Electives in the Field: 9 # Credits of Other Electives: 0 # Cr Special Requirements *(include internship, etc.):* 6 Thesis <u>Total # Cr in the Program</u> *(sum of all #Cr above)*: 30 From "Total # Cr in the Program" above, enter #Cr that are part of/belong in an already approved program(s) at the institution: 18 in initial concentration
Program Characteristics Name of Program: Official Certificate Program in Additive Manufacturing Engineering Stand-Alone Certificate: *(specify type and level)* Official Certificate Program Anticipated Program Initiation Date: Fall 2021 Anticipated Date of First Graduation: December 2022 Modality of Program: X On ground Online Combined If "Combined", % of fully online courses? Locality of Program: X On Campus Off Campus Both	**Program Credit Distribution** # Credits in General Education: 0 # Credits in Program Core Courses: 12 # Credits of Electives in the Field: 0 # Credits of Other Electives: 0 # Cr Special Requirements *(include internship, etc.):* 0 <u>Total # Cr in the Program</u> *(sum of all #Cr above)*: 12 From "Total # Cr in the Program" above, enter #Cr that are part of/belong in an already approved program(s) at the institution: 3
Program Characteristics Name of Program: Official Certificate Program in Advanced Manufacturing Engineering Stand-Alone Certificate: *(specify type and level)* Official Certificate Program Anticipated Program Initiation Date: Fall 2021 Anticipated Date of First Graduation: December 2022 Modality of Program: X On ground Online Combined If "Combined", % of fully online courses? Locality of Program: X On Campus Off Campus Both	**Program Credit Distribution** # Credits in General Education: 0 # Credits in Program Core Courses: 12 # Credits of Electives in the Field: 0 # Credits of Other Electives: 0 # Cr Special Requirements *(include internship, etc.):* 0 <u>Total # Cr in the Program</u> *(sum of all #Cr above)*: 12 From "Total # Cr in the Program" above, enter #Cr that are part of/belong in an already approved program(s) at the institution: 3
NOTE: All applications to establish a new program will be considered for both Licensure and Accreditation by the BOR	
CIP Code Number 14.1901 Title of CIP Code Mechanical Engineering	

If establishment of the new program is concurrent with discontinuation of related program(s), please list for each program:
Program Discontinued: Engineering Technology MS CIP: 15.0000 OHE#: 009299 BOR Accreditation Date: 10/17/2001
Phase Out Period 3 years Date of Program Termination Spring 2023

Institution's Unit *(e.g. School of Business):* School of Engineering, Science, and Technology Location *(e.g. main campus)* Offering the Program: CCSU main campus

Other Program Accreditation:

- If seeking specialized/professional/other accreditation, name of agency and intended year of review: Engineering Accreditation Commission of Accreditation Board for Engineering and Technology (EAC of ABET) 2022-2023
- If program prepares graduates eligibility to state/professional license, please identify: Professional Engineering (PE) licensure in many States requires continuing education credits beyond the BS degree in engineering. The Master of Science in Mechanical Engineering (MSME) would typically satisfy and the would OCPs partially satisfy these requirements.

(As applicable, the documentation in this request should addresses the standards of the identified accrediting body or licensing agency)

Institutional Contact for this Proposal: Peter F. Baumann, Ph.D.	Title: Professor (Former Chair), Engineering Department	Tel.: 860-832-0086 e-mail: baumannp@ccsu.edu

SECTION 2: PROGRAM PLANNING ASSESSMENT

Alignment of Program with Institutional Mission, Role and Scope

(Provide concise statements)

The Engineering Department within the School of Engineering, Science, and Technology at Central Connecticut State University proposes to dissolve its Master of Science in Engineering Technology (MSET) degree program with two specializations and instead offer two independent Master of Science in Engineering degrees: a Master of Science in Civil Engineering (MSCE) and a Master of Science in Mechanical Engineering (MSME). The MSME will eventually afford students the option of three concentrations: (1) Mechanical Design, Materials, and Manufacturing; (2) Thermo-fluids and Energy; and (3) Control, Dynamics, and Aerospace Systems. The Engineering Department intends to first offer the "Mechanical Design, Materials, and Manufacturing" concentration given our current and initially proposed resources. With continued growth, additional faculty members could be added to achieve full-scale program implementation across all three concentrations.

This proposal also includes two embedded 12-credit Official Certificate Programs in Additive Manufacturing Engineering and in Advanced Manufacturing Engineering. All credits of either OCP can be applied to the MSME. These OCPs also serve an important function of providing continuing education opportunities to licensed professional engineers.

The Mission of Central Connecticut State University:

Central Connecticut State University is a community of learners dedicated to teaching and scholarship that emphasizes development and application of knowledge and ideas through research and outreach activities, and prepares students to be thoughtful, responsible and successful citizens. As a comprehensive public university, we provide broad access to quality degree programs at the baccalaureate, master's, and doctoral levels.

The Mission of the School of Engineering, Science, and Technology (SEST):

The School of Engineering, Science & Technology will strive to provide an innovative and unique educational experience to every student, ***develop the most qualified engineers****, scientists and technologists. The School will maintain academic excellence in a wide variety of traditional disciplines and develop innovative disciplines in emerging fields, creating interdisciplinary educational and research programs, and* ***building the infrastructure to support the expansion of programs****.*

The School will be a leader in developing cross-disciplinary initiatives that combine and expand the talents of its students and faculty in all disciplines and prepares our graduates for a multidisciplinary world through a flexible and diverse curriculum; and, meets the needs for a well-educated and skilled workforce.

The School of Engineering, Science, and Technology will provide premier undergraduate and graduate programs in engineering, technology, computing, life and physical sciences, and mathematics. The School will provide a technology-rich, and interdisciplinary learning environment that ***offers students a rewarding academic experience through experiential and active learning that embraces the concept of "thinking, learning, and doing."***

The School will strive to ***serve a student population that mirrors the diversity of the region and includes many international students****. The School aspires to be a leading force in offering a number of creative outreach programs designed to encourage and support all students to pursue careers in science and engineering.*

Alignment with SEST's mission:

Developing the Most Qualified Engineers

The Master of Science in Engineering Technology (MSET) was developed prior to CCSU offering any engineering degrees. Enrollments within the program have steadily declined from 11 students in Fall 2015 to 1 student in Fall 2018. The MSET tends to draw only from the CCSU Bachelor of Science in Engineering Technology programs and a Master's degree is generally not sought by professionals having that credential since it is generally not needed to secure a position.

