



C. U. SHAH UNIVERSITY

Faculty: - Pharmaceutical Sciences

Department: Pharmaceutics & Pharmaceutical Technology

Semester: II

Name of Subject: Pharmaceutical Industrial Process-I (Theory)

Subject Code: 4PS02PIP1

Teaching & Evaluation Scheme:-

Sr. No	Branch Code	Subject Code	Subject Name	Teaching hours/ week				Credit	Evaluation Scheme/ Semester							
				Th	Tu	Pr	Total		Theory				Practical			Total
									Sessional Exam		University Exam		Internal		University	
									Marks	Hrs	Marks	Hrs	Pr	TW	Pr	
1	04	4PS02PIP1	Pharmaceutical Industrial Process I	3	0	3	6	4.5	20	1	70	3	20	--	70	200
									10 (CEC)	--			10 (CEC)	--		

Objectives: - The objectives of Pharmaceutical Industrial Process-I is to develop the ability to predict the approach of applications of pharmaceutical engineering from initial stages to the field of dosage form manufacturing in a pharmaceutical industry.

Prerequisites:- To have a more thorough theoretical background in many of the topics covered in this course, the candidate should have an adequate knowledge about general physics as well as chemistry studied during his/her standard - 12 (10+2) pattern science stream from the Examination Board of respective Stat

Course outline:-

Sr. No	Course Contents	Hours
1	Size Reduction Objectives, theory of size reduction, factors influencing size reduction, energy requirements in size reduction, study of various mills including ball mill, hammer mill, fluid energy mill, colloid mill, cutter mill, etc. Introduction to methods of generating nanoparticles.	06
2	Size Separation Principles of size separation, screens- types, Pharmacopoeial standards, screening methods, screening equipments including shaking and vibrating screens, gyratory screens, sedimentation tank, elutriation and cyclone type separators etc. Application of size separation in pharmacy, angle of repose, Carr's index, Hausner ratio.	04
3	Mixing Theory of mixing, mixing mechanisms, solid – solid, solid – liquid and liquid – liquid mixing equipments. Importance of content uniformity in solid dosage forms.	07
4	Crystallization Objectives, crystal lattice, types of crystal, crystal form, size and habit, formation of crystals, supersaturation theory, factors affecting crystallization process, crystal growth. Study of various types of crystallizers including Swenson walker, tanks, circulating magma, vaccum and crystal cooling crystallizer, etc. Spherical crystallization and its application in ph, brief	10



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	introduction of co-crystals, polymorphism and amorphous forms of drugs.	
5	Extraction Principle, theory, types of extraction, solvents used for extraction, leaching and extraction equipments, small scale and large scale extraction methods, special extraction techniques, application in pharmaceutical industry.	06
6	Filtration and Centrifugation: Theory of filtrations, filter aids, filter media, industrial filters, including filter press, rotary filter, edge filters, filter leaf and laboratory filtration equipments etc., Factor effecting filtration, mathematical problems on filtrations, optimum cleaning cycle in batch filters. Principles of centrifugation, industrial centrifugal filters and centrifugal sedimentars	08
7	Industrial hazards and safety precautions. Mechanical, chemical, electrical, fire, dust, noise hazards Industrial dermatitis, accident, records, safety requirements/equipments etc.	04
	Total	45



C. U. SHAH UNIVERSITY

Faculty: - Pharmaceutical Sciences

Department: Pharmaceutics & Pharmaceutical Technology

Semester: II

Name of Subject: Pharmaceutical Industrial Process-I (Practicals)

Subject Code: 4PS02PIP1

The practical exercises are based on topics describe under theory. The practical's should broadly cover the following:

