OFFICE OF THE DIRECTOR/PRINCIPAL
GOVERNMENT COLLEGE OF PHARMACY, ROHRU
TEHSIL ROHRU, DISTT. SHIMLA-171207, HIMACHAL PRADESH
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LESSON PLAN

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: 1st
Subject Title: HUMAN ANATOMY AND PHYSIOLOGY-I		**Subject Code:** BP 101 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Introduction to the human body**	Students will be able to learn fundamental knowledge of the structure and functions of the human body's various systems.	04
I	**The cellular level of organization**	Students will be able to learn the structure, and functions of cells along with transportation across membranes and general principles of cell communications, etc.	03
I	**Tissue level of organization**	Students will be able to learn the classification, structure, location, and functions of tissues.	03
II	**Integumentary system**	Students will be able to learn the structure and function of the skin.	03
II	**Skeletal system**	Students will be able to learn skeletal system divisions, types, and functions of bones, organization of skeletal muscle, muscle contraction, and neuromuscular junction.	04
II	**Joints**	Students will be able to learn the structures, functions, classifications, and types of joints.	03
III	**Body fluids and blood**	Students will be able to learn the function of body fluids, blood, mechanisms of coagulation, blood grouping, Rh factors, transfusion, and blood disorders.	05
III	**Lymphatic system**	Students will be able to learn about lymphatic organs and tissues, lymphatic vessels, lymphcirculation and its functions.	05
IV	**Peripheral nervous system**	Students will be able to learn the classification, structure and functions of the sympathetic and parasympathetic nervous system along with the functions of spinal and cranial nerves.	04
IV	**Special senses**	Students will be able to learn the structure and functions of eye, ear, nose and tongue and their disorders.	04
V	**Cardiovascular system**	Students will be able to learn the anatomy of heart elements of conduction system of heart and heartbeat, Regulation of blood pressure and disorders of heart	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam.Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA.
4. Textbook of Medical Physiology- Arthur C, Guyton and John.E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A. 32
6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
8. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co Riverview, MI USA
9. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
10. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje, Academic Publishers.

LESSON PLAN
GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: 1st
Subject Title: PHARMACEUTICAL ANALYSIS		**Subject Code:** BP 102 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Pharmaceutical analysis**	Students will be able to learn the definition, scope, various techniques, standardization of various normal and molar solutions.	03
I	**Errors**	Students will be able to learn the sources and types of errors along with their rectification methods.	03
I	**Pharmacopoeia and Limit Tests**	Students will be able to learn the various pharmacopoeias in the world and sources of impurities in medicinal agent and types, procedure of limit test.	04
II	**Acid base titration**	Students will be able to learn the introduction, principles, and theories of acid-base titration.	05
II	**Non aqueous titration**	Students will be able to learn the introduction, principles of non-aqueous titration. Solvents, acidimetry and alkalimetry titration and estimation of various compounds.	05
III	**Precipitation Titrations**	Students will be able to learn the introductions and use of various methods like Mohr's method, Volhard's, Modified Volhard's, Fajans method, along with estimation of sodium chloride.	03
III	**Complexometric Titration**	Students will be able to learn the Classification, metal ion indicators, masking and demasking reagents, estimation of of Magnesium sulphate, and calcium gluconate.	04
III	**Gravimetry**	Students will be able to learn about Principle and steps involved in gravimetric analysis. Estimation of barium sulphate. Basic Principles, methods, and application of diazotisation titration.	03
IV	**Redox titrations**	Students will be able to learn the Concepts of oxidation and reduction, Types of redox titrations, Iodimetry, Iodometry, Bromometry.	08
V	**Electrochemical methods of analysis and Conductometry**	Students will be able to learn the Introduction, Conductivity cell, Conductometric titrations, applications.	04
V	**Potentiometry and Polarography**	Students will be able to learn the Electrochemical cell, construction and working of reference and indicator electrodes and endpoint methods determinations. Principle of polarography, Ilkovic equation.	03