Building the Infrastructure to Support the Expansion of Programs

The MSME will begin offering a single concentration in Mechanical Design, Materials, and Manufacturing. The curriculum is designed to support additional concentrations in Thermo-fluids and Energy and in Control Dynamics and Aerospace Systems.

Serving a Student Population That Mirrors the Diversity of the Region and Includes Many International Students

The Master of Science in engineering programs (MSCE and MSME) are more appropriate next steps to our very successful and more analytical engineering degrees now offered. Over the past 3 years, the Mechanical Engineering BS program averages 308 students in Fall headcount enrollment and graduates an average of 49 students per year. Many of our graduates have needed to seek advanced degrees at other institutions. The MSME will draw students from a larger number of in-State graduates and professionals holding a BS in Mechanical Engineering. International students may also find the degree attractive to bolster their credentials for work in the US.

Offering students a rewarding academic experience through experiential and active learning that embraces the concept of "thinking, learning, and doing."

Attracting Masters-level engineering students allows faculty opportunities to undertake more challenging research including industrial community outreach through company-sponsored projects. The two-term Thesis requirement provides the curricular opportunity for graduate students to perform such research in consultation with their faculty advisor.

Consistent with CCSU's mission, the proposed MSME provides educational advancement through learning-centered environments designed to engage students and faculty in the discovery, application, and dissemination of knowledge. Advancing students' knowledge base and professional achievements transform students from generalists to specialists in their respective fields. Our curricular experiences and pedagogy are centered around finding solutions to technological, human, and environmental challenges that improve the quality of life.

Addressing Identified Needs

- How does the program address CT workforce needs and/or the wellbeing of CT communities – and include a description/analysis of employment prospects for graduates of this proposed program *(Succinctly present as much factual evidence and evaluation of stated needs as possible)*

We expect our MS graduates to help fill the state-wide demand for mechanical engineers and take on jobs requiring advanced abilities and responsibility.

State of Connecticut market feasibility – *The State of Connecticut Occupational Projections: 2016-2026* reported that employment of mechanical engineers is strong and is projected to grow over the next decade. Mechanical engineering is expected to be in high demand. The State of Connecticut employment projections are shown in Table 1 and these include the need for professionals with MS degrees. Although the minimum education is a Bachelor's degree, the need for professionals with more advanced degrees (OCPs and MS) should grow at comparable rates.

Table 1: State of Connecticut Occupational Projections: 2016-2026

Occupational Title	Estimated Employment 2016	Projected Employment 2026	10 Year Net Change	10 Year Percent Change	Annual Growth Openings	Annual Total Openings	Median Annual Wage	Minimum Education
Mechanical Engineers	6,206	7,684	1,478	23.8	148	578	$85,299	Bachelor's degree
https://www1.ctdol.state.ct.us/lmi/projections2016.asp								

According to JobsEQ, Connecticut added 387 jobs in mechanical engineering over the past 3 years since Q3 of 2019. Over the last 180 days from January 30, 2020, JobsEQ reported 278 job postings in Connecticut for occupations related to mechanical engineering. JobsEQ projects that approximately 68% of currently employed mechanical engineers in Connecticut do not have an advanced degree. The advanced OCPs may also be attractive for already employed Mechanical Engineers to efficiently build skills and become current in the field.

National market feasibility – The federal Employment Projections program in the U.S. Department of Labor's Bureau of Labor Statistics provides the national data on civil and mechanical engineering disciplines employment and forecasts for future hiring needs. As shown in Table 2, these projections include growth and replacement openings. Growth is expected to be 8.8% in mechanical engineering. According to the DOL data, earnings are also expected to remain very strong.

Table 2: National occupational employment and job openings data, projected 2016 and projected 2026, and worker characteristics, 2016 (Numbers in thousands)

Occupational Title	Employment		Employment Change, 2016-26		Average annual job openings due to growth and replacements, 2016-26	Typical education needed for entry
	2016	2026	Number	Percent		
Mechanical Engineers	288.8	314.1	25.3	8.8	21.2	BS
https://projectionscentral.com/Projections/LongTerm						

- How does the program make use of the strengths of the institution (*e.g. curriculum, faculty, resources)* and of its distinctive character and/or location?

Institutional Strength – CCSU's academic infrastructure emphasizes science, engineering, and technology. CCSU is the only university in the CSCU system that offers baccalaureate engineering degrees. All full-time tenured or tenure-track faculty members in the Engineering Department earned an engineering doctorate which is required for teaching at the graduate level.

Our new planned engineering building slated for open in Fall 2021 will provide additional needed laboratory space and equipment for research (described below).

Location – CCSU's location in the center of Connecticut and near two urban areas (New Britain and Hartford) provides the opportunity for broad access across the state. Also, we intend to offer both day and evening courses to be mindful of both traditional full-time students as well as industry professionals seeking advanced credentials. The fact that many companies reimburse employees' graduate study makes it plausible for students employed in local industry to take advantage of this financial incentive to take evening classes. In addition, many of the envisioned research projects will involve faculty and students collaborating side-by-side with local industry, which in turn paves the way for funding through contracts and grants from industry.

- Equity (eliminating achievement disparities among different ethnic/racial, economic and gender groups) is one of the Board of Regents' Goals. In addition to current institutional efforts already underway, what distinct actions will the proposed program undertake to advance equitable student success?

In accordance with the Mission of The School of Engineering, Science, and Technology, the School will strive to serve a student population that mirrors the diversity of the region and includes many international students. The School aspires to be a leading force in offering a number of creative outreach programs designed to encourage and support all students to pursue careers in science and engineering. There are also efforts to provide broader access and greater flexibility to students with families. The planned drop-in center for child care may be a game changer particularly for women in STEM. There may also be opportunity to offer graduate assistantships to support students from historically underrepresented populations. The program will allow all enrolled students to pursue more focused engineering study which will enable program graduates greater potential to succeed in their careers as problem solvers, designers, communicators, professionals, experimenters, and life-long learners.

We have embedded two OCPs within the MSME to provide stackable credentials for students who find that their careers are best served by additional coursework, but not a thesis. The chosen OCPs in Additive Manufacturing Engineering and Advanced Manufacturing Engineering are proposed in response to local industry needs and these cutting-edge engineering certificates consolidate coursework where the CCSU Engineering Department has expertise.

