

Office of the Registrar
FORM 40G REV. 4/10

PURDUE UNIVERSITY
REQUEST FOR ADDITION, EXPIRATION,
OR REVISION OF A GRADUATE COURSE
(50000-60000 LEVEL)

CHE 55300

EFD 39-12

DEPARTMENT School of Chemical Engineering EFFECTIVE SESSION Spring 2013-201620

INSTRUCTIONS: Please check the items below which describe the purpose of this request.

- | | |
|--|---|
| <input checked="" type="checkbox"/> 1. New course with supporting documents (complete proposal form) | <input type="checkbox"/> 7. Change in course attributes |
| <input type="checkbox"/> 2. Add existing course offered at another campus | <input type="checkbox"/> 8. Change in instructional hours |
| <input type="checkbox"/> 3. Expiration of a course | <input type="checkbox"/> 9. Change in course description |
| <input type="checkbox"/> 4. Change in course number | <input type="checkbox"/> 10. Change in course requisites/restrictions |
| <input type="checkbox"/> 5. Change in course title | <input type="checkbox"/> 11. Change in semesters offered |
| <input type="checkbox"/> 6. Change in course credit/type | <input type="checkbox"/> 12. Transfer from one department to another |

PROPOSED:		EXISTING:		TERMS OFFERED Check All That Apply:	
Subject Abbreviation	<u>CHE</u>	Subject Abbreviation		<input type="checkbox"/> Fall	<input checked="" type="checkbox"/> Spring
Course Number	<u>55300</u>	Course Number		<input type="checkbox"/> Summer	
CAMPUS(ES) INVOLVED					
Long Title	<u>Pharmaceutical Process, Development and Design</u>		<input type="checkbox"/> Calumet	<input type="checkbox"/> N. Central	
Short Title	<u>Pharm Process Develop & Design</u>		<input type="checkbox"/> Cont Ed	<input type="checkbox"/> Tech Statewide	
Abbreviated title will be entered by the Office of the Registrar if omitted. (20 CHARACTERS ONLY)			<input type="checkbox"/> Ft. Wayne	<input checked="" type="checkbox"/> W. Lafayette	
			<input type="checkbox"/> Indianapolis		

CREDIT TYPE		COURSE ATTRIBUTES: Check All That Apply			
1. Fixed Credit Cr. Hrs.	<u>3</u>	1. Pass/Not Pass Only	<input type="checkbox"/>	6. Registration Approval Type	
2. Variable Credit Range		2. Satisfactory/Unsatisfactory Only	<input type="checkbox"/>	Department	<input type="checkbox"/>
Minimum Cr. Hrs.		3. Repeatable	<input type="checkbox"/>	Instructor	<input type="checkbox"/>
(Check One) To	<input type="checkbox"/> Or <input type="checkbox"/>	Maximum Repeatable Credit	<input type="checkbox"/>	7. Variable Title	<input type="checkbox"/>
Maximum Cr. Hrs.		4. Credit by Examination	<input type="checkbox"/>	8. Honors	<input type="checkbox"/>
3. Equivalent Credit: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		5. Special Fees	<input type="checkbox"/>	9. Full Time Privilege	<input type="checkbox"/>
4. Thesis Credit: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>				10. Off Campus Experience	<input type="checkbox"/>

Schedule Type	Minutes Per Mig	Meetings Per Week	Weeks Offered	% of Credit Allocated	Cross-Listed Courses
Lecture	50	3	16	100	
Recitation					
Presentation					
Laboratory					
Lab Prep					
Studio					
Distance					
Clinic					
Experiential					
Research					
Ind. Study					
Pract/Observ					

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COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

Concurrent Prerequisites: CHE 34800 and CHE 45600
Pre-requisites: CHE 30600 and CHE 37800
This course introduces the engineering methodologies involved in translating a laboratory recipe for a drug compound produced via synthetic organic chemistry methods to an industrial process. The basic features of common unit operations used in the pharmaceutical industry will be reviewed, including batch reaction, solid-liquid separation, crystallization, drying, mixing, batch distillation and other separation systems. Both dedicated and multi-product production system design and batch and semi-continuous operating modes will be covered. Professor Reklaitis.