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stallone Press of University of London.
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis.
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry.
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry.
5. John H. Kennedy, Analytical chemistry principles.
6. Indian Pharmacopoeia.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: 1st
Subject Title: PHARMACEUTICS- I		**Subject Code:** BP 103 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 43	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Historical background and development of profession of pharmacy**	Students will be able to learn the history of pharmacy profession, carrier opportunities of pharmacy, introduction of various pharmacopeia's like IP, BP, USP, JP, Int Ph etc.	04
I	**Dosage forms**	Students will be able to know the introduction, definition and classifications of dosages form.	03
I	**Prescription and Posology**	Students will be able to learn the Definition, Parts of prescription, handling of Prescription and Errors in prescription. Definition, factors affecting posology and pediatric dose calculations.	03
II	**Pharmaceutical calculations**	Students will be able to learn the weights and measures along with pharmaceutical calculations like method of allegation, proof spirit etc.	04
II	**Powders**	Students will be able to learn the introduction, principles, classifications of powders.	03
II	**Liquid dosage forms**	Students will be able to learn the introduction, principles, classifications of liquids. Various solubility enhancement techniques.	03
III	**Monophasic liquids**	Students will be able to learn the introductions, definitions and various preparations like syrups, mixture, elixirs, linctus, lotion, liniments, eye drops, nasal drops.	04
III	**Biphasic liquids**	Students will be able to learn about introduction, definition, merits, demerits and principle, method of preparations of suspensions and emulsions along with stability problems and their overcome methods.	04
IV	**Suppositories**	Students will be able to learn the concepts of suppositories preparations with their bases. value & its calculations, evaluation of suppositories.	04
IV	**Pharmaceutical incompatibilities**	Students will be able to learn the Definition, classification, physical, chemical and therapeutic incompatibilities with examples.	04
V	**Semisolid dosage forms**	Students will be able to learn the definitions, classifications, mechanisms, and factors influencing dermal penetration of drugs. Ointments, pastes, creams, and gels preparations. Excipients used in semi-solid dosage forms. Evaluation of semi solid dosages forms.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
3. M.E. Aulton, Pharmaceutics, The Science& Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Indian and British pharmacopoeia.
5. Lachmann- Theory and Practice of Industrial Pharmacy, Lea & Febiger Publisher, The University of Michigan.
6. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
7. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.
8. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.
9. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.
10. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.
11. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: 1st
Subject Title: PHARMACEUTICAL INORGANIC CHEMISTRY		**Subject Code:** BP 104 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**History of Pharmacopoeia**	Students will be able to learn the introduction, history and types of Pharmacopoeias.	02
I	**Impurities in pharmaceutical substances**	Students will be able to know the sources and types of impurities in pharmaceutical products. Limit test of chloride, sulphate, iron, lead, arsenic, heavy metals, modified limit tests.	08
II	**Acids, Bases, and Buffers**	Students will be able to learn the buffer equations and buffer capacity, buffered isotonic solutions, measurements of tonicity, calculations, and methods of adjusting isotonicity.	03
II	**Major extra and intracellular electrolytes**	Students will be able to learn the functions of major physiological ions, Electrolytes used in the replacement therapy.	04
II	**Dental products**	Students will be able to learn the dentifrices, role of fluoride in the treatment of dental caries, desensitizing agents, calcium carbonate etc.	03
III	**Gastrointestinal agents**	Students will be able to learn the types, background of acidifiers and antacids.	03
III	**Cathartics**	Students will be able to learn the introductions, definitions of magnesium sulphate, sodium orthophosphate, Kaolin and Bentonite.	04
III	**Antimicrobials**	Students will be able to learn about the mechanism, classification and preparations of potassium permanganate, Boric acid, Hydrogen peroxide, Chlorinated lime, Iodine.	04
IV	**General methods of preparation: - Miscellaneous compounds & Astringents**	Students will be able to learn the assay, properties, and general methods of miscellaneous compounds such as expectorants, emetics, haematinics, poison and antidote, astringents.	08
V	**Radiopharmaceuticals**	Students will be able to learn radioactivity, measurement of radioactivity, properties, the study of radioisotopes Storage conditions, precautions & pharmaceutical application of radioactive substances.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stallone Press of University of London, 4th edition.
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis.
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3rd Edition.
4. M.L Schroff, Inorganic Pharmaceutical Chemistry.
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry.
6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry.
7. Indian Pharmacopoeia.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: 1st
Subject Title: COMMUNICATION SKILLS		**Subject Code:** BP 105 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 30	**Credits:** 02	**Lectures & Tutorial**: 2/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Communication Skills**	Students will be able to learn the introduction, definition, importance, and process of communication.	03
I	**Barriers to communication and Perspectives in Communication**	Students will be able to learn about various barriers to communication. Introduction, Visual Perception, Language, Other factors affecting our perspective.	04
II	**Elements of Communication**	Students will be able to learn the introduction, face-to-face communication voice tone, body language, verbal communication, and physical communication.	03
II	**Communication Styles**	Students will be able to learn the introduction, and communication styles matrix with examples.	04
III	**Basic Listening Skills**	Students will be able to learn the introduction, self-awareness, active listening.	03
III	**Effective Written Communication**	Students will be able to learn the introduction, written communication, shades of meaning, formal communication.	02
III	**Writing Effectively**	Students will be able to learn the subject lines, know your audience, and message organization.	02
IV	**Interview Skills**	Students will be able to learn about purpose of an interview, Do's and Don'ts of an interview.	02
IV	**Giving Presentations**	Students will be able to learn the dealing with fears, presentation planning, presentation structuring, presentation delivering, and techniques of delivery.	03
V	**Group Discussion**	Students will be able to learn the introduction, communication skills in group discussion, Do's and Don'ts of group discussion.	04