- Describe any transfer agreements with other CSCU institutions that will be instituted as a result of the approval of this program *(Please highlight details in the Quality Assessment portion of this application, as appropriate)*

n/a

- Indicate what similar programs exist in other CSCU institutions, and how unnecessary duplication is being avoided.

No similar programs exist at other CSCU institutions.

Cost Effectiveness and Availability of Adequate Resources

(Complete the PRO FORMA Budget – Resources and Expenditure Projections on page 6 and provide a narrative below regarding the cost effectiveness and availability of adequate resources for the proposed program. Add any annotations for the budget form below, as well.)

[i]Projected enrollments built in attrition at the rate of 1 full-time student each Spring semester. We assumed that all OCP students would be part-time and that 20% of part-time students would cease their studies after completing an OCP.

[ii]Tuition revenue was conservatively estimated with AY 2019-20 in-state graduate rates. For full-time graduate students, tuition was $3,689 per term plus the University General Fee less accident insurance ($1908). We assumed that PT students would take six credits per semester, resulting in $4,181 of revenue per student ($407 tuition per credit, $279 general fee per credit, and $65 registration fee). No tuition increases for 2021-23 were built into the budget.

[iii]The program will pursue instituting a program fee every semester of $250 for full-time students and $125 for part-time students.

[iv]A program coordinator from the full-time faculty will receive three credits of reassigned time per semester for coordinating the program. Replacement costs for a part-time faculty member to meet instructional demand at the undergraduate level was estimated to be $13,142 per academic year (AY 2019-20 Group B lecturer rate $1,672 x 6 credits x 1.31 fringe).

[v]Instructional costs scale with the number of credits expected to be offered, with the assumption that the 12 credits of core classes would be offered every semester. We anticipate 21 credits to be offered in the Spring semester of Year 1. Starting in Year 2, Semester 1 (Fall 2022), we estimated 30 instructional credits per semester. We estimated FT salary using the median FY20 salary of current faculty teaching with the program plus starting salaries for two anticipated new faculty and 73.28% fringe. In Year 1, three core courses (ENGR 501, ENGR 557, and ENGR 592) will combine MSME students with MS Civil Engineering students. Consequently, the true instructional estimates for Year 1 are scaled: 15 credits of instructional cost at 60% and 18 credits of instructional cost at 100%.

[vi]An administrative professional is anticipated to spend approximately 10% of their time in direct support of the MS in Mechanical Engineering. With 73.28% fringe and a 3% COLA added each year, expected expenses range from $11,227 to $11,911. In addition, a computer technician is expected to support the program approximately 10% of the time. With benefits, anticipated expenses range from $13,356 to $14,170. Further, the Engineering Department would hire two Graduate Assistants to support the program and report to the Program Coordinator: one in Year 1 and two in the following two years. Total stipends were projected at $4,800 per academic year for each Graduate Assistant.

[vii]Additional books on mechanical design, materials, and manufacturing engineering may be needed. Given that the Library resources already support our robust undergraduate program, additional requests for the MS program would occur through the Library's typical requisition process and would not require additional funds to support.

[viii]Replacement costs for non-capital equipment are covered by program fees collected as revenue less the stipends for graduate assistants.

[ix]Other costs include a 3-year marketing plan of approximately $5,000 in Year 1, $2,500 in Year 2, and $2,500 in Year 3. As this marketing plan involves a joint venture with the MS in Civil Engineering, some savings were built into these estimates. Further additional costs included an incremental increase in the demand for software licenses (described below). Although CCSU already supports all of the anticipated software for this program, there could be incremental increases due to increased enrollment. We estimated $100 in incremental increased expense per FTE resulting in projected expenses of $1,900 in Year 1, $3,300 in Year 2, and $3,600 in Year 3.

Student Recruitment / Student Engagement

What are the sources for the program's projected enrollments? Describe the marketing, advisement and other student recruitment activities to be undertaken to ensure the projected enrollments are achieved. If applicable, what student engagement strategies will be employed to advance student retention and completion in program?

Projected Enrollments –

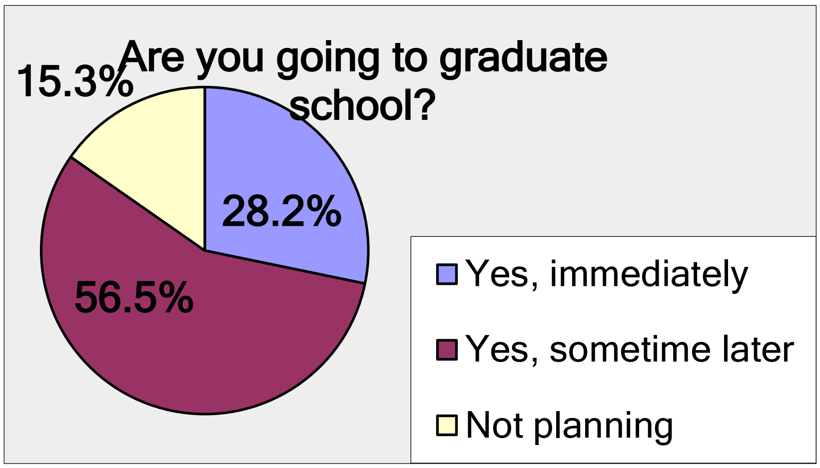
Part of our enrollment will come from students in our undergraduate program progressing directly to the graduate degree. Degree conferrals over the past 5 years for the BS in Mechanical Engineering are:

2014-15	2015-16	2016-17	2017-18	2018-19
37	36	44	53	49

Analysis of the exit interview data below for our B.S. graduates shows that the majority are either pursuing a master's degree immediately after graduation or in the near future:

CCSU – FA 13 - FA 16 ME Program Exit Interview Questionnaire

Are you going to graduate school?		
Answer Options	Response Percent	Response Count
Yes, immediately	28.2%	24
Yes, sometime later	56.5%	48
Not planning	15.3%	13
	answered question	85



Approximately 48% of our graduates would qualify for admission to the graduate program. If we take the cumulative number of CCSU BSME graduates over the past 5 years (219) and—to be conservative—the percentage of those who desire to pursue an MS immediately (28.2%), and the fraction that would qualify for admissions (219 x 0.282 x 0.48), we could expect 30 former students from CCSU to be amongst the first to enroll in the program.