1. To perform the size reduction of Ball mill.
2. To determine the average particle size of given sample by sieving.
3. To determine the specific cake resistance () and the resistance offered by filter medium () by filtering the prepared slurry using Buchner funnel and filter paper at room temperature
4. To study the effect of surface area on the rate of filtration of prepared slurry at room temperature.
5. To study the effect of temperature on rate of filtration of prepared slurry
6. To study the effect of method of addition of filter aid on rate of filtration of prepared slurry at room temperature
7. To study the effect of Filter aid on rate of filtration of the prepared slurry at room temperature and find out its optimum concentration
8. To plot Meir's super solubility curve for given substance
9. To determine the % yield of crystals followed by crystallization.
10. To study the rate of crystallization of given substance (CuSO₄.7H₂O).
11. To study the effect of speed of mixing on rate of mixing using magnetic stirrer.
12. To determine the % recovery of aspirin by single extraction process using different solvents.
13. To determine the % recovery of Aspirin by single and multiple extraction process.
14. To determine % recovery of acetic acid from benzene and acetic acid mixture using single and multiple extraction process.
15. To determine the content of uniformity of given powder (Aspirin) from five different places
16. To determine the content of uniformity of given tablets (Aspirin).
17. To determine the content of uniformity of given tablets (Ibuprofen). To determine the content of uniformity of given capsules (Ibuprofen).

Learning Outcomes:-

On the completion of the course, students will be able to:

1. Learning method of dosage form manufacturing pharmaceutical industry.
2. Learning role of Extraction and Crystallization and its possible involvement in Pharmaceutical Industrial Process.
3. And of course safety precautions to be taken for various Industrial hazards.

Teaching Methodology:-

- Lectures will be conducted with the aid of various Audio visual aids.
- Assignments based on course content will be given to the students at the end of each Unit/topic and will be evaluated at regular interval.
- Specific discussion questions will be assigned each week.



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Books Recommended:

1. S.J. Carter, Cooper and Gunn's Tutorial Pharmacy 6th ed CBS publisher, Delhi
2. C.V.S. Subramanayam, Pharmaceutical Unit Operation, Vallabh Prakashan
3. Prof. K. Samba Murthy, Pharmaceutical Engineering.
4. Badzer & Banchemo, Introduction to Chemical Engineering.
5. Perry's Handbook of Chemical Engineering.
6. Unit Operations by Mc Cabe & Smith.
7. Mc Cabe & Smith, Elements of Chemical Engineering.
8. Lippincott Williams and Wilkins: Remington Pharmaceutical Sciences.
9. EA Rawlins, Bentley's Text Book of Pharmaceutics, 8th edition, ELBS

E-Resources:

www.csupomona.edu/~fjjanger/ce457/457_09.doc



C. U. SHAH UNIVERSITY

Faculty: - Pharmaceutical Sciences

Department: Pharmaceutical Chemistry & Pharmaceutical Analysis

Semester: II

Name of Subject: Pharmaceutical Chemistry-III (Organic Chemistry-I)

Theory

Subject Code: 4PS02PCH3

Teaching & Evaluation Scheme:-

Sr. No	Branch Code	Subject Code	Subject Name	Teaching hours/ week				Credit	Evaluation Scheme/ Semester							Total
				Th	Tu	Pr	Total		Theory				Practical			
									Sessional Exam		University Exam		Internal		University	
									Marks	Hrs	Marks	Hrs	Pr	TW	Pr	
1	04	4PS02PCH3	Pharmaceutical Chemistry-III (Organic Chemistry-I)	3	0	3	6	4.5	20	1	70	3	20	--	70	200
									10 (CEC)	--			10 (CEC)	--		

Objectives: -

The objective of the course is for students to develop an understanding and appreciation of both structure and chemical transformations of organic molecules. Students will acquire basic concepts of electronic structure and be able to apply them to solve problems from various areas of organic chemistry, including stereochemistry, reactivity patterns and synthesis. Improvements in learning strategies, critical-thinking, and problem-solving skills are an expected outcome.

Prerequisites:-

To have a more thorough theoretical background in many of the topics covered in this course; student must have taken general chemistry or science at 10+2 level related to organic compounds before this course.

Course outline:-

The starting point for this course will be about atomic structure, orbital concepts, Quantum numbers, Types of bonding valency of carbon, different types of hybridization and their properties, Electro negativity, Polarity in bonds. I.U.P.A.C. Nomenclature of organic compounds. Compare and contrast the structures, properties and reactions of hydrocarbons, alkyl halides, alcohols, ethers and amines.