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1stEdition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1stEdition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5thEdition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Greenhall, 1st Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konar nira, 2ndEdition, New arrivals –PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1stEdition, Oxford Press,2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt. ltd,2011
10. Soft skills and professional communication, Francis Peters SJ, 1stEdition, Mc Graw Hill Education, 2011
11. Effective communication, John Adair, 4thEdition, Pan Mac Millan, 2009
12. Bringing out the best in people, Aubrey Daniels, 2nd Edition, Mc Graw Hill, 1999

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: 1st
Subject Title: REMEDIAL BIOLOGY		**Subject Code:** BP 106 RBT
Subject Teacher:		**Session**:
Total Lectures Prescribed: 30	**Credits:** 02	**Lectures & Tutorial**: 2/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Living World**	Students will be able to learn the definition and characters of living organisms; diversity in the living world; binomial nomenclature.	03
I	**Morphology of Flowering plants**	Students will be able to know the Morphology of different parts of flowering plants – root, stem, inflorescence, flower, leaf, fruit, seed along with general anatomy.	04
II	**Body fluids and circulation**	Students will be able to learn the composition of blood, blood groups, coagulation of blood; composition and functions of lymph; structure of human heart and blood vessels and ECG.	03
II	**Digestion and Absorption**	Students will be able to learn the Human alimentary canal and digestive glands; Role of digestive enzymes.	02
II	**Breathing and respiration**	Students will be able to learn the human respiratory system; mechanism of breathing and its regulation; exchange of gases, transport of gases.	02
III	**Excretory products and their elimination**	Students will be able to learn the modes of excretion; human excretory system- structure and function; urine formation.	02
III	**Neural control and coordination**	Students will be able to learn the definition and classification of nervous system; Structure and functions of neuron; brain, cerebrum.	02
III	**Chemical coordination and regulation and Human reproduction**	Students will be able to learn about the endocrine glands and their secretions; functions of hormones secreted by endocrine glands. Parts of female and male reproductive system.	03
IV	**Plants and mineral nutrition and Photosynthesis**	Students will be able to learn the essential mineral, macro and micronutrients; nitrogen metabolism, cycle, biological nitrogen fixation, Autotrophic nutrition, photosynthesis, Photosynthetic pigments.	03
V	**Plant respiration and Plant growth and development**	Students will be able to learn the Respiration, glycolysis, fermentation (anaerobic). Phases and rate of plant growth, condition of growth.	02
V	**Cell - The unit of life and Tissues**	Students will be able to learn the Structure and functions of cell and cell organelles. Cell division. Definition, types, location and functions of tissues.	04