Additionally, BS programs at Fairfield University, University of Connecticut, University of Hartford, University of New Haven, U.S. Coast Guard Academy, and Yale University are potential feeder schools within the State. CCSU's program would provide a high-quality, cost-effective alternative to existing programs in the state.

The following table contains IPEDS data for degree completions across other schools in CT that offer Bachelor's and Master's programs in Mechanical Engineering.

Bachelor's Mechanical Engineering

Institution	AY 2013-2014	AY 2014-15	AY 2015-16	AY 2017-18	AY 2018-19
Fairfield University	19	24	25	20	32
Quinnipiac University	0	0	12	9	20
United States Coast Guard Academy	30	15	10	39	34
University of Bridgeport	n/a	n/a	n/a	0	0
University of Connecticut	111	118	124	150	146
University of Hartford	24	51	57	47	47
University of New Haven	20	32	39	54	36
Yale University	11	7	20	17	14

Master's Mechanical Engineering

Institution	AY 2013-2014	AY 2014-15	AY 2015-16	AY 2017-18	AY 2018-19
Fairfield University	5	6	27	18	17
Quinnipiac University	n/a	n/a	n/a	n/a	n/a
United States Coast Guard Academy	n/a	n/a	n/a	n/a	n/a
University of Bridgeport	17	23	68	79	84
University of Connecticut	16	25	25	16	16
University of Hartford	21	17	58	24	13
University of New Haven	10	15	16	32	32
Yale University	5	8	6	20	9

This degree can also attract students from across New England and internationally.

Marketing, Advisement and other Student Recruitment Activities – In an effort to secure projected enrollment for this program, the Department, assisted by the School and University, will embark on a 3-year multifaceted marketing, advisement, and recruitment strategy. Funds to support these activities are designated on the budget.

Within the Department, program coordinators will gather lists of bachelor's program alumni and graduating seniors which would meet the admission requirements for direct e-mail contact. The local professional organizations in the engineering fields (ASME) will also be contacted as a vehicle for communication of advertising materials. This engagement will consist of the development of print publications and email communications as well as campus visits and invitations to events at CCSU.

We hope to also highlight our new program though our University's standard advertising. With the help of our University's Office of Marketing and Communication, the MSME Program will be advertised through:

1) Press Release
2) Advertisements
3) Mailers (Brochures), E-mail
4) Website Updates and Redesign
5) Social Professional Media (Linked-in)
6) Engineering Company Contacts
7) International Agents / Exchange Programs

Whenever possible, we will facilitate communication though our faculty to maximize the appeal. With the help of our University's School of Graduate Studies, we hope to also secure superior turnout of participants interested in Engineering at the Graduate Open House events.

CCSU also plans to develop several digital marketing campaigns including ads on social media, Google, and graduate recruitment sites such as Gradschools.com and Petersons.com. CCSU's digital campaigns will periodically be supported by print campaigns on local billboards, mass transit, and newspapers as well as radio campaigns targeting specific recruitment events.

Finally, CCSU looks to develop marketing materials including pamphlets and brochures for distribution at college and career fairs, campus events, and through mailings to inquiries and leads generated through advertising and outreach.

SECTION 3: PROGRAM QUALITY ASSESSMENT

Learning Outcomes - L.O. *(Please list up to seven of the most important student learning outcomes for the program and concisely describe assessment methodologies to be used in measuring the outcomes. If the program will seek external accreditation or qualifies* *graduates to opt for a professional/occupational license, please frame outcomes in attention to such requirements. With as much detail as possible, please map these learning outcomes to courses listed under the "Curriculum" section of this application)*

The Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC of ABET) requires MS graduates to show the same learning outcomes as BS recipients for accreditation. To distinguish the undergraduate from the graduate outcomes, we would expect that graduates with an MS degree to show "increased" ability in all ABET outcomes. The MS in Mechanical Engineering at CCSU would measure the following learning outcomes in fulfillment of ABET expectations:

1. Increased ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. Increased ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. Increased ability to communicate effectively with a range of audiences.
4. Increased ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. Increased ability to function effectively, with faculty advising committee guidance, to establish goals, plan tasks, and meet objectives.
6. Increased ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. Increased ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Students earning the OCPs are expected to show "increased" ability in the first two learning outcomes.

Capstone thesis rubrics will measure outcomes for the MS and ENGR 510 assignment rubrics will be used to assess L.O.s 1 and 2 for the OCPs.

Program Administration *(Describe qualifications and assigned FTE load of administrator/faculty member responsible for the day-to-day operations of the proposed academic program. Identify individual for this role by name or provide time frame for prospective hiring)*

The Chair of the Engineering Department (Dr. Nidal Al-Masoud, Chair) would have overall responsibility for Program Administration assisted by a dynamic MSME Program Coordinator needing up to 3 reassigned load credits per semester to be responsible for the day-to-day operations of the new proposed academic program. Dr. Edward (Ned) Moore is recommended for this role.

Faculty *(Please complete the faculty template provided below to include current full-time members of the faculty who will be teaching in this program and, as applicable, any anticipated new positions/hires during the first three years of the program and their qualifications)*

How many new full-time faculty members, if any, will need to be hired for this program?

The program will require two new full-time faculty members for initial implementation: one in Year 1 and a second in Year 2 or 3. As the program is modified with additional concentrations, faculty will be added accordingly.

What percentage of the credits in the program will they teach?

New faculty will teach 20% of this new program and will be assigned courses in the baccalaureate program normally covered by more senior faculty eager to teach at the graduate level.

What percent of credits in the program will be taught by adjunct faculty?

0%

Describe the minimal qualifications of adjunct faculty, if any, who will teach in the program

Minimum qualifications will be consistent with the requirements of our Graduate School (i.e., an Engineering Doctorate in Mechanical, Aerospace or Manufacturing Engineering or a closely related field).

Special Resources *(Provide a brief description of resources that would be needed specifically for this program and how they will be used, e.g. laboratory equipment, specialized library collections, etc. Please include these resources in the Resources and Expenditures Projections spreadsheet)*

This program will utilize laboratories and equipment within the new engineering building at CCSU, in addition to existing and renovated facilities in Copernicus. In the new engineering building, the following mechanical engineering laboratories will be available for use by the MSME program: Computation Space, Fluids Lab, Engineering Materials Lab, Materials Science Lab, Engineering Mechanics Lab, Dynamics and Controls Lab, Thermal and Energy Lab, and an ME Design Lab. Capital lab equipment is partially bonded through the building project. Maintenance of equipment including repair, service contracts, and calibration is required. The proposed program fees will offset such costs.