Sr. No	Course Contents	Hours
1	Bohr's atomic structure, Atomic and Molecular orbital concepts, Quantum numbers, Chemical bonding: Ionic bond, Covalent bonds, Coordinate covalent bonds, Type of covalent bonds, Tetravalency of carbon, Hybridization: sp, sp ² , sp ³ . Bond energy, Bond length, Bond angle, Electronegativity, Polarity in Covalent bonds, Hydrogen bonding. I.U.P.A.C. Nomenclature of Organic compounds.	08



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2	<p>Organic Reactions and their Mechanisms: Reaction mechanism, Electron Displacement Effects: Inductive Effect, Mesomeric Effect, Electromeric Effect, Hyperconjugative Effect. Homolytic bond fission, Heterolytic bond fission. Structure and Stability of: Carbonium ions, Carbanion ions and Free radicals. Attacking Reagents: Electrophilic reagents, Nucleophilic reagents. Brief Concept of Organic reactions: Substitution reactions, Addition reactions, Elimination reaction and Rearrangement reactions.</p>	15
3	<p>Alkanes: Nomenclature, General methods of preparation, physical properties, combustion, Free radical substitution reactions (Chain reaction: halogenation) Cycloalkanes: Nomenclature, General methods of preparation, Chemical reactions and Relative stabilities: Bayer strain theory, Sachse-Mohr concept of strainless rings. Conformational analysis of cyclohexane. Alkenes: Nomenclature, general methods of preparation, Electrophilic addition reactions, Markovnikov rule, Antimarkovnikov rule, Catalytic hydrogenation, Oxidation, Combustion. Brief introduction to alkadienes, Diel's Alder reaction. Alkynes: Nomenclature, general methods of preparation, Electronegativity of <i>sp</i>-hybridized carbon and acidity of acetylene, Substitution and Addition reactions.</p>	15
4	<p>Haloalkanes: Nomenclature general methods of preparation, Nucleophilic Substitution reactions: SN^1 & SN^2 reactions. Alcohols: Nomenclature, General methods of preparation, Physical properties (Hydrogen bonding) Nucleophilic substitution reactions and Elimination reaction, Saytzeff rule. Ethers: Nomenclature, General methods of preparation, Physical and Chemical properties. Amines: Nomenclature, General methods of preparation, Physical and Chemical properties, Basicity.</p>	07
Total		45



C. U. SHAH UNIVERSITY

Faculty: - Pharmaceutical Sciences

Department: Pharmaceutical Chemistry & Pharmaceutical Analysis

Semester: II

Name of Subject: Pharmaceutical Chemistry-III (Organic Chemistry-I) Practical

Subject Code: 4PS02PCH3

The practical exercises are based on topics describe under theory. The practicals should broadly cover the following:

(A minimum of 15 experiments shall be conducted)

1. Determination of Melting Point and Boiling Point
2. Identification of mono-functional organic compounds by a study of their physical properties, detection of characteristic functional group reactions and preparations of the rational derivative.
3. The following types of compounds are included for the study:
4. Carboxylic acids, phenol, aldehydes, ketones, amides, esters. Hydrocarbons and carbohydrates.
5. Esterification of alcohol.

Learning Outcomes:-

On the completion of the course, students will be able to:

1. Identify and explain organic reaction mechanisms
2. Describe the structure, chemistry and reactions of hydrocarbons, haloalkanes, alcohols, ethers and amines.
3. Perform the laboratory synthesis of organic and pharmaceutical compounds and present experimental results in an ordered manner
4. Perform and justify the separation techniques used in purifying organic compounds.

Teaching Methodology:-

1. Lectures will be conducted with the aid of multimedia projector, use of molecular models of organic molecule, black board, OHP etc.
2. Assignments based on course content will be given to the students at the end of each Unit/topic and will be evaluated at regular interval.
3. Specific discussion questions will be assigned each week.