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Text book of Biology by S. B. Gokhale.
2. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.
3. A Text book of Biology by B.V. Sreenivasa Naidu.
4. A Text book of Biology by Naidu and Murthy.
5. Botany for Degree students By A.C.Dutta.
6. Outlines of Zoology by M. Ekambaranatha Ayyer and T. N. Ananthakrishnan.
7. A manual for pharmaceutical biology practical by S.B. Gokhale and C. K. Kokate.
8. Practical human anatomy and physiology. by S.R. Kale and R.R. Kale.
9. A Manual of pharmaceutical biology practical by S.B. Gokhale, C.K. Kokate and S.P. Shriwastava.
10. Biology practical manual according to National core curriculum. Biology forum of Karnataka. Prof. M.J.H. Shafi.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: 1st
Subject Title: REMEDIAL MATHEMATICS		**Subject Code:** BP 106 RMT
Subject Teacher:		**Session**:
Total Lectures Prescribed: 30	**Credits:** 02	**Lectures & Tutorial**: 2/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Partial fraction and Logarithms**	Students will be able to learn the introduction, polynomial, rational fractions, proper and improper fractions, partial fraction. Introduction, definition, theorems/properties of logarithms.	03
I	**Function and Limits and continuity**	Students will be able to know the real valued function, classification of real valued functions. Introduction, definition and limit of function.	03
II	**Matrices and Determinant**	Students will be able to learn the introduction matrices, types of matrices, operation on matrices, transpose of a matrix, matrix multiplication. Solution of system of linear of equations using matrix method, cramer's rule, characteristic equation and roots of a square matrix, cayley–hamilton theorem, application of matrices.	06
III	**Calculus, Differentiation**	Students will be able to learn the introductions, derivative of a function, derivative of a constant, derivative of a product of a constant and a function , derivative of the sum or difference of two functions.	03
III	**Without Proof**	Students will be able to learn the Successive differentiation, conditions for a function to be a maximum or a minimum at a point with Application.	03
IV	**Analytical Geometry Introduction**	Students will be able to learn the Signs of the coordinates, distance formula, straight line, slope of a line joining two points, slope – intercept form of a straight line.	03
IV	**Integration**	Students will be able to learn the introduction, definition, application, standard formulae, rules of integration, method of substitution, method of partial fractions, integration by parts.	03
V	**Differential Equations**	Students will be able to learn the order and degree, equations in separable form, homogeneous equations, linear differential equations, exact equations, and their applications in solving pharmacokinetic equations.	03
V	**Laplace Transform**	Students will be able to learn the introduction, definition, applications, and properties of Laplace transform, Laplace transforms of elementary functions, inverse Laplace transforms, and Laplace transform of derivatives.	03

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Differential Calculus by Shanthinarayan.
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.
3. Integral Calculus by Shanthinarayan.
4. Higher Engineering Mathematics by Dr. B.S. Grewal.

2ND SEMESTER

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: II nd
Subject Title: HUMAN ANATOMY AND PHYSIOLOGY-II		**Subject Code:** BP 201 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 49	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Nervous system**	Students will be able to learn the organization of nervous system, neurons, neuroglia, classification and properties of nerve fiber, electrophysiology, action potential, and nerve impulse.	05
I	**Central nervous system**	Students will be able to know the meninges, ventricles of the brain and cerebrospinal fluid, structure, and functions of the brain, and spinal cord.	05
II	**Digestive system**	Students will be able to learn the anatomy of GI Tract with special reference to the anatomy and functions of the stomach, small intestine, and large intestine, anatomy and functions of salivary glands, pancreas, and liver.	07
II	**Energetics**	Students will be able to learn the formation and role of ATP, creatinine phosphate, and BMR.	03
III	**Respiratory system**	Students will be able to learn the anatomy of the respiratory system with special reference to the anatomy of lungs, mechanism of respiration, regulation of respiration, lung volumes and capacities transport of respiratory gases, and artificial respiration.	05
III	**Urinary system**	Students will be able to learn the anatomy of the urinary tract with special reference to the anatomy of the kidney and nephrons, functions of the kidney and urinary tract, physiology of urine formation, along with kidney disorders.	05
IV	**Endocrine system**	Students will be able to learn the classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus, and their disorders.	10
V	**Reproductive system**	Students will be able to learn about the anatomy of male and female reproductive systems, functions of the male and female reproductive system, sex hormones, physiology of menstruation, fertilization, and spermatogenesis.	06
V	**Introduction to genetics**	Students will be able to learn the chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance.	03

