

**Graduate Certificate in Particle Technology**

**I.** **Description**

The Graduate Certificate in Particle Technology will be offered by the University of Delaware’s Department of Chemical and Biomolecular Engineering and will be administered through the Engineering Outreach Program. Satisfactory completion of the certificate requires earning a GPA of 3.0 or higher in three CHEG graduate courses (9 credits, details to follow in *Curriculum Specifics*). Students eligible to pursue this graduate certificate will be those showing satisfactory completion of STEM undergraduate course prerequisites (earning a GPA of 3.0 or higher) in chemical engineering, mechanical engineering, civil engineering, environmental engineering, chemistry, materials science or physics disciplines, if the undergraduate program included engineering thermodynamics, calculus, differential equations, and linear algebra, and transport phenomena (fluid mechanics, heat and mass transport). Students may gain admittance to the certificate program by the following:

* EGOR-ND/graduate/non-degree
* UD undergraduate student
* After matriculation into a graduate engineering degree program

Completion of the certificate requirements will be noted on the student’s graduate transcript and a certificate will be awarded as well, signed by the Director of the Graduate Certificate in Particle Technology, the Chair of the Department of Chemical and Biomolecular Engineering, and the Assistant Dean/Director of the Engineering Outreach Program.

***Objective****:* To prepare students to meet the processing industry employer’s expectations with respect to particle technology. Additionally, it is anticipated that it will serve as a recruiting tool for the graduate program in Master of Engineering in Particle Technology.

**II.** **Rationale and Demand**

A. Institutional Factors

1. UD Mission Compatibility: Among the “milestones” mapped out in UD’s *Path to Prominence* were excellence in professional education and a global initiative that extends UD’s geographic reach. Through use of UDCapture and Sakai (and other media platforms), this certificate will be accessible to students well beyond the Delaware region. To date, we have had students taking the core courses remotely from other areas of the country (more than one hour from campus).

2. Planning Process: Because the College of Engineering/Department of Chemical and Biomolecular Engineering recognized the gap in their graduate offerings, Dr. R. Bertrum Diemer and Dr. James N. Michaels were hired to start and direct the Master of Engineering in Particle Technology Program, the national need for which has been affirmed by research of existing national and international programs. Through initial research and input from Merck, DuPont, Dow, AbbVie, Procter and Gamble, Abbott, Unilever, Lilly, GlaxoSmithKline, Particle Science and DSM, appropriate courses were designated (with additional courses planned as options for the certificate program). [What about IFPRI support????]

3. Impact on other UD Programs: Program course requirements are all CHEG courses.

4. Utilization of Existing Resources: No additional resources are required at this point, as all courses are existing or planned and UDCapture is existing on-campus.

B. Student Demand: This certificate is designed for engineering professionals working in the process industries or for those engineers desiring to expand their knowledge of particle technology engineering. We anticipate an ongoing enrollment of engineering professionals pursuing the certificate program courses.

C. Transferability: All three of the certificate program courses are transferable into a graduate engineering degree program, if the program approves. However, **CHEG608** ***Introduction to Particle Technology*** will not be approved to replace core or elective requirements in the MEPT Program. Because the University policy is that at most 9 credits taken in non-degree status can be transferred into a graduate degree program, completion of this graduate certificate is in conformity with that policy, should the student decide to apply and is accepted into a graduate engineering degree program.

D. Graduate and Professional Program Access: Those wishing to pursue this graduate certificate will be guided by Engineering Outreach staff through the admissions process used for all engineering graduate/non-degree students, including review of undergraduate transcripts and completion of the UD graduate application to Engineering Outreach/Non-degree status.

E. Demand & Employment Factors: As our initial research study pointed out, there are no US institutions offering graduate degrees in particle technology engineering or a certificate program. Only one institution, the University of Western Ontario, offers a master’s degree in particle technology and fluidization. Several international schools have strong particle technology research programs, including TU Delft, University of Birmingham, University of Leeds, University of Queensland, U Pretoria and TU Braunschweig but none offer a coherent degree or concentration in particle technology.