Books Recommended:

1. Organic chemistry by Morrison and Boyd. (Prentice Hall of India, New Delhi)
2. Advanced organic chemistry by Bhal & Bhal (S.Chand, New Delhi)
3. Organic Chemistry Vol. 1 and II by I.L.Finar (Longman, Singapore)
4. Bentley and Drivers Text of Pharmaceutical Chemistry by Oxford University, New Delhi

E-Resources:

1. <http://www.freebookcentre.net/chemistry-books-download/A-Brief-Review-Of-Organic-Chemistry-%28PDF-30P%29.html>



C. U. SHAH UNIVERSITY

Faculty: - Pharmaceutical Sciences

Department: Pharmaceutical Chemistry & Pharmaceutical Analysis

Semester: II

Name of Subject: Pharmaceutical Analysis-I (Theory)

Subject Code: 4PS02PHA1

Teaching & Evaluation Scheme:-

Sr. No	Branch Code	Subject Code	Subject Name	Teaching hours/ week				Credit	Evaluation Scheme/ Semester						Total	
				Th	Tu	Pr	Total		Theory				Practical			
									Sessional Exam		University Exam		Internal			University
				Marks	Hrs	Marks	Hrs		Pr	TW	Pr					
1	04	4PS02PHA1	Pharmaceutical Analysis-I	3	0	3	6	4.5	20	1	70	3	20	--	70	200
									10 (CEC)	--			10 (CEC)	--		

Objectives: -

1. To Design and application of analytical method to obtain analysis data with high precision and accuracy.
2. To Introduce various analytical techniques and their applications.
3. To make students familiar with the principles of pharmaceutical analysis and its application in pharmacy

Prerequisites:-

1. Student must have taken general chemistry or science at 10+2 level subject related to simple titration before this course.

Course outline:-

Sr. No.	Course Content	Hours
1	Significance of qualitative analysis in quality control, Different techniques of analysis, Preliminaries and definitions, Significance of figures. Rules for retaining significant digits. Types of errors, minimization of error, selection of sample, precision and accuracy. Fundamentals of volumetric analysis, methods of expressing concentration, primary and secondary standards.	06
2	Acid Base Titration: Acid base concepts role of solvers, Relative strength of acids and bases, Ionization, Law of mass action, Common ion effect, ionic product of water, pH, Hydrolysis of salts, Henderson-Hasselbalch equation, Buffers solutions, Neutralization curves, Acid-base indicators, Theory of indicators, Choice of indicators, Mixed indicators, Polyamine and amino acid systems. Amino acid titration, applications in assay, H_3PO_4 , NaOH, $CaCO_3$ etc.	07
3	Oxidation- Reduction Titrations: Theory of redox titrations, redox indicators, types of redox titrations, iodometry, cerimetry, mercurimetry, diazotization nitrite titrations, 2,6-dichlorophenol indophenol titrations, titration curve and calculations of potentials during course of titrations.	04
4	Precipitation Titrations: Precipitation reactions, solubility product, effect of acids, temperature and solvent upon the solubility of a	07



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	precipitate, Argentometric titration and titrations involving ammonium or potassium thiocyanate, mercuric nitrate and barium sulphate, Indicators, Gay-Lussac method; Mohr's method, Volhard's method and Fajan's method.	
5	Non-aqueous titrations: Acidimetry & Alkalimetry. Basic principles, solvents involved indicators. Typical examples of Acidic & Basic drug molecules.	06
6	Complexometric titration: Types of complexometric titrations, Metal ion indicators, Complexometric titrations involving EDTA. Typical examples of complexometric titration.	07
7	Gravimetric Analysis: Precipitation techniques, solubility products. The colloidal state, supersaturation, co-precipitation, post precipitation, Digestion, washing of the precipitate, Filtration, Filter papers, and crucibles, Ignition. Thermo gravimetric curves, specific examples like barium sulphate, aluminum as aluminum oxide, calcium as calcium oxalate and magnesium as magnesium pyrophosphate, organic precipitants.	08
Total		45



C. U. SHAH UNIVERSITY

Faculty: - Pharmaceutical Sciences

Department: Pharmaceutical Chemistry & Pharmaceutical Analysis

Semester: II

Name of Subject: Pharmaceutical Analysis-I (Practical)

Subject Code: 4PS02PHA1

The practical exercises are based on topics describe under theory. The practicals should broadly cover the following:

PRACTICAL

(A minimum of 15 experiments shall be conducted)

3hrs/week

1. Standardization of analytical weights and calibration of volumetric apparatus.
2. Preparation and standardization of sodium carbonate, potassium hydrogen phthalate, sodium bicarbonate, oxalic acid.
3. Assay of boric acid, zinc oxide, ammonium carbonate.
4. Preparation and standardization of silver nitrate and ammonium thiocyanate
5. Titration according to Mohr's and Volhard's methods.
6. Preparation and standardization of perchloric acid and sodium methoxide and assay of one official drug under each type.
7. Preparation and standardization of EDTA solution and assay of calcium gluconate.
8. Assay of calcium by gravimetric analysis.
9. Assay of aspirin
10. Any other practical based on theory.