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam.Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA.
4. Textbook of Medical Physiology- Arthur C, Guyton and John.E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A. 32.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
8. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co Riverview, MI USA.
9. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
10. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje, Academic Publishers.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: II[nd]
Subject Title: PHARMACEUTICAL ORGANIC CHEMISTRY –I		**Subject Code:** BP 202 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Classification, nomenclature, and isomerism**	Students will be able to learn the classification of organic compounds, and common and IUPAC systems of nomenclature of organic compounds. Structural isomerism's in organic compounds.	07
II	**Alkanes, Alkenes and Conjugated dienes**	Students will be able to learn the SP3 hybridization in alkanes, the halogenation of alkanes, and the uses of paraffin. Stabilities of alkenes, SP2 hybridization in alkenes	03
II	**E1 and E2 reactions**	Students will be able to learn the kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, saytzeffs orientation, and evidences. E1 versus E2 reactions, factors affecting E1 and E2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, markownikoff's orientation, anti markownikoff's orientation. Stability of conjugated dienes etc.	07
II	**Alkyl halides**	Students will be able to learn the SN1 and SN2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations. SN1 versus SN2 reactions, factors affecting SN1 and SN2 reactions. Structure and uses of ethyl chloride, Chloroform, trichloroethylene, tetrachloroethylene, and dichloromethane.	05
III	**Alcohols**	Students will be able to learn the qualitative tests, structure, and uses of ethyl alcohol, methyl alcohol, chlorobutanol, cetosteryl alcohol, benzyl alcohol, glycerol, and propylene glycol.	05
IV	**Carbonyl compounds (Aldehydes and ketones)**	Students will be able to learn the nucleophilic addition, electrometric effect, aldol condensation, crossed aldol condensation, cannizaro reaction, crossed Cannizaro reaction, benzoin condensation, perkin condensation, qualitative tests, structure and uses of formaldehyde, paraldehyde, acetone, chloral hydrate, hexamine, benzaldehyde, vanilin, cinnamaldehyde.	10
V	**Carboxylic acids**	Students will be able to learn about the acidity of carboxylic acids, the 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.	05
V	**Aliphatic amines**	Students will be able to learn the basicity, the effect of substituent on basicity. Qualitative test, structure, and uses of ethanolamine, ethylenediamine, and amphetamine.	03

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L. Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K. Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.
9. Reaction and reaction mechanism by Ahluwaliah/ Chatwal.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: II[nd]
Subject Title: BIOCHEMISTRY		**Subject Code:** BP 203 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Biomolecules and Bioenergetics**	Students will be able to learn the introduction, classification, chemical nature, and biological role of carbohydrates, lipids, nucleic acids, amino acids, and proteins. Concept of free energy, endergonic and exergonic reaction, the relationship between free energy, enthalpy, and entropy; Redox potential, etc.	08
II	**Carbohydrate metabolism**	Students will be able to learn the Glycolysis – Pathway, energetics and significance Citric acid cycle- Pathway, energetics and significance HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency; Glycogen metabolism Pathways and glycogen storage diseases (GSD); Gluconeogenesis- Pathway and its significance.	06
II	**Biological oxidation**	Students will be able to learn the Electron transport chain (ETC) and its mechanism. Oxidative phosphorylation & its mechanism and substrate phosphorylation. Inhibitors ETC and oxidative phosphorylation/Uncouplers level etc.	04
III	**Lipid metabolism**	Students will be able to learn the β-Oxidation of saturated fatty acid (Palmitic acid) Formation and utilization of ketone bodies; ketoacidosis *De novo* synthesis of fatty acids (Palmitic acid) Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone, and vitamin D Disorders of lipid metabolism.	05
III	**Amino acid metabolism**	Students will be able to learn the General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, alkaptonuria, tyrosinemia) Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline.	05
IV	**Nucleic acid metabolism and genetic information transfer**	Students will be able to learn the Biosynthesis of purine and pyrimidine nucleotides Catabolism of purine nucleotides and Hyperuricemia and Gout disease Organization of mammalian genome Structure of DNA and RNA and their functions DNA replication (semi-conservative model) Transcription or RNA synthesis.	10
V	**Enzymes**	Students will be able to learn about the Introduction, properties, nomenclature and IUB classification of enzymes, Enzyme kinetics (Michaelis plot, Line Weaver Burke plot) Enzyme inhibitors with examples, Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation, Therapeutic and diagnostic applications of enzymes and isoenzymes, Coenzymes –Structure and biochemical function.	05

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Principles of Biochemistry by Lehninger.
2. Harper‘s Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
3. Biochemistry by Stryer.

