UNIVERSITY FACULTY SENATE FORMS

Academic Program Approval

This form is a routing document for the approval of new and revised academic programs. Proposing department should complete this form. Detailed instructions for the proposal should be followed. A checklist is available to assist in the preparation of a proposal. For more information, call the Faculty Senate Office at 831-2921.

Submitted by: Bert Diemer and Jim Michaels phone number: 831-8648 831-0630
Department: Chemical & Biomolecular Engineering email address: rbdjr@udel.edu michaeja@udel.edu
Date: October 6, 2015

Action: ADD – Graduate Certificate in Particle Technology
(Example: add major/minor/concentration, delete major/minor/concentration, revise major/minor/concentration, academic unit name change, request for permanent status, policy change, etc.)

Effective term 16F
(use format 04F, 05W)

Current degree MEPT
(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

Proposed change leads to the degree of: Graduate Certificate in Particle Technology
(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

Proposed name: Graduate Certificate in Particle Technology
Proposed new name for revised or new major / minor / concentration / academic unit
(if applicable)

Revising or Deleting:

Undergraduate major / Concentration:
(Example: Applied Music – Instrumental degree BMAS)

Undergraduate minor:
(Example: African Studies, Business Administration, English, Leadership, etc.)

Graduate Program Policy statement change:
(Must attach your Graduate Program Policy Statement)

Graduate Program of Study:
(Example: Animal Science: MS Animal Science: PHD Economics: MA Economics: PHD)

Graduate minor / concentration:

Note: all graduate studies proposals must include an electronic copy of the Graduate Program Policy Document, either describing the new program or highlighting the changes made to the original policy document.

Attached
List new courses required for the new or revised curriculum. How do they support the overall program objectives of the major/minor/concentrations)?

(Be aware that approval of the curriculum is dependent upon these courses successfully passing through the Course Challenge list. If there are no new courses enter “None”)

CHEG 608 – Introduction to Particle Technology (presently taught as experimental course CHEG667)

An overview of the field of particle technology taught at an introductory level and then applied in several case studies drawn from industrial practice:

a) the characterization of particle properties and their distributions
b) the fundamental processes by which particles are formed, grow or shrink in size and are dispersed into and separated from continuous fluid phases
c) the population balance that is used to describe particle growth and how processing modifies particle distributions

This overview encompass the main program objectives of the MEPT program.

Supply support letter from the Library, Dean, and/or Department Chair if needed
(all new majors/minors will need a support letter from the appropriate administrator.)

Attached

Supply a resolution for all new majors/programs; name changes of colleges, departments, degrees; transfer of departments from one college to another; creation of new departments; requests for permanent status. See example of resolutions.

WHEREAS, the Department of Chemical & Biomolecular Engineering in the College of Engineering has sponsored a new MEPT program (Master of Engineering in Particle Technology), and

WHEREAS, the Department of Chemical & Biomolecular Engineering does not have a graduate certificate program, and,

WHEREAS, the Department of Chemical & Biomolecular Engineering has received inquires over the last several years from individuals interested in a graduate certificate program, and,

WHEREAS, there is present particle technology interest from students, practicing engineers and IFPRI members, and,

WHEREAS, there is a lack of graduate degree certificate programs in particle technology, and,

WHEREAS, there is a lack of concentration in particle technology in undergraduate degrees, and,

WHEREAS, there is a lack of particle technology credentials in the chemical engineering industry, and,

WHEREAS, the existing MEPT graduate program already provides all of the courses (with the new addition of CHEG608 – presently experimental course 667) and administrative framework for such a degree, and,

WHEREAS, the proposed graduate certificate program contributes to the milestones on the University’s “path to prominence” to achieve excellence in professional education; be it therefore

RESOLVED, that the Faculty Senate recommends provisionally for five years the approval of the establishment of a graduate certificate in particle technology.
Explain, when appropriate, how this new/revised curriculum supports the 5 goals of undergraduate education: http://www2.udel.edu/gened/

WHEREAS, through 9 credits of coursework, class assignments, case studies, quizzes and tests, the proposed graduate certificate will help students: read critically, analyze arguments and information, and engage in constructive ideation; communicate effectively in writing, orally and through creative expression; work collaboratively and independently within and across a variety of cultural contexts and a spectrum of differences; critically evaluate the ethical implications of what they say and do; and reason quantitatively, computationally and scientifically.