Learning Outcomes: -

At the end of the course, the student will be able to understand the fundamental concept of pharmaceutical analysis, which is important for qualitative as well as quantitative analysis of drug substances and drug product.

1. Understand and be able to apply the fundamental principles of analytical chemistry.
2. Demonstrate an understanding of the application of and use of different methods of analysis.
3. Competently undertake advanced qualitative and quantitative laboratory tasks, including the operation of advanced analytical instrumentation.
4. Demonstrate the ability to follow the analytical approach to the solution of problems in chemical analysis and adhere to good laboratory practice.
5. Be able to understand and follow standard documented methods of analysis.

Teaching & Learning Methodology:-

1. Lectures will be conducted with the aid of multimedia projector, black board, OHP etc.
2. Assignments based on course content will be given to the students at the end of each Unit/topic and will be evaluated at regular interval.
3. Specific discussion questions will be assigned each week.

Books Recommended:

1. Pharmacopoeia: USP, B.P., I.P.
2. Quantitative chemical analysis – Vogel A.I, Pearson Education



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3. Instrumental Methods of Analysis H. H. Willard (CBS Publishers, Delhi)
4. Analytical Chemistry by R. M. Verma CBS Publishers.
5. Quantitative chemical analysis by Gilbert H. Ayers. Harper and Row New York.
6. A Textbook of pharmaceutical analysis by Kenneth A. Connors. Jon Wiley and sons.
7. Analysis chemistry by Gary D. Christian, John Wiley and sons N.Y.
8. Quantitative analysis by V. Alexeyev. Mir publishers, Moscow.
9. Pharmaceutical Analysis by T. Higuchi etc. CBS Publishers, New Delhi.
10. Quantitative Analysis R. A. Day and A. L. Underwood Prentice Hall of India.
11. The Quantitative analysis of drugs Garratt.

E-Resources:

1. <http://www.freebookcentre.net/chemistry-books-download/Introduction-to-Analytical-Chemistry-%28PDF31P%29.html>
2. <http://www.freebookcentre.net/chemistry-books-download/Analytical-Chemistry-Notes-%28PDF-55P%29.html>



C. U. SHAH UNIVERSITY

Faculty: - Pharmaceutical Sciences

Department: Pharmacology

Semester: II

Name of Subject: Human Anatomy & Physiology-II (Theory)

Subject Code: 4PS02HAP2

Teaching & Evaluation Scheme:-

Sr. No	Branch Code	Subject Code	Subject Name	Teaching hours/ week				Credit	Evaluation Scheme/ Semester							Total
				Th	Tu	Pr	Total		Theory				Practical			
									Sessional Exam		University Exam		Internal		University	
				Marks	Hrs	Marks	Hrs		Pr	TW	Pr					
1	04	4PS02HAP2	Human Anatomy & Physiology-II	3	0	2	5	4	20	1	70	3	20	--	70	200
									10 (CEC)	--			10 (CEC)	--		

Objective of Course:

1. To make students familiar with the principles of human anatomy and physiology.
2. To understand homeostasis mechanisms and its relation with various body systems.
3. To knowledge imparted should help the students to understand the pharmacology of drugs

Prerequisites:

1. Anatomy and physiology studies are the base (core) of the major subjects in pharmaceutical studies like, pharmacology, Bio pharmaceuticals and Biochemistry.

