

Nirma University
Institute of Pharmacy
Teaching & Examination Scheme (B.Pharm)

Semester - II

Sr. No.	Course Code	Course Title	Teaching Scheme			
			L	LPW/PW	T	C
1	BP201T	Human Anatomy and Physiology II – Theory	3	-	1	4
2	BP207P	Human Anatomy and Physiology II –Practical	-	4	-	2
3	BP202T	Pharmaceutical Organic Chemistry I – Theory	3	-	1	4
4	BP208P	Pharmaceutical Organic Chemistry I– Practical	-	4	-	2
5	BP205T	Computer Applications in Pharmacy – Theory *	3	-	-	3
6	BP210P	Computer Applications in Pharmacy – Practical*	-	2	-	1
7	BP206T	Environmental sciences – Theory *	3	-	-	3
8	BP211T	Pharmaceutical Engineering – Theory	3	-	1	4
9	BP212P	Pharmaceutical Engineering - Practical		4	-	2
		Total	15	14	3	25
			32			

* Non University Examination (NUE)

L: Lectures, P/T: Practicals/Tutorial, C: Credits

LPW: Laboratory / Project Work

SEE: Semester End Examination

CE: Continuous Evaluation

w.e.f. students admitted from Academic Year 2022-2023

Nirma University
Institute of Pharmacy
Examination Scheme for Internal and Semester End Examinations Semester-wise
B.Pharm Semester - II

Sr. No.	Course Code	Course Title	Internal Assessment				Semester End Examination		
			Continuous Mode	Sessional Exams		Total	Marks	Duration	Total Marks
				Marks	Duration				
1	BP201T	Human Anatomy and Physiology II – Theory	10	15	1 Hr	25	75	3 Hr	100
2	BP207P	Human Anatomy and Physiology II –Practical	5	10	4 Hr	15	35	4 Hr	50
3	BP202T	Pharmaceutical Organic Chemistry I – Theory	10	15	1 Hr	25	75	3 Hr	100
4	BP208P	Pharmaceutical Organic Chemistry I– Practical	5	10	4 Hr	15	35	4 Hr	50
5	BP205T	Computer Applications in Pharmacy – Theory *	10	15	1 Hr	25	50	2 Hr	75
6	BP210P	Computer Applications in Pharmacy – Practical*	5	5	2 Hr	10	15	2 Hr	25
7	BP206T	Environmental sciences – Theory *	10	15	1 Hr	25	50	2 Hr	75
8	BP211T	Pharmaceutical Engineering – Theory	10	15	1 Hr	25	75	3 Hr	100
9	BP212P	Pharmaceutical Engineering - Practical	5	10	4 Hr	15	35	4 Hr	50
		Total	70	110	19 Hrs	180	445	27 Hrs	625

* Non University Examination (NUE) – The subject experts at college level shall conduct examinations

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w.e.f. students admitted from Academic Year 2022-2023

NIRMA UNIVERSITY
Institute of Pharmacy

(B. Pharm)
(Semester - II)

L	T	P	C
3	1	-	4

Course Code	BP201T
Course Title	Human Anatomy and Physiology II – Theory

Scope:

This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives:

Upon completion of this course the student should be able to -

1. Explain gross morphology, structure and functions of various organs of the human body.
2. Describe various homeostatic mechanisms and their imbalances.
3. Identify various tissues and organs of different systems of human body.
4. Perform hematological tests like blood cell counts, hemoglobin estimation, bleeding/clotting time etc. and also record blood pressure, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system.
6. Appreciate interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.

Course Learning Outcomes (CLO):

At the end of the course, students will be able to -

1. Identify the structure, location of cell, tissues, muscles and various organs of the body.
2. Explain the anatomy, physiology and functions of cardiovascular, digestive, respiratory and reproductive system.
3. Outline the concepts of genetics.
4. Summarize the roles and functions of body fluids, blood and lymph.
5. Discuss various feedback mechanisms and regulation of physiological processes.
6. Perform hematological tests like blood cell counts, hemoglobin estimation, bleeding/clotting time etc. and also record blood pressure, heart rate, pulse and respiratory volume.