CCSU already supports the software needs of the Engineering programs. Program faculty anticipate using the following software: MATLAB, MAPLE, Mathematica, MiniTab, Ansys, Siemens NX, Solid Works, National Instruments LabView, PCT, BIOWin, Autodesk (free), Livermore LSDYNA, CSI SAP2000, Bentley, CNC Software Mastercam, CGTech Vericut, and IBM SPSS. Because increased enrollment could produce increased need for licenses, we estimated the additional incremental expense of each FTE student in the MSME at $100 per year.

Curriculum

*(Please list courses for the proposed program, including the core/major area of specialization, prerequisites, electives, required general education courses (undergraduate programs), etc. Using numerals, map the Learning Outcomes listed in the previous section to relevant program courses in this table. Mark any new courses with an asterisk * and attach course descriptions. Mark any courses that are delivered fully online with a double asterisk ** Please modify this format as needed)*

Course Number and Name	L.O. # [1]	Pre-Requisite	Cr Hrs	Course Number and Name	L.O. #	Cr Hrs
Program Core Courses				**Other Related/Special Requirements**		
ENGR 501 – Engineering Analysis*	1	MSME Admission	3			
ENGR 510 – Engineering Optimization	2	MSME Admission	3			
ENGR 557 – Advanced Mechanics of Materials*	1, 2	MSME Admission	3			
ENGR 592 – Methods of Engineering Research	6	MSME Admission	3			
ME 567 – Advanced Finite Element Analysis*	1, 2	MSME Admission	3			
ME 597 – Thesis I*	4	ENGR 592	3			
ME 599 – Thesis II*	1-7	ME 597	3			
Core Course Prerequisites				**Mechanical Design, Materials, and Manufacturing Concentration**		**(9)**
See above.				ME 516 – Machines and Mechanisms*	1, 2	3
				ME 518 – Fracture Mechanics*	1, 2	3
				ME 520 – Tribology*	1, 2	3
				ME 522 – Plasticity and Elasticity*	1, 2	3
Curriculum: Official Certificate Program in Additive Manufacturing Engineering			12	ME 523 – Contemporary Engineering Materials	1, 2	3
ENGR 510 – Engineering Optimization			3	ME 525 – Materials Engineering of Additive Manufacturing*	1, 2	3
ME 525 – Materials Engineering of Additive Manufacturing*			3	ME 540 – Advanced Geometric Dimensioning and Tolerancing (GD&T) and Metrology	1, 2	3
ME 545 – Design and Analysis of Additive Manufacturing*			3	ME 545 – Design and Analysis of Additive Manufacturing*	1, 2	3
ME 563 – Engineering of Additive Manufacturing Processes			3	ME 563 – Engineering of Additive Manufacturing Processes	1, 2	3
Curriculum: Official Certificate Program in Advanced Manufacturing Engineering			12	ME 565 – Advanced Manufacturing Engineering*	1, 2	3
ENGR 510 – Engineering Optimization -OR-			3	ME 569 – Composites Design	1, 2	3

[1] From the ABET Learning Outcomes enumerated list provided at the beginning of Section 3 of this application

ME 567 – Advanced Finite Element Analysis		and Analysis		
ME 540 – Advanced Geometric Dimensioning and Tolerancing (GD&T) and Metrology	3	**Thermo-Fluids and Energy Concentration**		(9)
ME 563 – Engineering of Additive Manufacturing Processes	3	ME 551 – Advanced Fluid Mechanics*	1, 2	3
ME 565 – Advanced Manufacturing Engineering*	3	ME 553 – Computational Fluid Dynamics*	1, 2	3
		ME 554 – Advanced Heat Transfer*	1, 2	3
		ME 555 – Combustion*	1, 2	3
		ME 557 – Turbomachinery*	1, 2	3
		ME 559 – Heating, Ventilation, Refrigeration, and Air-Conditioning*	1, 2	3
		Controls, Dynamics, and Aerospace Systems Concentration		(9)
		ME 501 – Digital Control*	1, 2	3
		ME 502 – Optimal Control*	1, 2	3
		ME 503 – System Identification*	1, 2	3
		ME 505 – Robust Control Theory*	1, 2	3
		ME 509 – Guidance, Navigation, and Control*	1, 2	3
		ME 551 – Advanced Fluid Mechanics*	1, 2	3
		ME 555 – Combustion*	1, 2	3
		ME 580 – Aerospace Propulsion Systems*	1, 2	3
		ME 582 – Advanced Propulsion*	1, 2	3
		ME 583 – Advanced Aerodynamics*	1, 2	3
		ME 586 – Aerospace Structures*	1, 2	3
		ME 588 – Flight Dynamics*	1, 2	3
Total Other Credits Required to Issue Credential *(e.g. GenEd/Liberal Arts Core/Liberal Ed Program)*				**0**

Academic Map for Master of Science in Mechanical Engineering:

Year 1 **Fall Semester**	**Year 1** **Spring Semester**	**Year 2** **Fall Semester**
ENGR 501 – Engineering Analysis	ME 567 – Advanced Finite Element Analysis	ME 599 – Mechanical Engineering Thesis II
ENGR 510 – Engineering Optimization	ME 597 – Mechanical Engineering Thesis I	Elective Course

ENGR 557 – Advanced Mechanics of Materials	Elective Course	Elective Course
ENGR 592 – Methods of Engineering Research		

***Special Requirements** include co-curriculum activities – structured learning activities that complement the formal curriculum – such as internships, innovation activities and community involvement.
None.

Program Outline *(Please provide a summary of program requirements including total number of credits for the degree, special admission requirements, capstone or special project requirements, etc. Indicate any requirements and arrangements for clinical affiliations, internships, and practical or work experience.)*

These programs at Central Connecticut State University will require all applicants to have the equivalent of a BS in Mechanical Engineering with a minimum 3.0/4.0 cumulative GPA as per documented Admission Standards.

Graduation with an MSME requires completion of 30 credit hours including a six-credit, two-course thesis capstone sequence.

Graduation with an Official Certificate requires completion of the specified 12 credit hours.