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Calumet Department Head	Date	Calumet School Dean	Date	Calumet Undergrad Curriculum Committee	Date
Fort Wayne Department Head	Date	Fort Wayne School Dean	Date	Fort Wayne Chancellor	Date
Indianapolis Department Head	Date	Indianapolis School Dean	Date	Undergrad Curriculum Committee	Date
North Central Department Head	Date	North Central School Dean	Date	APPROVED 9/17/15	Date Approved by Graduate Council
West Lafayette Department Head	Date	West Lafayette College/School Dean	Date	<i>Julia L. Payne</i> 9/18/15	Graduate Council Secretary
Graduate Area Committee Convener	Date	Graduate Dean	Date	<i>Josie Halburay</i> 9/11/15	West Lafayette Registrar

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(Grad Form 40G [Excel format] - Does not include the Graduate Council's required supporting document. See pdf version of Form 40G)

Ujs 9/30/15 39-12

To: Faculty of the College of Engineering

From: Faculty of the School of Chemical Engineering

RE: New Graduate Course, CHE 55300, Pharmaceutical Process, Development, and Design

The faculty of the School of Chemical Engineering has approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

CHE 55300, Pharmaceutical Process, Development, and Design

Sem 2, cr. 3, LEC 3

Concurrent Prerequisites: CHE 34800 and CHE 45600

Pre-requisites: CHE 30600 and CHE 37800

Description: This course introduces the engineering methodologies involved in translating a laboratory recipe for a drug compound produced via synthetic organic chemistry methods to an industrial process. The basic features of common unit operations used in the pharmaceutical industry will be reviewed, including batch reaction, solid-liquid separation, crystallization, drying, mixing, batch distillation and other separation systems. Both dedicated and multi-product production system design and batch and semi-continuous operating modes will be covered.

Reason: The course has been taught as **Pharmaceutical Process, Development, and Design**, CHE 597D in the fall 2005 semester with 24 students, the fall 2006 semester with 33 students, and as **Pharmaceutical Process, Development, and Design**, CHE 59700 in the spring 2008 semester with 4 students, the spring 2009 semester with 15 students, spring 2010 semester with 8 students, the spring 2011 semester with 22 students, and the spring 2012 semester with 9 students.



A. Varma, Head
School of Chemical Engineering
Date: 7/1/12

Supporting Documentation - ChE 55300, Pharmaceutical Process Development and Design

Level: dual level

Course Instructor: G.V. Reklaitis

Textbook: Notes, papers and documents from variety of sources posted on Blackboard

Course Operation: The course involves lectures, discussions and readings on issues related to batch process design and operations. The models and experimental data required to predict, optimize and scale-up the main unit operations are covered. Professional engineering software is used to carry out case studies on specific unit operations as well as to design and schedule integrated process trains. Students work in two member teams to carry out case studies involving modeling and optimization of specific unit operations. Additional case studies involve design and operations of integrated process train. These projects require a written report as well as preparation and delivery of an in-class presentation. The course grade is also based in part on a written mid-term and a final project report.

Topics covered in previous semesters include:

- Overview of Pharmaceutical Process Development & Design
- Status of relevant engineering software
- Characteristics of Batch operations
- Optimization of Integrated Process Trains
- Batch reactor design & operation
- Reaction calorimetry & safety
- Mixing & scale-up
- Solid-liquid separations
- Crystallization
- Drying
- Batch distillation
- Liquid-liquid separations
- Impact of API on solid dosage form design
- Current Good Manufacturing Practice
- Process analytical technology
- Batch process control
- Production planning & scheduling
- Industrial case studies

Course Objectives

To introduce the student to the engineering decision processes involved in translating a laboratory recipe for a synthetic organic pharmaceutical substance to an integrated batch process

for its manufacture. The basics of the main unit operations are covered, including engineering models for predictive design and strategies for integrated process design, control and operation.

Course Outcomes

Students will develop the following knowledge and skills

- The thermodynamic, reaction and transport phenomena arising in the typical batch unit operations used in the pharma and specialty chemicals industries, including batch reaction, crystallization, solid-liquid separation, mixing, distillation, drying and liquid-liquid extraction.
- The use experimental data and relevant models to design and predict the performance of these units.
- Use of engineering software to conduct studies of these operations and interpret and critically assess the results such software produces.
- Understand different modes of operation for batch processes and their scheduling
- Understand aspects of the design of batch process in which the set of batch operations are integrated
- Use of planning/scheduling software to conduct design and operational studies of integrated process.

Students will enhance their skills in succinctly reporting the most important conclusions of their team projects in written and oral form.

Assessment Methods

Course outcomes are assessed through written project reports, oral presentation of project key findings, engagement in class discussions, as well as a written mid term examination.