UNIT I**10 Hours****Body fluids and blood:**

Body fluids, composition and functions of blood, hemopoiesis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood. Reticulo-endothelial system.

Lymphatic system:

Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system.

UNIT II**10 Hours****Cardiovascular system:**

Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle.

Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

UNIT III**06 Hours****Digestive system:**

Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.

UNIT IV**10 Hours****Respiratory system:**

Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration. Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.

Urinary system:

Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.

UNIT V**09 Hours****Reproductive system:**

Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition.

Introduction to genetics:

Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance.

Tutorials:**Teaching hours: 15 Hours**

Tutorials will be based on above syllabus

Suggested Readings[^]: (Latest Edition)

1. Sembulingam, K. Sembulingam, P. *Essentials of Medical Physiology*. New Delhi. Jaypee Brother's Medical Publishers.
2. Wilson. K.J.W. *Anatomy and Physiology in Health and Illness*. New York. Churchill Livingstone.
3. Best and Taylor. *Physiological basis of Medical Practice*. MI USA, Williams & Wilkins Co. Riverview.
4. Guyton, A.C, Hall J.E, Miamisburg, O.H. *Text book of Medical Physiology*. U.S.A. Elsevier Saunders.
5. Tortora G, Palmetto, G.A. *Principles of Anatomy and Physiology*. U.S.A. John Wiley & sons.
6. Singh I. *Textbook of Human Histology*. New Delhi, Jaypee Brother's Medical Publishers.
7. Ghai, C.L. *Textbook of Practical Physiology*. New Delhi. Jaypee Brother's Medical Publishers.
8. Srinageswari, K., Sharma, R. *Practical workbook of Human Physiology*. New Delhi. Jaypee Brother's Medical Publishers.
9. Gandhi, T.P. et. al. *Human Anatomy, Physiology & Health Education*. B.S.Shah Prakashan, Ahmedabad.
10. Goyal. R.K. et al.: *Practical Anatomy Physiology and Biochemistry*. B.S. Shah Prakashan. Ahmedabad.

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(B. Pharm)
(Semester - II)

L	T	P	C
-	-	4	2

Course Code	BP207P
Course Title	Human Anatomy and Physiology II – Practical

Syllabus:**Total Hours: 60 Hours**

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

1. Introduction to hemocytometry.
2. Enumeration of white blood cell (WBC) count.
3. Enumeration of total red blood corpuscles (RBC) count.
4. Determination of bleeding time.
5. Determination of clotting time.
6. Estimation of hemoglobin content.
7. Determination of blood group.
8. Determination of erythrocyte sedimentation rate (ESR).
9. Determination of heart rate and pulse rate.

10. Recording of blood pressure.
11. Determination of tidal volume and vital capacity, Human spirometer.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13. Recording of basal mass index.
14. Study of family planning devices and pregnancy diagnosis test.
15. Demonstration of total blood count by cell analyser.
16. Permanent slides of vital organs and gonads.

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(B. Pharm)
(Semester - II)

L	T	P	C
3	1	-	4

Course Code	BP202T
Course Title	Pharmaceutical Organic Chemistry I - Theory

Scope:

This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.

Objectives:

Upon completion of the course, the student shall be able to -

1. Write the structure, name and the type of isomerism of the organic compound.
2. Write the reaction, name the reaction and orientation of reactions.
3. Account for reactivity/stability of compounds.
4. Identify/confirm the identification of organic compound.

Course Learning Outcomes (CLO):

After successful completion of the course, student will be able to -

1. Remember IUPAC rules for nomenclature of organic compounds.
2. Understand basic concepts of organic chemistry.
3. Discuss concept of reactivity for the possible chemical reactions.
4. Draw reaction, reaction mechanism and explain orientation of reactions.
5. Identify unknown organic compound.

Syllabus:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained.

