SYLLABUS:

Date / Revision 23 May 2015 / 02 May 2017 / PP
Faculty Life Sciences (LS)
Study Program Food Technology, Chemical Engineering

SUBJECT: Unit Process Design

1 Basic Information

1.01	**Subject Name**	**Unit Process Design**
1.02	**Semester**	5
1.03	**Level**	*1*
1.04	**SKS**	2
1.05	**Mandatory / Curriculum**	*D-02*
1.06	**Subject Code**	UNPD
1.07	**Subject Code**	CHE-FTE-D-LS-117
1.08	**Year**	2017 (7)
1.09	**Quality Control**	Final Test, OFSE, see evaluation
1.10	**Limitations**	Min 12 and Max 32 students in one class
1.11	**Combined with**	Food Technology
1.12	**Pre-requisite**	Chemistry, Physics, Engineering Math, Fluid & Particle Mechanics, Mass and Energy Balance, Heat and Mass Transfer
1.13	**Responsible**	Dr. Tutun Nugraha
1.14	**Revision**	15-05-2017/pp

2 Description of Subject

This course is intended as an initial approach for designing unit process in chemical and food plant. The course will integrate the existing subject of fluid mechanic, mass and energy balance, heat transfer and mass transfer operation into one simple design. Students will learn to calculate basic infromation needed to design simple unit operation with regard of its safety requirement. At the end of the course, students are expected to be able to come up with a design of a real life functioning simple equipment.

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3 Objectives

This course will bridge the concept that was given in the previous semester with the more advanced Plant Design class. In this course students begin to integrate various basic concepts in engineering and process technology and applying it to the design of the unit process selected. Integration of basic knowledge such as attempted in this course will be one of the step towards a better understanding of the process and engineering concept given in the previous semester, and will help the students to become more prepared for industrial challenges whether it is design in nature or application of technology in the industries.

4 Competency

After having the course, students are expected to:

a) Have basic knowledge of unit operation for chemical and food plant.
b) Understand the importance of material selection for equipment design.
c) Be able to calculate basic information needed to design simple unit process.
d) Have the knowledge of safety requirement in designing a process.
e) Be able to build simple unit process and provide protocol for the equipment.

5 Learning Approach / Methodology

- Lectures/ Class contact (time-tabled) supplemented with interactive questions and answers to build the projects;
- Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing;
- Student Study Effort: homework/assignment; preparation for test/quizzes/ examination.
- Writing assignments/preseantations

6 Evaluation

5.1	**Absence maximum**	25%
5.2	**Participation in Discussion**	5 Points
5.3	**Homework / Classwork**	-
5.4	**Presentation /Simulation**	10 Poins
5.5	**Daily Quiz**	25
5.6	**Final Examination**	60 Points
	Total	100 Points

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7 Text Book and Reference

1	**Main Text Book:** **a)** Unit Operations of Chemical Engineering - McCabe et. al. - McGraw-Hill Also **b)** Conventional and Advanced Food Processing Technologies, Suvendu Bhattacharya (Editor), ISBN: 978-1-118-40632-8, 2014, 1st ed, wiley
2	**Supplement Textbooks:** • Chemical Engineering design – Sinnot, R. K. - Elsevier

8 Content / Topics of Lecture

Week	Content/ Topics of Lecturing	Text Book	Remark
1	**Introduction to Unit Process Design** What is unit process design? Hierarchy of unit process design Basic Information needed to design unit process		1 x 2 x 50 minutes
2	**Particle and Powder Technology** Particle: shape, size, surface Sphericity Particle Size Distribution Size reduction		1 x 2 x 50 minutes
3	**Particle and Powder Technology** Powder mixing Demixing/Segregation Flow through bed of solids Solid fluidization		1 x 2 x 50 minutes
4	**Pressurized Vessel** Design consideration Cylinder and spherical shells Heads ans closures Vessel supports		1 x 2 x 50 minutes
5	**Heat Exchanger** Co-current and Counter current flow Overall heat transfer coefficient Shell and tubes, construction details		1 x 2 x 50 minutes
6	**Heat Exchanger** Tubes arrangements Tubes bundle diameter		1 x 2 x 50 minutes
7	**Heat Exchanger** Shells Baffles Pressure drop		1 x 2 x 50 minutes

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8	**Midterm Break**		1 x 2 x 50 minutes
9	**Distillation** Reflux consideration Ideal stages requirement Plate efficiency Column sizing		1 x 2 x 50 minutes
10	**Distillation** Plate design Packed columns design Height Transfer Unit (HTU)		1 x 2 x 50 minutes
11	**Liquid Mixing** Classification of liquid mixing Mixing equipment Stirred tanks and Reactors		1 x 2 x 50 minutes
12	**Liquid Mixing** Tank anatomy Baffle Configuration Impellers Flow pattern		1 x 2 x 50 minutes
13,14	**Safety Requirement** Fire safety Explosion Safety analysis methods		2 x 2 x 50 minutes
15	**Review/evaluation/quizes**		1 x 2 x 50 minutes
16, 17	**Final Examination**		

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