

PHM 4415: POWDER TECHNOLOGY

Pre-requisites: PHM 3411

Credit Units: 3

2.12.2 Purpose of the course;

To teach the student the properties of powders and methods used when preparing them.

2.12.3 Expected Learning Outcomes of the Course;

At the end of the course, the student should be able to:

1. Describe the properties of powders
2. Outline the methods of measuring particle size
3. Describe the methods of measuring particle surface area
4. Discuss the different types of mills
5. Describe the methods used to dry powders.

2.12.4 Course Content

Properties of powders; size and shape of particles, structure, flow properties, bulk and apparent density. Measure of particle size; sieving, microscopic methods, elutriation, sedimentation and electrical conductivity methods. **Measure of surface area;** permeability and gas adsorption methods. Size grading of bulk powders; screening sedimentation and elutriation. Size Reduction: Forces used in size reduction. **Equipments;** roller, cutter, colloid, pin and disk, ball and fluid energy mills. Mixing. Solid/liquid mixing. Heat Exchange: Fundamental principles. Factors affecting heat transfer, sources of heat, heat exchange, materials and equipment. Evaporation. Drying: principles involved, rates of drying, types of equipment, freeze drying.

Week	Topic	Reference
1	Introduction to Pharmaceutical Powders	Aulton's Pharmaceuticals: The Design and Manufacture of Medicines: Ch. 8: Solid-state properties
2	Particle Size Analysis	Aulton's Pharmaceuticals: The Design and Manufacture of Medicines: Ch. 9: Particle size analysis
3	Surface Area Determination	Aulton's Pharmaceuticals: The Design and Manufacture of Medicines <i>Ch. 4 and Ch. 9)</i>
4	Particle Size Reduction (Comminution)	Aulton's Pharmaceuticals: The Design and Manufacture of Medicines Ch. 10: Particle size reduction and size separation
5	Powder Mixing and Blending	Aulton's Pharmaceuticals: The Design and Manufacture of Medicines: Ch. 11: Mixing
6	Improving powder flow	Aulton's Pharmaceuticals: The Design and Manufacture of Medicines
7	Mid-Semester Examination	-
8	Evaporation in Pharmaceutical Processing	<i>Aulton's Pharmaceuticals: The Design and Manufacture of Medicines</i>

9	Drying Techniques	Aulton's Pharmaceutics: The Design and Manufacture of Medicines: Ch. 30: Drying
10	Freeze Drying (Lyophilization)	<i>Aulton's Pharmaceutics: The Design and Manufacture of Medicines: Ch. 30 and Ch. 41</i>
11	Granulation Techniques	Aulton's Pharmaceutics: The Design and Manufacture of Medicines: Ch. 29: Powders, granules and granulation
12	Quality Control of Powdered Pharmaceuticals	<i>Aulton's Pharmaceutics: The Design and Manufacture of Medicines: Ch. 37, Ch. 53)</i>
13-14	End-of-Semester Examination	-

2.12.5 Mode of Delivery;

Lectures, power point presentations, and class discussions: The instructor will give lectures in class to explain to the students various subjects that make up the field of pharmacy. The lectures will take a participatory approach where the instructor will involve students by frequently asking them questions that are meant to keep them alert in class and trigger class discussions. The instructor will also be available to answer questions from students during the lectures. **Video demonstrations and/or CD-Roms** in various Pharmacy settings will be shown in class when available after the relevant topic has been covered. **Assignment criteria:** Students will be given several individual or group research assignments on relevant topics.

2.12.6 Instructional Materials and/or Equipment;

Lecture notes or power points for presentation; Video demonstrations; Tutorials; CD-Roms; Photos /charts

2.12.7 Course Assessment;

Distribution of Marks

Attendance and participation	10%
CATS (minimum 2 sit in)	15%
Term Paper/group or assignment	20%
Mid-semester Examination	25%
End semester Examination	30%
Total	100%

Grading

90 – 100	A
87 - 89	A ⁻
84 - 86	B ⁺
80 - 83	B
77 - 79	B ⁻
74 - 76	C ⁺
70 - 73	C

67 - 69	C ⁻
64 - 66	D ⁺
62 - 63	D
60 - 61	D ⁻
00 - 59	F

2.12.8 Core Reading Materials for the Course;

Dorland. (2011). Dorland's Illustrated Medical Dictionary. 32nd Edition. Saunders, Elsevier

Dorland. (2012). Dorland's Electronic Medical Speller Version 6.0. 6th Edition. Saunders, Elsevier

LaFleur Brooks, M., LaFleur Brooks, D. (2012). Basic Medical Language. 4th Edition. Mosby, Maryland Heights, MO

Loyd, Jr., V. A., Adejare, A., Desselle, S. P., Felton, L. A. (Eds). (2012). Remington: The Science and Practice of Pharmacy (2 Volumes). 22nd Edition. Pharmaceutical Press, LONDON

2.12.9 Recommended Reference Materials;

British Pharmacopoeia Commission. (2013). British Pharmacopoeia 2013. Stationery Office, Buckingham Palace Road, London.

Drug Information Handbook, 22nd Ed. 2013. Hudson, Ohio, Lexi-Comp, Inc.

Hamilton, R. J. (Ed.). (2012). Tarascon Pocket Pharmacopoeia 2013 Classic Shirt Pocket Edition. 27th Edition. Jones & Bartlett Learning, St. Burlington, MA

Joint Formulary Committee. British National Formulary (BNF). 2013. Pharmaceutical Press, London, United Kingdom.

Kimotho, J. H., Kibwage, I.O., **Mshilla, M.**, Jaguga C., Ronoh, W., Gaitungu, J., Githinji, J. (2011).

East African Pharmaceutical Loci: A Regional Drug Index for Healthcare Practitioners. 11th Edition. East African Pharmaceutical Loci Publishers, Nairobi, Kenya.

Lovett, A. W., Peasah, S. K., Xiao, H., Ryan, G. J. (2013). Introduction to the Pharmacy Profession. 1st Edition. Jones & Bartlett Learning, Wall Street Burlington, MA

O'Neil, M. J. (Ed.). 2013. The Merck Index: An Encyclopedia of Chemicals, Drugs, and Biologicals. **Royal Society of Chemistry**, Science Park, **Cambridge**

Pandit, N. K., Soltis, R. P. (2011). Introduction to the Pharmaceutical Sciences: An Integrated Approach. 2nd Edition. Lippincott Williams & Wilkins, Hagerstown, MD

PDR Staff. (2007). Drug Information for the Health Care Professional. 27th Edition. Thomson Healthcare, SaschaHendel, Berlin (Germany)

Reynolds, J.E.F., & Prasad, A.B., Eds. (2011). Martindale: The extra pharmacopeia. 28th Ed. The Pharmacopoeial Press, 1 Lamberth High Street, London, SE1 7JN.

Sweetman, S., Ed. (2011). Martindale: The Complete Drug Reference. 37th Edition. Pharmaceutical Press, London

[United States Pharmacopoeia Commission](#). (2013). United States Pharmacopoeia: AND the National Formulary. 37th Ed.; USP 37–NF 32. US Pharmacopoeia Convention, Inc; Rockville, MA, USA