Teaching hours: 45 Hours

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences.

UNIT I

07 Hours

Classification, nomenclature and isomerism:

Classification of Organic Compounds

Common and IUPAC systems of nomenclature of organic compounds

(up to 10 Carbons open chain and carbocyclic compounds) Structural isomerisms in organic compounds

UNIT II

10 Hours

Alkanes*, Alkenes*, Alkynes* and Conjugated dienes*:

SP³ hybridization in alkanes, Halogenation of alkanes, uses of paraffins

Stabilities of alkenes, SP² hybridization in alkenes

E1 and E2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeff's orientation and evidences. E1 versus E2 reactions, Factors affecting E1 and E2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.

Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement

UNIT III

10 Hours

Alkyl halides*:

S_N1 and S_N2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations

S_N1 versus S_N2 reactions, Factors affecting S_N1 and S_N2 reactions

Structure and uses of ethyl chloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform

Alcohols*:

Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, Isopropyl alcohol, Chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol

UNIT IV

10 Hours

Carbonyl compounds* (Aldehydes and ketones):

Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.

UNIT V

08 Hours

Carboxylic acids*:

Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester

Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid, Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid

Aliphatic amines*:

Basicity, effect of substituent on Basicity. Qualitative test. Structure and uses of Ethanolamine. Ethylenediamine. Amphetamine

Tutorials:

Tutorials will be based on above syllabus.

Teaching hours: 15 Hours

Suggested Readings[^]: (Latest edition)

1. Morrison, R. T., Boyd, R. N. *Organic Chemistry*. Prentice Hall, Inc., USA.
2. Finar, I. L. *Organic Chemistry*, Vol. I, ELBS.
3. Bahl, B. S. *Text Book Of Organic Chemistry {For B. Sc. Students}*. S. Chand And Company Ltd Ram Nagar, New Delhi.
4. March, J. *Advanced organic chemistry: reactions, mechanisms, and structure*. John Wiley & Sons.
5. Soni, P. L. *Fundamental organic chemistry*. New Delhi: S. Chand.
6. Mann, F. G., & Saunders, B. C. *Practical organic chemistry*. London: Longman.
7. Solomons, T. W., Fryhle, C. B., & Johnson, R. G. *Organic chemistry*. New York: Wiley.
8. Ahluwalia, V. K. *Organic Reaction Mechanism*. New Delhi: Ane Books India.
9. Mann, F. G. *Practical organic chemistry*. Pearson Education India.
10. Vishnoi, N. K. *Advanced practical organic chemistry*. Vikas Publishing House Pvt. Limited.
11. Pavia, D. L. *Introduction to organic laboratory techniques: a small scale approach*. Cengage Learning.
12. Gurudeep, C. R., & Gurudeep, C. R. *Reaction Mechanism and Reagents in Organic Chemistry*. Bombay: Himalaya Publishing House.
13. Furniss, B. S. *Vogel's textbook of practical organic chemistry*. Pearson Education India.

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**(B. Pharm)
(Semester - II)**

L	T	P	C
-	-	4	2

Course Code	BP208P
Course Title	Pharmaceutical Organic Chemistry I - Practical

Syllabus:

Teaching hours: 60 Hours

- I. Systematic qualitative analysis of unknown organic compounds like
 - a. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
 - b. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test
 - c. Solubility test

- d. Functional group test like Phenols, Amides/Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
- e. Melting point/Boiling point of organic compounds
- f. Identification of the unknown compound from the literature using melting point/boiling point.
- g. Preparation of the derivatives and confirmation of the unknown compound by melting point/boiling point.
- h. Minimum 5 unknown organic compounds to be analysed systematically.
2. Preparation of suitable solid derivatives from organic compounds
3. Construction of molecular models

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(B. Pharm)
(Semester - II)

L	T	P	C
3	-	-	3

Course Code	BP205T
Course Title	Computer Applications in Pharmacy - Theory

Scope:

This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.