Couse Descriptions of New Courses

ENGR 501: Engineering Analysis. Applications of mathematical analysis and numerical concepts to typical engineering problems such as analytical and numerical solutions for linear and nonlinear ordinary differential equations, Fourier series and integrals, the Laplace transform, and the solution of partial differential equations. Examples used in the course will be derived from the field of engineering. Use of computational software tools is an integral part of this course.

ENGR 510: Engineering Optimization. Application of optimization techniques to engineering design or process problems. Principles of design/process variables, constraints, and objective functions. Techniques for solving constrained and unconstrained optimization problems, computer implementation of optimization schemes. Both local and global methods are considered.

ENGR 557: Advanced Mechanics of Materials. This course explores advanced topics in mechanics of materials. Subjects include plasticity, orthotropic materials, energy methods, torsion of non-circular shafts, shear center, and beams on elastic foundations.

ENGR 592: Research and Development of Experiments. Concepts and procedures for obtaining, evaluating, and reporting existing and measured data.

ME 501: Digital Control. Introduction to the analysis and design of discrete-time feedback control systems. Topics include: mathematical representation of physical systems with linear difference equations, z-transforms, transfer functions, sampling, A/D and D/A converters, sampled-data systems, discrete equivalent systems, transient specifications, steady-state tracking errors, stability, controller design, and quantization effects.

ME 502: Optimal Control. Introduction to the principles and methods of the optimal control approach. Topics include performance measures, dynamic programming, calculus of variations, Pontryagin's principle, optimal linear regulators, minimum-time and minimum-fuel problems, steepest descent, and quasi-linearization methods for determining optimal trajectories.

ME 503: Dynamic System Parameter Identification. Introduction to system identification, including approaches to system modeling, identification procedure, and the properties of parameter estimates. Additional topics include regression and correlation analysis, the structures of linear dynamic models, deterministic methods of dynamic systems, system identification in the time and frequency domains, statistical methods of dynamic system identification, batch and recursive methods of identification, and practical aspects of identification, including experiment design, data preprocessing, model structure selection, and model validation.

ME 505: Design of Control Systems with Uncertainties. Analysis of linear systems under uncertainty, including quantifying stability and performance, uncertainty and robustness, parameterization of stabilizing controllers, algebraic Riccati equations, norms for signals and systems, and H2 control, and Hinf control.

ME 509: Guidance, Navigation, and Control. Design of guidance and navigation systems for various aerospace vehicles. Analysis of the guidance and control systems used in missile systems and launch vehicles. Equilibrium glide trajectories for atmospheric flight and energy guidance methods. Selection and trade-off between various navigation components such as the IMU, GPS and other navigation components. Implementation of multi-sensor fusion techniques.

ME 516: Machines and Mechanisms. Advanced concepts of kinematic and dynamic modelling and analysis of mechanisms and machines, including linkage mechanisms, cam mechanisms, and reciprocating and rotating machinery. The course will emphasize computer-aided methods for analysis of contemporary problems such as balancing and engine dynamics.

ME 518: Fracture Mechanics. Study of the basic fracture problem and concepts together with analysis of linear elastic, elastic-plastic, dynamic and time-dependent fracture mechanisms. Material behavior considers fracture mechanics in metals and non-metals.

ME 520: Tribology. Study of the friction, wear and lubrication of materials. Review of surface interactions and the basic wear problem and concepts together with analysis of adhesive, abrasive, and other wear mechanisms. Examination of the impact of solid and liquid lubricants on the friction and wear of materials.

ME 522: Elasticity and Plasticity. The fundamentals of the theory of elasticity and plasticity are studied. Elasticity topics include analysis of stress, strain, and stress-strain relations. Two-dimensional problems in elasticity are solved using both Airy and Prandtl stress functions. Plasticity topics include generalized yield criterion, isotropic and kinematic hardening models, and J2 flow theory.

ME 523: Contemporary Engineering Materials. Analysis of contemporary materials for the applications, advantages or disadvantages, properties and specifications for product design and manufacturing techniques. Two hours lecture and two hours laboratory, course meets four hours per week.

ME 525: Materials Engineering of Additive Manufacturing. Study of the resultant process – structure – property relationships achieved using various additive fabrication (AF) processes. Properties of plastics, metals, and ceramics are considered.

ME 540: Advanced Geometric Dimensioning & Tolerancing and Metrology. Measurements and acceptance inspection of dimensional and GD&T requirements for parts and assemblies using typical measuring instruments, such as micrometers, calipers, indicators, gage blocks, Go-NoGo gages, functional gages, and coordinate measuring machines (CMM). Simulated datums and fitted datums. Measurement versus functional acceptance, procedures and equipment. Design of functional gages. Measurement system analysis and Gage R&R. Data graphing and analysis. Measurements of surface finish in 2D and 3D for various materials and applications.

ME 545: Design and Analysis of Additive Manufacturing. Engineering analysis of parts made via additive manufacturing. Includes finite element analysis of orthotropic materials, topological optimization of structures, design for additive manufacturing principles, and a study of the relationships between design, materials and process, and the final part dimensions and mechanical and surface properties. Design validation through lab activities.

ME 551: Advanced Fluid Mechanics. This course provides a continuation of the principal concepts and methods of fluid dynamics. Topics include mass conservation, momentum, and energy equations for continua, Navier-Stokes equations for viscous flows and its solution, similarity and dimensional analysis, boundary layers, potential and rotational flows, introduction to flow instability and transition to turbulence, and surface tension and surface tension driven flows.

ME 553: Computational Fluid Dynamics. Computational Fluid Dynamics is a branch of continuum mechanics that deals with numerical simulation of fluid flow and heat transfer problems. This course provides an introduction to the scientific principles and practical engineering applications of CFD. The fundamental mathematical equations governing the fluid flow and heat transfer phenomena are introduced. Then this knowledge will be applied to practical use of commercial CFD codes.

ME 554: Advanced Heat Transfer. Introduces detailed analysis of conduction, convection, forced convection, and natural convection. The fundamentals of thermal radiation, diffusion, mass transfer, vaporization, condensation heat transfer are discussed. The theory and basics of the design and calculation of heat exchangers is covered. Two hours lecture and one-hour laboratory per week.

ME 555: Combustion. Physical and chemical aspects of basic combustion phenomena are covered. Flames, including premixed flames and diffusion flames, will be studied from the perspectives of chemical thermodynamics, temperatures, classification, laminar speed, and the theory of flame propagation. Chemical equilibrium, kinetics, and reaction mechanisms as applied to detonation and theories of ignition, stability, and combustion efficiency are considered. Finally, fuels are discussed, including the atomization and evaporation of liquid fuels.

