

Spring 2021

## CHE 714-002: Micromechanics of Particle Technology Processes

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**Otto York Department of Chemical Engineering**  
**ChE 714-002: Micromechanics of Particle Technology Processes, Spring 2021**  
**Online, Thursdays, 2:30-5:25 PM**  
**Course Instructor:** Rajesh N. Davé, dave@njit.edu  
**Course TA:** Zhixing Lin, zl378@njit.edu

**Prerequisites:** CHE 624 or equivalent, **Corequisites:** PHEN 601 or equivalent (not required but suggested)

**Course Description:** Presents methodologies for analyzing the macroscopic properties of particulate systems. Includes characterization and processing of particulate systems at the microlevel, predicting macroscopic properties from microlevel models, and analysis of particulate manufacturing processes involving solids processing, such as solids characterization, blending, milling, granulation, tableting, etc. Course includes laboratory demonstrations and a class project involving use of surface modification (project subject to change depending on the course constituency).

This course has both fundamental and applied components with focus towards micro-mechanical phenomena applied to particle technology processes and unit operations. There will be numerous examples of pharmaceutical applications, and includes content related to particle engineering and surface modification to improve particulate materials and process performance. Some of the advanced concept include particle contact modeling concepts and linking particle-scale to bulk-scale properties.

**Lecture/Lab Schedule:**

Week	Lecture	Lab/Other tasks	Date
1	Overview of particle processing; powder properties and characterization; pharma	Sieving and Laser-based PSD measurements	1/21/21
2	Dry coating --- overview - project(s) discussion and assignments	Measuring density - pycnometer	1/28/21
3	Powder cohesion, flow/packing characterization	Powder testing - shear testing and other - FT4	2/4/21
4	Powder cohesion, flow/packing characterization	Powder testers - - AoR, Flodex	2/11/21
5	Guest lecture - equipment expert(s)	GranuPack	2/18/21
6	Dry coating --- Surface energy, contact models, predictions	Dry coating using LabRAM	2/25/21
7	Dry coating applications	FEM and Comil (demo - screens, impellor, etc)	3/4/21
8	Property enhancements and prediction, dry coating applications;	SEA and USP dissolution	3/11/21
9	DEM; hard sphere and soft sphere; recent work; Mid-term review	Excel for BD and FFC predictions	3/25/21
10	Mid-term Exam or Project - format to be decided		4/1/21
11	Guest lecture - industry experts	Other devices in T310; SpecTester	4/8/21
12	Miscellaneous/review		4/15/21
13	Project presentations	3 M.S. & 3 PhD Students	4/22/21
14	Project presentations	5 PhD Students	4/29/21

**Homework and attendance:** Homework must be submitted on time at the beginning of the class electronically. Numerous assignments will be given pertaining to solving problems, reading of relevant papers and submitting a summary in form of PPT slides. Attendance is required and all absences without prior email approval will lead to loss of credit towards attendance grade.

**Grading:** Final grade will depend on performance on projects, exam(s), homework, and attendance/participation. Homework, attendance and class participation count towards 30 % of the grade