F. Regional, State and National Factors: The process industry in US is flourishing, yet, despite the importance of particle processing and particle technology in industry, degree offerings in the field are limited, especially for post-baccalaureate students and practicing professionals. This certificate program can help fill the void.

G. Other Strengths: We already have anticipated collaborations with several corporations for our MEPT program. The addition of a certificate program will enhance industry engineers who would like to advance their careers, help meet their employers’ expectations for educational background in the particle processing industry and allow students to gain prospective faculty recommendations.

**III.** **Enrollments, Admissions and Student Finances**

Admissions and enrollment in the particle technology certificate program courses by those who are not already matriculated in a graduate engineering degree program will be managed through the Engineering Outreach Program. The prospective student is required to submit a copy of his/her undergraduate transcript for review and, upon approval by the Assistant Dean/Director of Engineering Outreach, the student will be guided through the graduate admissions process to obtain Engineering Outreach/Non-degree matriculation status. This results in courses taken to reside on the graduate transcript (making them applicable to a degree program if/when the student elects to apply and is accepted into a graduate engineering degree program). Part-time students are self- or industry-funded.

**IV. Curriculum Specifics**

Program Description: The graduate certificate courses will be taken for credit with standard grading (A, B, etc.). Courses in which the student earns a grade of B or better would be transferable in a graduate degree program, if the program approves. At the University of Delaware, and most institutions, a maximum of three graduate courses (9 credits) taken in non-degree status can be transferred into a graduate degree program.

Professor R. Bertrum Diemer, Jr., and James N. Michaels will serve as the Directors of the Graduate Certificate in Particle Technology. This certificate program will be offered by the University of Delaware’s Department of Chemical and Biomolecular Engineering and will be administered through the Engineering Outreach Program. Satisfactory completion of the certificate will require taking three graduate courses (as detailed below) earning a GPA of 3.0 or higher. This can be done by students classified EGOR-ND/graduate/non-degree or matriculated in a graduate engineering degree program.

Certificate Core Course Requirement: (*This list may be added to over time.*)

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| --- | --- | --- |
| **Core Course** | **3 credits** | **Session** |
| CHEG608 | Introduction to Particle Technology | Winter Course / Future  Online Course |

Certificate Elective Requirements: 2 courses (*This list may be added to over time*.)

|  |  |  |
| --- | --- | --- |
| **Elective Courses** | **3 credits** | **Session** |
| CHEG670 | Particle Rate Processes | Fall Course |
| CHEG671 | Particle Transport | Fall Course |
| CHEG672 | Mathematics of Particle Systems | Fall Course / Future  Online Spring Course |
| CHEG673 | Particle Properties and Characterization | Fall Course |

**V. Resources Available**

There are no special learning resources required to support this certificate program, other than the availability of UDCapture (or other media programs) and a learning management platform, both of which currently exist.

**VI. Resources Required**

Current resources (learning resources as well as faculty resources) are currently sufficient to support this graduate certificate program.

**VII. Implementation and Evaluation**

In collaboration with the Engineering Outreach Program and the Department of Chemical and Biomolecular Engineering [what about IFPRI support], this graduate certificate will be marketed broadly, both nationally and internationally. Because of the anticipated part-time status of its clientele, the program will be administered by the Engineering Outreach Program, including admission and advisement, in collaboration with the Directors of Particle Technology. Upon completion of three certificate program courses with a GPA of 3.0 or higher, Engineering Outreach will notify the Graduate Office to have the notation added to the graduate transcript, “Completion of the Graduate Certificate in Particle Technology”.

University course evaluations of the certificate program courses (which are part of the graduate curriculum in chemical engineering) will be reviewed by the Department of Chemical and Biomolecular Engineering. In addition, a follow-up survey will be conducted by the Engineering Outreach Program of those who complete the certificate program in an effort to assess the usefulness of the information provided for those in the particle processing industries. That feedback will be provided to the Director of the Graduate Certificate in Particle Technology, enabling continual improvement.