December 9, 2020

TO: Members of the Board of Trustees

FROM: Carl W. Lejuez, Ph.D.
Provost and Executive Vice President for Academic Affairs

RE: Master of Science in Regenerative Engineering

RECOMMENDATION:

That the Board of Trustees approve a new Master of Science in Regenerative Engineering.

BACKGROUND:

Our leaders at the United States National Academies have recently recognized that the implementation of convergence research will be key to solving our most challenging societal needs. Convergence research employs a diverse interdisciplinary approach to solve a target, highly complex problem. To this end, Regenerative Engineering is a new field defined as the convergence of advanced materials science, stem cell science, physics, developmental biology and clinical translation for the regeneration of complex tissues and organ systems.

The Master of Science (M.S.) in Regenerative Engineering program is intended to train a new transdisciplinary workforce for Regenerative Engineering. The masters program is administrated by the Department of Chemical and Biomolecular Engineering and the Department of Materials Science and Engineering at the University of Connecticut. It is anticipated that up to 20 students to be enrolled in the M.S. program. NIH funds will provide fellowships for 3-4 new full-time M.S. students each year. M.S. students typically complete their course load within 2-3 semesters and complete their thesis research by the end of their second year. It is anticipated that the first students to graduate from the program will do so in 2023.
Request for New UConn Academic Degree Program

**General Information**

Name of degree program: Master of Science (M.S.) in Regenerative Engineering  
Name of sponsoring Department: Chemical and Biomolecular Engineering / Materials Science and Engineering  
Name of sponsoring College: School of Engineering  
Campuses: Storrs  
Contact persons: Cato Laurencin  
Type of Proposal: New  
Type of Program: Master of Science  
Anticipated Initiation Date: Fall 2020  
Anticipated Date of First Graduation: Spring 2021  
Program Payment Type: Tuition based  
CIP Code: 14.0501 Biomedical/Medical Engineering

**Justification for the New Program**

Our leaders at the United States National Academies have recently recognized that the implementation of convergence research will be key to solving our most challenging societal needs. Convergence research employs a diverse interdisciplinary approach to solve a target, highly complex problem. To this end, Regenerative Engineering is a new field defined as the convergence of advanced materials science, stem cell science, physics, developmental biology and clinical translation for the regeneration of complex tissues and organ systems. Regenerative engineering is considered a game-changing area of engineering and medicine with the potential to fully heal damaged tissues and organs from blindness to cancer. Thus regenerative engineering offers solutions and hope for people who have conditions that today are beyond repair. This will be the first master’s program in regenerative engineering and convergence in the United States. The program is intended to train a new transdisciplinary workforce for convergence research. Convergence research is a means for solving vexing research problems, in particular, complex problems focusing on societal needs. After completing the program, students will be poised to apply to PhD or MD or MD/PhD programs, enter the growing field of Convergent Research in Regenerative Engineering, or engage in other academic, clinical or business efforts.

**Are there similar programs in CT or elsewhere?**

Our search did not reveal any programs focusing on regenerative engineering and convergence research and related topics.
What are the desired learning outcomes of the program?

- Understand and solve regenerative engineering problems using advanced materials, stem cell sciences, statistical methods, and clinical translational methods
- Use standard written English and revise and edit your own writing for appropriateness
- Demonstrate research skills, integrate your own ideas with those of others, and apply the conventions of attribution and citation correctly
- Understand convergence aim at developing sustainable relationships that may not only create solutions to the problem that engendered the collaboration, but also develop novel ways of framing related research questions and open new research vistas
- Improve the ability to function effectively on project teams, and the ability to manage (interdisciplinary) project teams
- Formulate, and solve engineering problems in advanced manufacturing for regenerative engineering
- Be able to identify and use appropriate tools in solving relevant engineering problems
- Be able to follow and implement recent developments in the field of regenerative engineering

Program Description
This will be the first master’s program in regenerative engineering and convergence in the United States. The program is intended to train a new transdisciplinary workforce for convergence research. Convergence research is a means for solving vexing research problems, in particular, complex problems focusing on societal needs. After completing the program, students will be poised to apply to PhD or MD or MD/PhD programs, enter the growing field of Convergent Research in Regenerative Engineering, or engage in other academic, clinical or business efforts. Bachelor degree in science or engineering is required from a regionally accredited college or university or present evidence of the equivalent. Student must meet the admission requirements of Graduate Degree Programs set by the University of Connecticut.

Proposed Graduate Catalogue Copy
The Master of Science (M.S.) in Regenerative Engineering program is intended to train a new transdisciplinary workforce for Regenerative Engineering. Regenerative Engineering is a new field defined as the convergence of advanced materials science, stem cell science, physics, developmental biology and clinical translation for the regeneration of complex tissues and organ systems. The master program is administrated by the Department of Chemical and Biomolecular Engineering and the Department of Materials Science and Engineering at the University of Connecticut.