4. Biochemistry by D. Satyanarayan and U.Chakrapani.
5. Textbook of Biochemistry by Rama Rao.
6. Textbook of Biochemistry by Deb.
7. Outlines of Biochemistry by Conn and Stumpf
8. Practical Biochemistry by R.C. Gupta and S. Bhargavan.
9. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
10. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
11. Practical Biochemistry by Harold Varley.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: II[nd]
Subject Title: PATHOPHYSIOLOGY (THEORY)		**Subject Code:** BP 204 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Basic principles of Cell injury and Adaptation**	Students will be able to learn the introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury**,** Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage)**,** Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia)**,** Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage, and Cell Death etc.	05
I	**The basic mechanism involved in the process of inflammation and repair**	Students will be able to learn the introduction, Clinical signs of inflammation, different types of inflammation, mechanism, of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC‘s, mediators of inflammation, basic principles of wound healing in the skin, the pathophysiology of atherosclerosis.	05
II	**Cardiovascular System, Respiratory system and Renal system**	Students will be able to learn the Hypertension, congestive heart failure, ischemic heart disease, asthma, chronic obstructive airway diseases, and acute and chronic renal failure.	10
III	**Hematological Diseases, Endocrine system,**	Students will be able to learn the iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, and hemophilia. Diabetes, thyroid diseases, disorders of sex hormones.	05
III	**Nervous system, Gastrointestinal system**	Students will be able to learn the Epilepsy, Parkinson’s disease, stroke, and psychiatric disorders: depression, schizophrenia and Alzheimer’s disease. Peptic Ulcer	05
IV	**Inflammatory bowel diseases, The disease of bones and joints. Principles of cancer, Diseases of bones and joints.**	Students will be able to learn the Jaundice, hepatitis (A, B, C, D, E, F) alcoholic liver disease, Rheumatoid arthritis, osteoporosis and gout, classification, etiology, and pathogenesis of cancer, Rheumatoid Arthritis, Osteoporosis, Gout.	08
V	**Infectious diseases, Sexually transmitted diseases**	Students will be able to learn about meningitis, typhoid, leprosy, tuberculosis, urinary tract infections, AIDS, Syphilis, Gonorrhoea.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins & Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2. Harsh Mohan; Text book of Pathology; 6th edition; India; Jaypee Publications; 2010.
3. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman‘s The Pharmacological Basis of therapeutics; 12th edition; New York; McGraw-Hill; 2011. Biochemistry by D. Satyanarayan and U.Chakrapani.
4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B(John Burnard); Best and Taylor‘s Physiological basis of medical practice; 12th ed; united states;
5. William and Wilkins, Baltimore;1991 [1990 printing].

6. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston; Davidson‘s Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.
7. Guyton A, John .E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company; 2010.
8. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014.
9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia;WB Saunders Company; 1997.
10. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London;Churchill Livingstone publication; 2003.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: II[nd]
Subject Title: COMPUTER APPLICATIONS IN PHARMACY (Theory)		**Subject Code:** BP 205 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 30	**Credits:** 03	**Lectures & Tutorial**: 3/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Number system**	Students will be able to learn the 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.	03
I	**Concept of Information Systems and Software**	Students will be able to learn the information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project.	03
II	**Web technologies**	Students will be able to learn the Introduction to HTML, XML, CSS, and programming languages, introduction to web servers and Server Products, Introduction to databases, MYSQL, MS ACCESS, and Pharmacy Drug database.	06
III	**Application of computers in Pharmacy**	Students will be able to learn Drug information storage and retrieval, Pharmacokinetics, Mathematical modelsl 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.	06
IV	**Bioinformatics**	Students will be able to learn the Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, and Impact of Bioinformatics in Vaccine Discovery.	06
V	**Computers as data analysis in Preclinical development**	Students will be able to learn about Chromatographic data analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS).	06

