BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
INSTRUCTION DIVISION
SECOND SEMESTER 2014-2015
Course Handout (Part II)

Date: 01.08.2016

In addition to part I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. **: BITS F219**
Course Title **: Process Engineering**
Instructor-in-charge **:Dr.Anil B Jindal**
Instructors **: Murali M Pandey, Kowthavarapu V Krishna**

1. Course Description:

Processes and equipment's involved in extraction and clarification; mixing and granulation; preparations such as aromatic waters, spirits, syrups, elixirs, lotions, liniments, official solutions, etc.; galenical products like infusions, decoctions, tinctures, extracts, etc.

2. Scope & Objective:

The course is designed to impart knowledge on various pharmaceutical processes and equipments, their selection, used in pharmacy operations with special emphasis on pharmaceuticals formulations process and unit operations. Practicals are designed to expose the students to those operations and processes.

3. Text Books:

1. Lachman, L., Lieberman, H. A., Kanig, J. L., The Theory and Practice of Industrial Pharmacy, Varghese Publishing House, Bombay, 3rd Edition, 1987.
2. Aulton M.E., Pharmaceutics: The Science of Dosage form Design, ELBS, 1st Ed.

4. Reference Books:

1. Rawlins, E.A., Bentley's Textbook of Pharmaceutics, ELBS, 8th Edition.
2. Carter, S.J. (Ed.), Cooper and Gunn's Tutorial Pharmacy, Kothari, Bombay, 6th Edition, 1972.
3. Ganderton D; Unit Processes in Pharmacy, Heinamann, London.
4. Pharmacopoeias of different countries like:
   a. Indian Pharmacopoeia
   b. British Pharmacopoeia
   c. United States Pharmacopoeia
5. K. Sambamurthy, Pharmaceutical Engineering, New Age Publishers (P) Ltd. Chennai.
6. Warren L McCabe, J. C. Smith, P. Harriott, Unit Operations of chemical engineering, McGraHill International, Seventh edition.

5. Course Plan:

Lecture No.	Learning objective	Topics to be covered	Ref./Chap./Sec.
1	Introduction of Process Engineering	Applications, Operations	T2-1
2	Decision and selection of Materials for construction of equipment	Materials of construction and their selection, protection and cleaning of equipment	T2-29
3 - 4	Size reduction: Science, methods ,equipment, selection of methods and equipment	Communition and Size reduction	T1- 2
5 - 6	Size separation and Size measurement	Micromeritics	T2-33,35
7 - 8	Mixing: Science, techniques equipment and their selection	Mixing; Liquid, Solid and Semisolid	T1-1, T2-32
9 -10	Heat transfer: Concept application, calculation	Heat transfer	R3
11-12	Distillation: Operation, application, equipment	Distillation	R1-14
13 - 14	Evaporation: Operation application, equipment	Evaporation	T2-30
15 -16	Mass Transfer: Concept application, calculation	Mass Transfer	
17-18	Drying: Operation, use equipment	Drying ; Freeze Drying	T1- 3, T2-38
19-20	Refrigeration and Humidity Control	Basic principle humidification & dehumidification	R5
21-22	Various aspects of extraction methods, mechanism, factors, solution	Extraction of drugs from Sources	T1-11
23-24	Transportation of Fluid	Fluid Flow	R5
25	Agitation and Mixing of liquids	Principle, Equipments and application	R6
26-27	Filtration: Use, equipment, operations	Filtration	T1- 7,T2-31
28-29	Crystallization: Science, use, operation, equipment	Crystallization	R1-3
30-31	Biological products	Glandular products ,Vaccines, Blood products and Plasma substitutes	R3,R1,R4
32-33	Science and Technology of Granulation and Compression	Granulation ; Compression	T1- 4
34-35	Preparations such as aromatic	Methods, examples and equipments	R4

	waters, spirits, syrups, elixirs, lotions, liniments, official solutions, etc		
36-37	Galenical products like infusions, decoctions, tinctures, extracts, etc	Methods, examples and equipments	R4

6. Practicals:

Experiments	**Practical hours**	**Ref./Chap./Sec.**
Execution of different pharmaceutical processes and study the effect of various process parameter thereof	12 hours for each section	Respective chapters of text/ref book

4. **Home assignments:**
Prior study of methodology of practical experiments and lecture topic to be dealt in the class would be beneficial for the students. Further, Problems/Assignments will be provided to solve at home.

5. **Evaluation Scheme:**

Evaluation Component	**Durations (Mins)**	**Weightage (%)**	**Date, Time and Venue**	**Remarks**
Mid Semester Test	90	30%	-	Open Book/Close Book
Surprise quizzes/Lab components/seminar/ Assignment	10-20 mins	30%		
Comprehensive	3 hrs	40%	10/12 FN	Open Book/Close Book

6. **Grading Procedure** (In addition to Part I): It is expected the students will attend classes regularly. The student shall not be considered as exposed to the course, unless he/she demonstrates appreciable skill in both laboratory and theory components of the course. Attending tutorial and appearing surprise quiz is very important. Students not appeared in any quiz and not completing the home assignment, may not be considered exposed to the course. In border line cases ,subjective judgment, based on attendance in lecture/practical classes, lab performance, appearing in quiz and involvement in the course, will be used to award grade. **Laboratory attendance is must and no make up will be given.**

7. **Chamber Consultation Hour:** As announced in the class

8. **Notices:** Notices will be displayed on **Pharmacy Group** Notice Board.

Instructor-In-Charge
BITS F219