Requirements: The M.S. in Regenerative Engineering requires a minimum of 30 credits. The credits include: 21 credits of advanced course work and successful completion of a thesis research (Plan A). Thesis research is equivalent to 9 credit hours. The thesis must be an original
Master of Science (M.S.) in Regenerative Engineering

and significant contribution to the field of regenerative engineering and related science, and must be defended orally according to Graduate School requirements.

Core Courses (15 credits): CHEG 5373; MSE 5700; CENG 5013; MSE 5001; CHEG 5352

Elective Courses: A total of six elective credits are required. Students will choose from a list of approved courses including, but not limited to BME 5000; CHEG 5395; CHEG 5358; BME 6086; MSE 5322; MSE 5336; CSE 5810; CSE 5815; CSE 5800. Students may request permission from the Advisory Committee and the Program Director to enroll in an elective that is not on the list of approved courses.

Faculty Involvement
Existing School of Engineering faculty members will develop and teach the courses, as well as advise the M.S. students in their thesis research.

Enrollment and graduate projections
We expect to have up to 20 students to be enrolled in the M.S. program. NIH funds will provide fellowships for 3-4 new full-time M.S. students each year. M.S. students typically complete their course load within 2-3 semesters and complete their thesis research by the end of their second year. We anticipate first graduates of the program by summer of 2023.

Program Evaluation
In general, (1) Retention Rates (2) Graduation rates (3) Time to completion (4) Academic performance will be evaluated as the metrics for the program success. The success of the program will be evaluated using a plan that consists of logic model, evaluation questions and measurable outcomes. A comprehensive evaluation plan consisting mainly of these elements will be followed. The evaluation plan is designed to assess how successful the program is in terms of achieving its main goal, which is to prepare students for careers in Regenerative Engineering and Convergence related areas. The overall aim of this evaluation is to determine the success of the program. Logic Model: We propose to use the conceptual model involving various components of the project. Program inputs, training activities, short-term outcomes, and long-term outcomes are proposed as the main components of this program. Also the connectivity and order of the project elements describe how the project will be administered. For example, elements such as funding, faculty members, research, and courses that are in place will serve as inputs in this logic model. Students participation in course, course exam grades, research training, lab member interaction, and research writing will be the main activities in this program. A list of short-term and long-term outcomes will serve to measure the program’s overall success. Evaluation questions will be based on the listed short-term outcomes, such as interest towards convergence research related areas. The questionnaire presented in the proposal will be handed to the students at three different times – entering stage, mid stage and exit stage. The data will be analyzed for short-term as well as the long-term outcome evaluation. The performance difference between
entering stage to mid stage, and mid stage to exit stage will determine improvement in short-term outcomes. In addition to the questionnaire, a progress evaluation will also be performed based on lab performance, progress in the specified research project as well as in scientific writing and seminar participation. Student interest towards STEM areas, enhanced career trajectory, and improved teaching and mentoring skills will be considered measurable outcomes.

Program Administration
The M.S. in Regenerative Engineering will be run jointly by the Department of Chemical & Biomolecular Engineering and the Department of Materials Sciences and Engineering.

Funding and Financial Resources Needed
NIH funds through the training grant applications (e.g. NIH supplement grants) will provide fellowships for 3-4 new full-time M.S. students each year, as well as some faculty time for development of the curriculum and the new courses planned as part of the new degree program.

Other Resource Needs
Existing teaching and research facilities will be utilized.

Consultation with other potentially affected units
Positive impact: a brand new and first master program in the new field that will attract students nationally and internationally to the School Negative impact: We expect some courses listed in the proposal will get more students enrollment, so that may potentially increase the workload of the instructors but we think the impact is minimal.

Who can apply to this program?
Internal applicants (current UConn students enrolled in another UConn degree or certificate program)
External applicants (individuals who are not currently UConn students)

Anticipated term and year of first enrollment
Fall 2021

Admission Requirements
A total of 30 credit hours after the B.S. is required, including 21 credits of advanced course work and successful completion of a thesis. Thesis research is equivalent to 9 credit hours. The thesis must be an original and significant contribution to the field of regenerative engineering and related science, and must be defended orally according to Graduate School requirements. Bachelor degree in science or engineering is required from a regionally accredited college or university or present evidence of the equivalent. Student must meet the admission requirements of Graduate Degree Programs set by the university of Connecticut.
Required for application:
- GRE Scores
- Personal statement
- Research Statement
- 2 letters of recommendation

Term(s) to which students will be admitted
- Fall
- Spring

Application deadline: Unsure at this time

Initiator
Wai Hong Lo, CT Convergence Institute for Translation in Regenerative Engineering, wlo@uchc.edu, 860-679-2949

Program Director Name
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Administrative Contact
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