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins –Wiley-Interscience, A John Willey and Sons, INC., Publication, USA.
3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers andDistributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002 (INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server,DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7,Ansari Road, Daryagani, New Delhi - 110002

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: II[nd]
Subject Title: ENVIRONMENTAL SCIENCES (Theory)		**Subject Code:** BP 206 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 30	**Credits:** 03	**Lectures & Tutorial**: 3/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**The multidisciplinary nature of environmental studies**	Students will be able to learn the Natural Resources Renewable and non-renewable resources: Natural resources and associated problems a) 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.	10
II	**Ecosystems**	Students will be able to learn the Concept of an ecosystem, the 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).	10
III	**Environmental Pollution**	Students will be able to learn the Air pollution; Water pollution; Soil pollution.	10

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore.
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480 p
5. Clark R.S., Marine Pollution, Clanderson Press Oxford.
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196 p.
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down of Earth, Centre for Science and Environment.

3RD SEMESTER

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: III[rd]
Subject Title: PHARMACEUTICAL ORGANIC CHEMISTRY –II (Theory)		**Subject Code:** BP 301 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Benzene and its derivatives**	Students will be able to learn the analytical, synthetic, and other evidence in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, and Huckel's rule. Reactions of benzene - nitration, sulphonation, halogenations reactivity, Friedel crafts alkylation- reactivity, limitations, Friedel crafts acylation. Substituents, the effect of substituents on reactivity and orientation of mono-substituted benzene compounds towards electrophilic substitution reaction. Structure and uses of DDT, Saccharin, BHC, and Chloramine.	10
II	**Phenols Aromatic Amines Aromatic Acids**	Students will be able to learn acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols, Basicity of amines, effect of substituents on basicity,and synthetic uses of aryl diazonium salts, Acidity, effect of substituents on acidity andimportant reactions of benzoic acid.	10
III	**Fats and Oils**	Students will be able to learn the Fatty acids – reactions, Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.	10
IV	**Polynuclear hydrocarbons.**	Students will be able to learn the synthesis, reactions, structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives	08
V	**Cyclo alkanes**	Students will be able to learn about stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of stainless rings), reactions of cyclopropane and cyclobutene only.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Organic Chemistry byMorrison and Boyd.
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry byMann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: III[rd]
Subject Title: PHYSICAL PHARMACEUTICS-I (Theory)		**Subject Code:** BP 302 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Solubility of drugs**	Students will be able to learn the solubility expressions, mechanisms of solute-solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, and diffusion principles in biological systems. Solubility of gas in liquids, the solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature, and applications. Distribution law, its limitations, and applications.	10
II	**States of Matter and properties of matter**	Students will be able to learn the state of matter, changes in the state of matter, latent heats, vapor pressure, sublimation critical point, eutectic mixtures, gases, aerosols– inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid crystalline, amorphous & polymorphism.	07
II	**Physicochemical properties of drug molecules**	Students will be able to learn the refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations, and applications.	03
III	**Surface and interfacial phenomenon**	Students will be able to learn the liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilization, detergency, adsorption at solid interface.	08
IV	**Complexation and protein binding**	Students will be able to learn the Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.	08
V	**pH, buffers, and Isotonic solutions**	Students will be able to learn about the Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, and buffered isotonic solutions.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Physical Pharmacy by Alfred Martin
2. Experimental Pharmaceutics by Eugene, Parott.
3. Tutorial Pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical Calculations, Lea &Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical Dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C and Manavalan R.
8. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J.Thimma settee
9. Physical Pharmaceutics by C.V.S. Subramanyam
10. Test book of Physical Pharmacy, by Gaurav Jain & Roop K. Khar.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: III[rd]
Subject Title: PHARMACEUTICAL MICROBIOLOGY (Theory)		**Subject Code:** BP 303 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Introduction and history of Microbiology**	Students will be able to learn the introduction, history of microbiology, its branches, scope and its importance. Introduction to Prokaryotes and Eukaryotes, Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count). Study of different types of phase contrast microscopy, dark field microscopy, and electron microscopy	10
II	**Identification of Bacteria**	Students will be able to learn the identification of bacteria using staining techniques (simple, Gram's & Acid-fast staining) and biochemical tests (IMVIC). Study of principle, procedure, merits, demerits, and applications of physical, chemical gaseous, radiation, and mechanical methods of sterilization. Evaluation of the efficiency of sterilization methods. Equipment employed in large-scale sterilization. Sterility indicators.	10
III	**Introduction of Fungi and Virus, Sterility testing**	Students will be able to learn the Study of morphology, classification, reproduction/replication, and cultivation of Fungi and Viruses. Classification and mode of action of disinfectants Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions Evaluation of bactericidal & Bacteriostatic. Sterility testing of products (solids, liquids, ophthalmic, and other sterile products) according to IP, BP, and USP.	10
IV	**Designing of aseptic area, Standardization method of antibiotics.**	Students will be able to learn the designing of an aseptic area, and laminar flow equipment; study different sources of contamination in an aseptic area, and methods of prevention, and clean area classification. Principles and methods of the different microbiological assays. Methods for standardization of antibiotics, vitamins, and amino acids. Assessment of a new antibiotic.	08
V	**Spoilage types, Cell culture**	Students will be able to learn about the Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, and assessment of microbial contamination and spoilage. Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations. Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. Application of cell cultures in pharmaceutical industry and research.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors,Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.