Course Outline:

Sr. No	Course Contents	Hours
1	Respiratory System: Anatomy of respiratory organs and functions, Mechanism and regulation of Respiration, Physiology of respiration: transport of respiratory gases ,Respiratory volumes and vital capacity , brief outline of asthma, COPD, emphysema, chronic bronchitis, pulmonary oedema.	5
2	Neurons: General anatomy and physiology of neurons(parts of Neuron, structural and functional classification of neurons, Neuroglia, Myelination, Graded potential, Resting membrane potential, Generation and propagation of Nerve action potential), synapses, Signal transmission at synapses, Post synaptic potentials (EPSP,IPSP) , Overview of nervous disorders like multiple sclerosis and epilepsy	5
3	Spinal cord: Anatomy of spinal cord, names and functions of spinal nerves , sensory and motor tracts, reflexes and reflex arcs, brief outline of poliomyelitis	4
4	Brain: Major parts and protective coverings of brain, blood brain barrier, CSF, medulla oblongata, pons, midbrain, reticular formation, cerebellum, thalamus, hypothalamus, cerebral cortex, lobes of cerebrum, basal nuclei, limbic system, reticular system sensory, motor and association areas of cerebral cortex, brain waves, cranial nerves names and functions, brief outline	8



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	of Alzheimer's disease, Parkinson's disease, Dementia	
5	Anatomy of autonomic motor pathways: Preganglionic neurons, autonomic ganglia, postganglionic neurons, enteric neurons, Synthesis and release of neurotransmitters (e.g. Acetylcholine, Nor adrenaline), comparisons of sympathetic and parasympathetic neurons	5
6	Special Senses: Process of sensation, sensory receptors, somatic sensation, somatic sensory and motor pathways, structures and physiology of eye ,ear, Taste and Smell Brief outline of cataract, glaucoma, deafness, otitis media	3
7	Urinary System: Parts of Urinary system and Gross structure of the kidney, Structure of Nephron , Formation of Urine, Rennin Angiotensin System - Juxta - Glomerular apparatus, Acid Base balance. brief outline of urinary tract infection, renal failure	4
8	Endocrine System: Pituitary gland, Adrenal gland ,Thyroid and parathyroid gland Pancreas and gonads(their secretion, regulation of secretion, functions and disorders)	4
9	Reproductive System Gross anatomy and physiology Male and female reproductive systems ,Their hormones – physiology of menstruation, Spermatogenesis and Oogenesis Pregnancy and its maintenance and parturition, Family planning, various contraceptive methods, Medical termination of pregnancy (Abortion), brief outline of erectile dysfunction (Impotence), Premenstrual syndrome, Male and female infertility, endometriosis, Benign prostatic hyperplasia.	7
	Total	45



C. U. SHAH UNIVERSITY

Faculty: - Pharmaceutical Sciences

Department: Pharmacology

Semester: II

Name of Subject: Human Anatomy & Physiology-II (Practical)

Subject Code: 4PS02HAP2

The practical exercises are based on topics describe under theory. The practicals should broadly cover the following:

Sr. No	Course Contents
1	Qualitative Urine Analysis: a) Studies physical characteristics, normal constituents b) Determination of inorganic constituents of urine c) Determination of organic constituents of urine d) Determination of abnormal constituents of urine e) Determination of unknown constituents of urine
2	Histological slides study of various organs of Respiratory System, Nervous system (spinal cord Brain), Urinary System, Reproductive System
3	Determination of body temperature
4	Study of different systems with the help of charts and models: a) Respiratory system b) Nervous system c) Ear and Eye d) Urinary system e) Male & Female reproductive system f) Study of various contraceptive techniques using charts g) Study of various contraceptive techniques
5	Determination of lung function a) Determination of lung volumes and vital capacity using Spirometer / Flowmeter b) Determination of breath holding time
6	Determination of other special senses a) Temperature sensations b) Sensation of taste c) Sensation of smell

Learning Outcomes:

1. Define and correctly use scientific terminology in regard to human body and processes.
2. Apply principles of scientific inquiry, differentiate a theory from a hypothesis, and differentiate fact from opinion in regard to different human system.
3. Describe and practice laboratory safety guidelines relating to working with chemicals, microorganisms and body fluids.
4. Show proficiency in taking lab practical exams, responding to questions quickly and accurately, effectively handling the pressure of a timed exam.



