GUJARAT TECHNOLOGICAL UNIVERSITY

CHEMICAL TECHNOLOGY (36)
MICROBIOLOGY & FORMULATION TECHNOLOGY OF LIQUIDS & TOPICALS
SUBJECT CODE: 2153605
B.E. 5thSEMESTER

Type of Course: Chemical Technology

Prerequisite: Studied department electives of previous semesters. Basic knowledge of Microbiology is required

Rationale: The main objective of this subject is to study Microbiology, Design, application & preparation of Liquid dosage forms, Topicals & Pharmaceutical production facilities.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	3	6	70	20	10	20	10	20	150

Content:

Sr. No.	Topic	Teaching Hours	Module Weightage (%)
01.	Microbiology: Microscopy concept of magnification resolution, basic of light microscopes. Dyes & stains, Observation of microorganism under light microscopy-wet mount, hanging drop, gram staining & acid fast stains.	6	23
	Cultivation & growth requirements, nutritional aspects & other conditions. Basis of growth media classification-principles & application.	4	
	Concept of pure culture, clone, isolation, preservation & maintenance of pure cultures.	4	
02	Basis of identification & characteristics of microorganisms , its relevance: Basis morphology of a typical prokaryotic cell. Appendages external to cell wall, cell membrane, cytoplasm & cell inclusions.	6	10
03	Study of bacteria, yeast, mold, algae & viruses: Morphology, structure. Reproduction isolation, cultivation & metabolism, Immunology-basic classification of antigen/antibody immunoglobulins, concept of allergy-antigen & antibody reaction.	6	10
04	Concept of vaccines : Manufacture of bacterial & viral vaccines. Sterilization-methods & validation, aseptic techniques, sterility testing. Disinfections & disinfectants, phenol coefficient tests.	4	7
05	Technology of Liquid and Topicals: Preparation and evaluation of oral syrups, elixirs, tinctures, ear drops, nasal drops	26	43

	Preparation and evaluation of suspensions/ dry syrup/emulsions of containing hydrophilic and hydrophobic drug, Preparation and evaluation of topical Iiniments and lotion, Preparation and evaluation of ointments representing each type of base, and gel, Preparation of suppositories (any 2 base)		
06	Pharmaceutical Production Facilities: Design and Applications	4	7

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
60%	**10%**	**10%**	**10%**	**10%**	**-**

Reference Books:

a. Pharmaceutical Dosage Forms & Drug Delivery Systems, Ansel, Philadelphia,Fea & Febiger, 1985
b. Introduction to Pharmaceutical Dosage Forms, Ansel, Henry Kimpton Publishers, 1976
c. Pharmaceutics: The Science of Dosage Form Design, Aulton,New Delhi, B.I.Naverly Pvt.Ltd.1995
d. Dermatological Formulations, B.W.Barry, New York, Marcel Dekker 1983
e. Modern Pharmaceutics, G.S.Banker, New York, Marcel Dekker 1990
f. Textbook of Pharmaceutics, Rawlins,Bentely Cassell Ltd, 8th Ed., 1977
g. Fundamentals of Pharmacy, Blome H.E., Philadelphia, Fea & Febiger, 1985
h. Pharmaceutical Production Facilities: Design & Applications, G.C.Cole, New York Ellis Horwood 1990
i. Husa'a Pharmaceutical Despensing, Martin E.W., Easton Mack Pub.Co.1971
j. Tran dermal Delivery of Drugs, A.Kydonieus, Florida, CRC Press, 1987
k. Textbook of Pharmaceutics, A C Bentley, Oxford University Press, 1969
l. Microbiology Fundamentals & Applications ,S S Purohit, Agrobios, 2003
m. Medical Microbiology Infections, Mackie & McCartney , Churchhill Livingstone, 1996
n. Burger's Medicinal Chemistry & Drug Discovery: Vol. 1 to 6, A. Burger & M.E.Wolff, John Wiley & Sons – New Jersey,6th Ed, 2003
o. Foye's Principles of Medicinal Chemistry, W.O. Foye, Lippincott Williams & Wilkins-Philadelphia, Oxford, 6th Ed, 2008.
p. Handbook of Pharmaceutical Excipients, Edited by R C Rowe, P J Sheskey and P J Weller, 4th Ed., 2003, Pharmaceutical Press, London UK, & American Pharmaceutical Association, Washington D C, USA
q. Pharmaceutical Dosage Forms and dispersing agents, Liberman H A, Riger M M, and Banker G S, Marcel Dekker, 1998, 2nd Ed., ISBN 0 8247 – 9842 – 2
r. Text book of Medicinal & Pharmaceutical Chemistry, Charles Owens Wilson Lippincott Williams & Wilkins – Philadelphia. 1962
s. Remington's Pharmaceutical Sciences, A.R.Gennaro Mac Pub. Co. Easton, Pennsylvania 1990
t. The Theory and Practice of Industrial Pharmacy, Lachman Bombay, K. M. Warghese Co. 1976
u. Transdermal Controlled System Medications Y. W. Chien, New York, Marcel Dekker 1987
v. Pharmaceutical Dosage Forms Vol. I & II, Liebermann, New York, Marcel Dekker, 1996.

Course Outcome: After learning this course the students can:

1) To know about microbiology, basis of identification & characteristics of microorganisms-its relevance , design, preparation, evaluation of liquid preparations & Topicals.
2) To carry out preparation of Liquid formulation & Topicals.
3) To be able to apply this knowledge in the Pharmaceutical Formulation industries
4) To build a bridge between theoretical and practical concept used in industry

List of Experiments:

1. Study of microscopy, study of common laboratory equipment
2. Preparation and sterilization of nutrient broth, agar slants, stabs, plates
3. Inoculation technique: Colony characteristics and growth patterns in broth of cocci and
4. Grams staining; monochrome staining, negative and vital staning
5. Cell wall spore, capsule and flagella staining
6. Motility by hanging drop technique
7. Microbial limit test, microbial assay, biochemical tests
8. Preparation and evaluation of oral syrups, elixirs, tinctures, ear drops, nasal drops
9. Preparation and evaluation of suspensions/ dry syrup/emulsions of containing
10. Preparation and evaluation of topical Iiniments and lotions
11. Preparation and evaluation of ointments representing each type of base, and gels

Open Ended Project fields:-

Students are free to select any area of science and technology based on chemical technology applications to define Projects.

Some suggested projects are listed below:

- Literature survey on microbial contamination and its effects in liquid & Topical preparations.
- Carry out innovative liquid & Topical formulations
- PPT on Immuno assay

List of Open Source Software/learning website:

1. Literature available under R&D of Pharmaceutical Industries.
2. Literature available on internet
3. Medical dictionaries
4. Delnet
5. Pharma journals. / e-journals

Major Equipment:

Glasswares, heating mantles / water baths, oven, microbiology lab & its equipments like microscope, autoclave etc, weighing scale, mortar & pestle, sieves

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.