ME 557: Turbomachinery. Dimensionless parameters such as similarity theory and Cordier diagrams. Impellers and specific speed. Performance maps. Basic principles such as Euler transport theorem. Conservation Laws in integral form. Entropy generation, work loss and efficiency. Basic energy transactions in turbomachines such as expansion, diffusion and energy extraction/addition. Torque and power. Pumps including incompressible flow and centrifugal pumps. Cavitation. Centrifugal compressors including components, operational principle, velocity triangles, design aspects. Stage design and losses of axial compressors, axial gas turbines, and axial steam turbines; steam turbines, impulse stage and reaction stages. Hydro turbines such as Pelton, Francis and Kaplan runners and their efficiency. Aerodynamics and power coefficient of wind turbines.

ME 559: Heating, Ventilation & Air Conditioning. Course topics include basic HVAC systems, as well as more advanced systems such as multizone, dual-duct, terminal reheat, variable air volume, induction, and induction reheat. Special applications, such as hydronic systems, unitary and heat pump systems, hydronic heat recovery systems are covered. Analysis of cooling and heating load calculation, duct and piping design, overall system design, and integration are discussed.

ME 563: Engineering of Additive Manufacturing Processes. Engineering fundamentals of additive manufacturing processes for metals, ceramics, and plastics including powder bed fusion, extrusion, vat photopolymerization, material jetting, binder jetting, and sheet lamination. Selection of processes based on product requirements. Concepts are developed through analytical class work and manufacturing laboratory experience. Current state of the art is explored through review of current research publications.

ME 565: Advanced Manufacturing Engineering. Simulation and analysis of assembly mates and mechanisms incorporating theoretical discussions for kinematic and dynamic analysis; Advanced Optimization and Meta Heuristics using MATLAB; Advanced fabrication and assembly, lithography, self-assembly, and other processes; Use of CAM software for advanced milling and turning operations. Concepts, toolpaths and toolpath control in advanced CNC programming with 5-axis machines. Modern cutting tool materials and geometry for aerospace alloys. Hard turning, milling and high speed machining.

ME 567 Advanced Finite Element Analysis. This advanced course in the finite element method begins with an overview of linear finite element analyses including the direct stiffness method, the principle of minimum potential energy, and the method of weighted residuals. The sources of nonlinearity including geometric, material, and boundary condition nonlinearities are presented in detail. Nonlinear compatibility and constitutive relationships are introduced. Geometric nonlinearity topics include stress and strain measures for large deformation and total and updated Lagragian descriptions. Material nonlinearity including yield criteria, work hardening, creep, and viscoelasticity and viscoplasticity are investigated. Contact and friction are included as boundary condition nonlinearity topics. Incremental and iterative solution procedures for nonlinear problems including full and modified Newton-Raphson methods are also introduced. Implicit and explicit time integration procedures are presented for nonlinear dynamic analyses. Analyses will include the use of commercially available finite element software.

ME 569: Composite Design and Analysis. Study of the design and analysis of composite structures using classical composite theory coupled with computational analysis software. New methods of structural redesign using composite materials.

ME 580: Aerospace Propulsion Systems. This course provides an overview of gas turbine engines, ramjet and scramjet engines and rocket liquid-propellant propulsion systems and their analysis. The course contains a computer project.

ME 582: Advanced Propulsion. The course reviews the types and performance attributes of rocket engines. Chemical rocket engines are studied in detail, including characteristics, propellants and combustion, expansion in nozzles, and thrust chambers. Liquid, solid, and hybrid propellant rocket engines are also covered, including their design, operational parameters, and specific features of combustion. Electrical rocket propulsion and advanced propulsion concepts are discussed. The course contains a design project.

ME 583: Advanced Aerodynamics. The course introduces concepts, derivations, and application of aerodynamic fundamentals. Emphasis is placed on advanced knowledge in the analysis of supersonic and hypersonic flows, compressible flows over airfoils, wing and wing-body combination in compressible flows, and multi- dimensional flows. Also covered are the basics aspects of the design of fixed-wing, launch/atmospheric return vehicles, and rotating systems. The course contains a computer project.

ME 586: Aerospace Structures. The course provides a review of plane states of stress and strain. These concepts are applied to the analysis of thin-walled beams with open and closed section, unsymmetrical bending of wing sections, torsion of skin-stringer and multi-cell sections, flexural shear in open and closed sections, and shear center and relevant failure criteria. This course also includes an introduction to composite materials and the demonstration of the behaviors of some simple structural elements.

ME 588: Flight Dynamics. The course focuses on equations of motion for rigid aircraft; aircraft performance, weight and balance, static stability and control, and dynamic stability. The design implications of these concepts are also explored.

ME 597: Thesis I. Initiation of the thesis creation process, under guidance of a thesis advisor, for students working towards fulfilling the requirements for the degree of Master's of Science in Mechanical Engineering.

ME 599: Thesis II. Completion of the thesis process, under guidance of a thesis advisor, for students working towards fulfilling the requirements for the degree of Master's of Science in Mechanical Engineering.

NOTE: The PRO FORMA Budget on the last page should provide reasonable assurance that the proposed program can be established and is sustainable. Some assumptions and/or formulaic methodology may be used and annotated in the "Cost Effectiveness …" narrative on page 6.