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Teaching & Learning Methodology:-

1. Lectures will be conducted with the aid of multimedia projector, black board, OHP etc.
2. Assignments based on course content will be given to the students at the end of each Unit/topic and will be evaluated at regular interval.
3. Specific discussion questions will be assigned each week.

Books Recommended:

1. Guyton A.C. and Hall J.E.: Textbook of Medical Physiology – 10th Edition– W. B. Saunders
2. Tortora G. J. and Anagnostokos, N. P. Principles of Anatomy and Physiology (Harper and Colling Publishers, New York)
3. Chatterjee C. C. Human Physiology (Medical Allied Agency, Calcutta)
4. Goyal R. K. et al.: Practical Anatomy Physiology and Biochemistry (B.S. Shah Prakashan, Ahmedabad)
5. Ross and Wilson Anatomy and Physiology, Churchill Livingstone, Elsevier.

E-Resources:

1. <http://faculty.sdmiramar.edu/dtrubovitz/anatomy/>
2. <http://academic.pg.cc.md.us/~aimholtz/AandP/AandPLinks/ANPLinks.html>
3. <https://sites.google.com/site/bio2324atbcc/Home/bio23>



C. U. SHAH UNIVERSITY

Faculty: - Pharmaceutical Sciences

Department: Pharmacognosy

Semester: II

Name of Subject: Pharmacognosy-I (Theory)

Subject Code: 4PS02PCOG1

Teaching & Evaluation Scheme:-

Sr. No	Branch Code	Subject Code	Subject Name	Teaching hours/ week				Credit	Evaluation Scheme/ Semester							Total
				Th	Tu	Pr	Total		Theory				Practical			
									Sessional Exam		University Exam		Internal		University	
									Marks	Hrs	Marks	Hrs	Pr	TW	Pr	
1	04	4PS02COG1	Pharmacognosy I	3	0	3	6	4.5	20	1	70	3	20	--	70	200
									10 (CEC)	--			10 (CEC)	--		

Objectives: - The main objective of this course is to familiarize the students with the basic aspects of Pharmacognosy. Knowledge regarding exploiting the full potential of herbs may be gained from this course.

Prerequisites:-The students should have a clear concept of Botany.

Course outline:-

Sr. No	Course Contents	Hours
1	Introductory Pharmacognosy Historical development, modern concept and scope of Pharmacognosy. Significance of Pharmacognosy in various systems of medicine viz; Ayurveda, Unani, Homeopathic, Siddha and Allopathic systems practiced in India.	05
2	Definition of drug Sources of crude drugs viz; Herbs, Animals, inorganic matter, plant tissue culture and marine sources. Role of herbal drugs in national economy.	05
3	Classification of crude drugs Based on alphabetical, morphological, pharmacological, chemical and taxonomical methods official and unofficial drugs, organized and unorganized drugs.	08
4	Cultivation of herbal drugs. Cultivation types, Factors influencing variability in drug activity, type of soils, fertilizers, plant hormones and their applications, polyploidy, mutation and hybridization in medicinal plants (Extrinsic and intrinsic factors affecting cultivation).	10
5	Plant taxonomy : study of the following families with special reference to medicinally important plants – Apocynaceae, Solanaceae, Rutaceae, Umbelliferae, Leguminosae, Rubiaceae, Liliaceae, Graminae, Labiatae, Cruciferae, Papaveraceae.	10



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6	Quality Control of crude drugs: Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods and properties.	07
		Total 45



C. U. SHAH UNIVERSITY

Faculty: - Pharmaceutical Sciences

Department: Pharmacognosy

Semester: II

Name of Subject: Pharmacognosy-I (Practical)

Subject Code: 4PS02PCOG1

The practical exercises are based on topics describe under theory. The practicals should broadly cover the following:

1. Morphological characteristics of plant families mentioned in theory.
2. Microscopic measurements of cells and Cell contents: Starch grains, calcium oxalate crystals and phloem fibres.
3. Determination of leaf constants such as stomatal index, stomatal number, vein-islet number, vein-termination number and palisade ratio.
4. Preparation of herbarium sheets.

Learning Outcomes:-

The student would have gained knowledge regarding herbal drugs, i.e: their cultivation, classification as well as quality control of drugs which is of utmost importance.