Objectives:

Upon completion of the course the student shall be able to-

1. Know various types of application of computers in pharmacy.
2. Know the various types of databases.
3. Know the various applications of databases in pharmacy.

Course Learning Outcomes (CLO):

At the end of the course, students will be able to -

1. Understand various types of computer applications in pharmacy.
2. Describe various types of databases.
3. Discuss various applications of databases in pharmacy.
4. Explain concepts of bioinformatics.
5. Identify the role of computers in data analysis.

Syllabus:

Teaching hours: 45 Hours

UNIT I

09 Hours

Number system:

Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc. binary addition, binary subtraction, One's complement, Two's complement method, binary multiplication, binary division.

Concept of Information Systems and Software:

Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project.

UNIT II**09 Hours****Web technologies:**

Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products. Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database.

UNIT III**09 Hours****Application of computers in Pharmacy:**

Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring. Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System.

UNIT IV**09 Hours****Bioinformatics:**

Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery.

UNIT V**09 Hours****Computers as data analysis in Preclinical development:**

Chromatographic data analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS).

Suggested Readings[^]: (Latest Edition)

1. Fasset, W. E. *Computer Application in Pharmacy*. South Washington Square, USA: Lea and Febiger.
2. Ekins, S. *Computer Applications in Pharmaceutical Research and Development*. USA: Wiley-Interscience.
3. Rastogi, S.C. *Bioinformatics-Concept, Skills and Applications*. New Delhi, CBS Publishers & Distributors.
4. Prague, C.N. *Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath*. New Delhi, Wiley Dreamtech India (P) Ltd.

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(B. Pharm)
(Semester - II)

L	T	P	C
-	-	2	1

Course Code	BP210P
Course Title	Computer Applications in Pharmacy - Practical

Syllabus:**Teaching hours: 30 Hours**

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.

3. Retrieve the information of a drug and its adverse effects using online tools.
4. Creating mailing labels Using Label Wizard, generating label in MS WORD.
5. Create a database in MS Access to store the patient information with the required fields using access.
6. Design a form in MS Access to view, add, delete and modify the patient record in the database.
7. Generating report and printing the report from patient database.
8. Creating invoice table using – MS Access.
9. Drug information storage and retrieval using MS Access.
10. Creating and working with queries in MS Access.
11. Exporting Tables, Queries, Forms and Reports to web pages.
12. Exporting Tables, Queries, Forms and Reports to XML pages.

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(B. Pharm)
(Semester - II)

L	T	P	C
3	--	--	3

Course Code	BP206T
Course Title	Environmental sciences - Theory

Scope:

Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.

Objectives:

Upon completion of the course the student shall be able to-

1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.
6. Strive to attain harmony with Nature.

Course Learning Outcomes (CLO):

At the end of the course, students will be able to -

1. Define various natural resources.
2. Identify the renewable and non-renewable resources.
3. Describe the concepts of ecosystems.
4. Discuss the structure and function of various ecosystems.
5. Explain various types of environmental pollution.

Syllabus:

Teaching hours: 45 Hours

UNIT I

15 Hours

The Multidisciplinary nature of environmental studies.

Natural Resources.

Renewable and non-renewable resources:

Natural resources and associated problems

Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.

UNIT II

15 Hours

Ecosystems:

Concept of an ecosystem.

Structure and function of an ecosystem.

Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT III

15 Hours

Environmental Pollution: Air pollution; Water pollution; Soil pollution.

Suggested Readings[^]: (Latest edition)

1. Singh, Y.K. *Environmental Science*. Bangalore, New Age International Pvt, Publishers.
2. Agarwal, K.C. *Environmental Biology*. Bikaner, Nidhi Publ. Ltd.
3. Bharucha, E. *The Biodiversity of India*. Ahmedabad, Mapin Publishing Pvt. Ltd.
4. Brunner, R.C. *Hazardous Waste Incineration*. McGraw Hill Inc.
5. Clark, R.S. *Marine Pollution*. Oxford, Clarendon Press.
6. Cunningham, W.P., Cooper, T.H., Gorhani, E & Hepworth, M.T. *Environmental Encyclopedia*. Mumbai, Jaico Publ. House.
7. De, A.K. *Environmental Chemistry*. New Delhi, Wiley Eastern Ltd.
8. *Down to Earth*, Centre for Science and Environment. New Delhi.