Identify other units affected by the proposed changes:
(This would include other departments/units whose courses are a required part of the proposed curriculum. Attach permission from the affected units. If no other unit is affected, enter “None”)

None

Describe the rationale for the proposed program change(s):
(Explain your reasons for creating, revising, or deleting the curriculum or program.)

I. Description

The Graduate Certificate in Particle Technology will be offered by the Department of Chemical and Biomolecular Engineering at the University of Delaware 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 processing industry employers’ 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 UD Capture 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. Bertram Diemer and Dr. James
N. Michaels were hired to start and direct the Master of Engineering in Particle Technology Program. The national need for this program was affirmed by surveying current and past members of the International Fine Particle Research Institute (IFPRI), a global research consortium of major industrial practitioners of particle technology that includes companies like Merck & Co., DuPont, AbbVie, Procter and Gamble, Unilever, E.I. Lilly, Universal Oil Products, and DSM. IFPRI and its members are strong sponsors of the program and are a source of material for courses, visiting instructors, and industrial internships.

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 and/or for undergraduate or graduate engineers desiring to expand their knowledge of particle technology. 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 graduate program approves. However, CHEG608 Introduction to Particle Technology will not be approved to replace core or elective requirements in the Master of Engineering in Particle Technology (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. (See Curriculum Specifics).

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 or a particle technology 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. All particle technology graduate certificate core and elective courses are relevant to gainful employment 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

A. Admissions and Enrollment:

- Admissions, enrollment and student advisement 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.
- The prospective student must have a minimum GPA of 3.0 in STEM courses.
- Upon approval by the Engineering Outreach Program, the particle technology courses taken will reside on the graduate transcript and, upon satisfactory completion, will be eligible for the graduate certificate (or applicable to a degree program if/when the student elects to apply and is accepted into a graduate engineering degree program).

B. Student Finances:

Part-time engineering outreach 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.). The courses will be eligible for the graduate certificate or matriculation in the following circumstances:

- The student earns a grade of B- or better.
- The student maintains an overall GPA of 3.0 or higher.
- The student completes the core and elective graduate certificate requirements (see below).
- A maximum of three graduate courses (9 credits) taken in non-degree status can be transferred for matriculation 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.

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

<table>
<thead>
<tr>
<th>Core Course</th>
<th>3 credits</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEG608</td>
<td></td>
<td>Introduction to Particle Technology</td>
</tr>
</tbody>
</table>

Certificate Elective Requirements: Choose 2 of the following (This list may be added to over time.)

<table>
<thead>
<tr>
<th>Elective Courses</th>
<th>3 credits</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEG670</td>
<td>Particle Rate Processes</td>
<td>Fall Course</td>
</tr>
<tr>
<td>CHEG671</td>
<td>Particle Transport</td>
<td>Fall Course</td>
</tr>
<tr>
<td>CHEG672</td>
<td>Mathematics of Particle Systems</td>
<td>Fall Course</td>
</tr>
<tr>
<td>CHEG673</td>
<td>Particle Properties and Characterization</td>
<td>Fall Course</td>
</tr>
</tbody>
</table>
V. **Resources Available**

There are no special learning resources required to support this graduate 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 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, and with the strong support of IFPRI and its members, 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 admissions and student advisement, in collaboration with the Director(s) 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.

**Program Requirements:**

(Show the new or revised curriculum as it should appear in the Course Catalog. If this is a revision, be sure to indicate the changes being made to the current curriculum and include a side-by-side comparison of the credit distribution before and after the proposed change.) **See example of side by side.**

n/a

**ROUTING AND AUTHORIZATION:** (Please do not remove supporting documentation.)

<table>
<thead>
<tr>
<th>Department Chairperson</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dean of College</td>
<td>Date</td>
</tr>
</tbody>
</table>

(By signing above, the Dean confirms that their college policies and bylaws have been followed correctly during consideration of the request described in this form.

The approval actions that were taken at the college level were (check all that apply) :

[ ] college faculty vote; [ ] college curriculum approval [ ] college senate approval

<table>
<thead>
<tr>
<th>Chairperson, College Curriculum Committee</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chairperson, Senate Com. on UG or GR Studies</td>
<td>Date</td>
</tr>
<tr>
<td>Chairperson, Senate Coordinating Com.</td>
<td>Date</td>
</tr>
<tr>
<td>Secretary, Faculty Senate</td>
<td>Date</td>
</tr>
</tbody>
</table>

Date of Senate Resolution | Date to be Effective |

Registrar | Program Code | Date |

Vice Provost for Academic Affairs & International Programs | Date |

Board of Trustee Notification | Date |

Revised 9/22/2015/khs