Teaching Methodology:-

1. Lectures will be conducted with the aid of multimedia projector, black board, OHP etc.
2. Assignments based on course content will be given to the students at the end of each Unit/topic and will be evaluated at regular interval.
3. Specific discussion questions will be assigned each week.

Books Recommended:

1. Pharmacognosy, Trease G.E. and Evans, W.C., Bailliere Tindall, Eastbourne, U.K
2. Pharmacognosy, Kokate C.K., Purohit A.P. and Gokhale S.B, Nirali Prakashan.
3. Study of Crude drugs, Iyengar M.A.and Nayak S.G.K. Manipal Power Press, Manipal.
4. Anatomy of Crude Drugs, Iyengar M.A.and Nayak S.G.K, Manipal Power Press, Manipal.
5. Practical Pharmacognosy, Kokate C.K., Vallabh Prakashan.
6. The chemotaxonomy of Plants. Smith P.M, Edinburgh.
7. Quality Control of Plants. WHO publication.

E-Resources:

1. sites.google.com/site/mystuden/Home/Pharmacognosy
2. www.klescoph.org/sis/Question%20Bank/Files/Pharmacognosy.doc
3. [faculty.ksu.edu.sa/alqasoumi/Documents/Pharmacognosy-I%2520\(Part-1\).ppt](http://faculty.ksu.edu.sa/alqasoumi/Documents/Pharmacognosy-I%2520(Part-1).ppt)
4. [http://elearning.najah.edu/OldData/pdfs/Pharmacognosy%20%20objectives\(103331\).ppt](http://elearning.najah.edu/OldData/pdfs/Pharmacognosy%20%20objectives(103331).ppt)



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Faculty: - Pharmaceutical Sciences

Department: General

Semester: II

Name of Subject: Environment & Ecology (Theory)

Subject Code: 4PS02EAE1

Teaching & Evaluation Scheme:-

Sr. No	Branch Code	Subject Code	Subject Name	Teaching hours/ week				Credit	Evaluation Scheme/ Semester							
				Th	Tu	Pr	Total		Theory				Practical			Total
									Sessional Exam		University Exam		Internal		University	
									Marks	Hrs	Marks	Hrs	Pr	TW	Pr	
1	04	4PS02EAE1	Environment and Ecology I	2	0	0	2	2	20	1	70	3	---	---	---	100
									10 (CEC)	--						

Objectives: - The primary objective of this course is to make people aware of the importance of environment on health of every individual and the society as a whole.

Prerequisites:- Basic understanding of concepts related to environment and awareness about the harmful effects of pollution are required to understand the concept better

Course outline:

Sr. No.	Course contents	Hours
1	The Multidisciplinary nature of environmental studies Definition, scope and importance Need for public awareness.	01
2	Environment Concept Introduction, concept of biosphere – lithosphere, hydrosphere, atmosphere; Biogeochemical cycle.	08
3	Principles and scope of Ecology; concepts of ecosystem, population, community, biotic interactions, biomes, ecological succession.	05
4	Natural Resources Renewable and non-renewable resources Natural resources and associated problems.	06
5	Environmental Pollution Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution & Nuclear hazards	06
6	Conservation of Environment The concepts of conservation and sustainable development, why to conserve, aims and objectives of conservation, policies of conservation; conservation of life support systems – soil, water , air, wildlife, forests.	04
	Total	30



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Learning Outcomes:-

The course provides knowledge regarding conservation of environment which is very crucial in the present day scenario.

Teaching & Learning Methodology:-

Use of multimedia, charts and models.

Books Recommended:

1. Masters, G.M., “Introduction to Environmental Engineering and Science”, Prentice – Hall of India Pvt. Ltd. , 1991
2. Nebel, B.J., “Environmental Science”, Prentice –Hall Inc., 1987
3. Odum, E.P., “Ecology: The Link between the natural and social sciences” , IBH Publishing Com. , Delhi.

E-Resources:

1. en.wikipedia.org/wiki/Environmental_science
2. www.iisc.ernet.in/ug/enviroimentscience.htm
3. www.sciencedaily.com/gallery/earth_climate/environmental_science/
4. environment.nationalgeographic.co.in/