Full-Time Faculty Teaching in this Program

Faculty Name and Title	Institution of Highest Degree	Area of Specialization/Pertinent Experience	Other Administrative or Teaching Responsibilities
Dr. Nidal A. Al-Masoud, Professor & Chair	University of Buffalo, Ph.D., 2002	Mechanical Engineering/ 19 yrs. teaching, 13 yrs. professional practice	Engineering Department Chair
Dr. Luz Amaya, Assoc. Professor	City University of New York, Ph.D., 2010	Mechanical Engineering/ 9 yrs. teaching, 3 yrs. professional practice	Coordinator BS Mechanical Engineering
Dr. Peter F. Baumann, Professor (Former Chair)	NYU Polytechnic School of Engineering, Ph.D., 1997	Materials Engineering/ 18 yrs. teaching, 20 yrs. professional practice	
Dr. Alfred Gates, Professor	University of Connecticut, Ph.D., 1992	Mechanical Engineering/ 25 yrs. teaching, 10 yrs. professional practice	Coordinator MS Engineering Technology
Dr. Reza Ghodsi, Professor	University of British Columbia, Ph.D., 2004	Mechanical Engineering/ 12 yrs. teaching, 5 yrs. professional practice	
Dr. Khaled J. Hammad, Professor	NYU Polytechnic School of Engineering, Ph.D., 1996	Mechanical Engineering/ 10 yrs. teaching, 14 yrs. professional practice	
Dr. Steven C. Johnson, Asst. Professor	The Ohio State University, Ph. D., 1997	Materials Science and Engineering/ 12 yrs. teaching, 14 yrs. Prof. practice	
Dr. Steven J. Kirstukas, Professor	University of Minnesota, Ph.D., 1995	Mechanical Engineering/ 14 yrs. teaching, 13 yrs. professional practice	Coordinator BS Mechanical Engineering Technology
Dr. Edward Moore, Assoc. Professor	University of Connecticut, Ph.D., 2011	Mechanical Engineering/ 9 yrs. teaching, 5 yrs. professional practice	Planned Coordinator MS Mechanical Engineering
Dr. Viatcheslav Naoumov, Professor	Kazan St. Tech. Univ., Dr. Sci., 1994 Kazan Aviation Inst., Ph.D., 1981	Aerospace Engineering/ 38 yrs. teaching, 18 yrs. professional practice	
Dr. Zbigniew Prusak, Professor	University of Connecticut, Ph.D., 1998	Mechanical Engineering/ 25 yrs. teaching, 6 yrs. professional practice	Coordinator BS Manufacturing Engineering Technology
Dr. Thomas J. Vasko, Professor	University of Connecticut, Ph.D., 1992	Mechanical Engineering/ 11 yrs. teaching, 31 yrs. professional practice	
Dr. Fu-Shang (John) Wei, Assoc. Professor	Washington University, Ph.D., 1978	Mechanical Engineering/ 9 yrs. teaching, 32 yrs. professional practice	
To be hired, Asst./Assoc. Professor		ME / Minimum 2 yrs. professional practice (Replacement for current vacancy)	
To be hired, Asst./Assoc. Professor		ME / Minimum 2 yrs. professional practice (Replacement for current vacancy)	

To be hired, Asst./Assoc. Professor (NEW)		ME/2 yrs. Min Prof. Practice (MSME)	
To be hired, Asst./Assoc. Professor (NEW)		ME/2 yrs. Min Prof. Practice (MSME)	

Chart Area

PRO FORMA Budget - Resources and Expenditures Projections (whole dollars only)

PROJECTED Enrollment[i]	2021-22						2022-23						2023-24					
	Fall Semester		Spring Semester		Summer		Fall Semester		Spring Semester		Summer		Fall Semester		Spring Semester		Summer	
	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT
Internal Transfer (from other programs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Students (first time matriculating)	10	10	10	10	0	0	10	10	10	10	0	0	10	10	10	10	0	0
Continuing Students progressing to credential	0	0	9	10	0	0	19	18	18	26	0	0	19	34	18	34	0	0
Headcount Enrollment	10	10	19	20	0	0	29	28	28	36	0	0	29	44	28	44	0	0
Total Estimated FTE per Year[1]	**18.4**						**34.5**						**38.5**					

PROJECTED Program Revenue	2020-21						2021-22						2022-23					
	Fall Semester		Spring Semester		Summer		Fall Semester		Spring Semester		Summer		Fall Semester		Spring Semester		Summer	
	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT	FT	PT
Tuition[2, ii]	$55,970	$41,810	$106,343	$83,620	$0	$0	$162,313	$117,068	$156,716	$150,516	$0	$0	$162,313	$183,964	$156,716	$183,964	$0	$0
Tuition from Internal Transfer[2]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Program Specific Fees (lab fees, etc.)[iii]	$2,500	$1,500	$4,750	$3,000	$0	$0	$7,250	$4,200	$7,000	$5,400	$0	$0	$7,250	$6,600	$7,000	$6,600	$0	$0
Other Revenue (annotate in narrative)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Annual Program Revenue	**$299,493**						**$610,463**						**$714,407**					

PROJECTED Program Expenditures[3]	[redacted]		
	2021-22	2022-23	2023-24
Administration (Chair or Coordinator)[4, iv]	$13,142	$13,142	$13,142
Faculty (Full-time, total for program)[4, v]	$200,170	$444,823	$444,823
Faculty (Part-time, total for program)[4]	$0	$0	$0
Support Staff (lab or grad assist, tutor)[vi]	$29,384	$34,921	$35,681
Library Resources Program[vii]	$0	$0	$0
Equipment (List in narrative)[viii]	$6,950	$14,250	$17,850
Other[ix]	$6,900	$6,000	$6,400
Estimated Indirect Costs[6]			
Total Expenditures per Year	**$256,546**	**$513,136**	**$517,896**

NOTE: Existing regulations require that: "an application for a new program shall include a complete and realistic plan for implementing and financing the proposed program during the first cycle of operation, based on projected enrollment levels; the nature and extent of instructional services required; the availability of existing resources to support the program; additional resource requirements; and projected sources of funding. If resources to operate a program are to be provided totally or in part through reallocation of existing resources, the institution shall identify the resources to be employed and explain how existing programs will be affected. Reallocation of resources to meet new and changing needs is encouraged, provided such reallocation does not reduce the quality of continuing programs below acceptable levels."

1 1 FTE = 15 credit hours for undergraduate programs; 1 FTE = 12 credit hours for graduate programs; both for Fall & Spring
Formula for conversion of part-time enrollments to Full-Time Equivalent (FTE): Divide part-time enrollment by 3, and round to the nearest tenth - for example 20 part-time enrollees equals 20 divided by 3 equals 6.67 or 6.7 FTE.

2 Revenues from all courses students will be taking.

3 Capital outlay costs, instructional spending for research and services, etc. can be excluded.

4 If full-time person is solely hired for this program, use rate time; otherwise, use a percentage. Indicate if new hires or existing faculty/staff. Record Salary and Fringe Benefits, accordingly.

5 e.g. student services. Course development would be direct payment or release time; marketing is cost of marketing that program separately.

6 Check with your Business Office – community colleges have one rate; the others each have their own. Indirect Cost might include such expenses as student services, operations and maintenance.