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(B. Pharm.)
(Semester - II)

L	T	P	C
3	1	-	4

Course Code	RP211T
Course Title	Pharmaceutical Engineering - Theory

Scope:

This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.

Objectives:

After completion of course student is able to know,

1. To know various unit operations used in Pharmaceutical industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.

File

4. To carry out various test to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in pharmaceutical industries.

Course Learning Outcomes (CLO):

At the end of the course, students will be able to –

1. Understand theoretical principles of various unit operations.
2. Describe factors influencing various unit operations.
3. Discuss properties of materials used for pharmaceutical plant construction.
4. Explain pharmaceutical equipment of various unit operations.
5. Correlate various unit operations and its applications in formulation development.
6. Solve calculations involved in various pharmaceutical unit operations.

Syllabus:

Teaching hours: 45 Hours

UNIT I

10 Hours

Flow of fluids:

Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.

Size Reduction:

Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.

Size Separation:

Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

UNIT II

12 Hours

Heat Transfer:

Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.

Evaporation:

Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator & Economy of multiple effect evaporator.

Distillation:

Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation.

UNIT III

08 Hours

Drying:

Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses,

merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.

Mixing:

Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier.

UNIT IV

08 Hours

Filtration:

Objectives, applications, Theories & Factors influencing filtration, filter aids, filter media. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtz filter.

Centrifugation:

Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

UNIT V

07 Hours

Materials of pharmaceutical plant construction, Corrosion and its prevention:

Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals, basic of material handling systems.

TUTORIALS

Teaching hours: 15 Hours

Tutorials will be based on above syllabus

Suggested Readings[^]: (Latest edition)

1. Walter L. B., Julius B. T. *Introduction to chemical engineering*. Tata McGraw-Hill Publishing Company Ltd. New Delhi.
2. Nigel J. K. S., *Solid phase extraction, Principles, techniques and applications*. Marcel Dekker Inc., USA.
3. Warren L. M., Julian C. S., Peter H. *Unit operation of chemical engineering*. McGraw-Hill Companies, Inc. USA.
4. Subrahmanyam C.V.S. Setty J. T., Suresh S., Devi V. K. *Pharmaceutical engineering principles and practices*. Vallabh Prakashan, New Delhi.
5. Gennaro A. R. *Remington the science and practice of pharmacy*. Lippincott Williams & Wilkins
6. Lachman I., Lieberman H. A., Kanig L. *Theory and practice of industrial pharmacy*. Varghese Publishing House, Mumbai.
7. Subrahmanyam C. V. S. *Essentials of Physical pharmaceuticals*. Vallabh Prakashan, New Delhi.
8. Carter S. J. *Cooper and Gunn's Tutorial pharmacy*. C. B. S. Publishers & Distributors, Delhi.

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(B. Pharm.)
(Semester - II)

L	T	P	C
-	-	4	2

Course Code	BP212P
Course Title	Pharmaceutical Engineering - Practical

Syllabus:

Teaching hours: 60 Hours

1. Determination of radiation constant of brass, iron, unpainted and painted glass.
2. Steam distillation – To calculate the efficiency of steam distillation.
3. To determine the overall heat transfer coefficient by heat exchanger.
4. Construction of drying curves (for calcium carbonate and starch).
5. Determination of moisture content and loss on drying.
6. Determination of humidity of air – i) From wet and dry bulb temperatures – use of Dew point method.
7. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, dehumidifier.
8. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.
9. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.
10. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.
11. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/viscosity).
12. To study the effect of time on the Rate of Crystallization.
13. To calculate the uniformity Index for given sample by using Double Cone Blender.

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