4. Malcolm Harris, Balliere Tindall, and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Peppler: Microbial Technology.
9. Ananthnarayan: Text Book of Microbiology, Orient-Longman, Chennai
10. Edward: Fundamentals of Microbiology.
11. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
12. Bergeys manual of systematic bacteriology, Williams, and Wilkins- A Waverly company

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy		**Scheme**: PCI	**Semester**: III[rd]
Subject Title: PHARMACEUTICAL ENGINEERING (Theory)			**Subject Code:** BP 304 T
Subject Teacher:			**Session**:
Total Lectures Prescribed: 43		**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Flow of fluids, Size Reduction,**	Students will be able to learn the types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube, and Rotometer. 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.	07
I	**Size Separation**	Students will be able to learn the 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.	03
II	**Heat Transfer, Evaporation, Distillation**	Students will be able to learn the Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation.	10
III	**Drying, Mixing,**	Students will be able to learn the objectives, applications & mechanism of the 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, and freeze dryer. 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	08
IV	**Filtration, Centrifugation**	Students will be able to learn the objectives, applications, Theories & Factors influencing filtration, filter aids, and filter medias. 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. Objectives, principles & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi-continuous centrifuge & super centrifuge.	08
V	**Materials of pharmaceutical plant construction, Corrosion and its prevention**	Students will be able to learn about the factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion, and their prevention. Ferrous and nonferrous metals, inorganic and organic nonmetals, and basic of material handling systems.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latestedition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson-Latest edition.
3. Unit operation of chemical engineering – Mcabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latestedition.
5. Remington practice of pharmacy- Martin, Latest edition.
6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.

4th SEMESTER

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: IVth
Subject Title: PHARMACEUTICAL ORGANIC CHEMISTRY –III (Theory)		**Subject Code:** BP 401T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Stereo isomerism**	Students will be able to learn optical isomerism –Optical activity, enantiomerism, diastereo-isomerism, and meso compounds. Elements of symmetry, chiral and achiral molecules, DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers, Reactions of chiral molecules, Racemic modification and resolution of racemic mixture. Asymmetric synthesis.	10
II	**Geometrical isomerism**	Students will be able to learn the Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems), Methods of determination of the configuration of geometrical isomers. Conformational isomerism in Ethane, n-Butane, and Cyclohexane. Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity. Stereospecific and stereoselective reactions.	10
III	**Heterocyclic compounds**	Students will be able to learn the nomenclature and classification, Synthesis, reactions, and medicinal uses of following compounds/derivatives, Pyrrole, Furan, and Thiophene, Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene.	10
IV	**Synthesis, reactions, and medicinal uses**	Students will be able to learn the synthesis, reactions and medicinal uses of following compounds/derivatives Pyrazole, Imidazole, Oxazole and Thiazole. Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine. Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives.	08
V	**Reactions of synthetic importance**	Students will be able to learn about metal hydride reduction ($NaBH_4$ and $LiAlH_4$), Clemmensen reduction, Birch reduction, and Wolff Kishner reduction. Oppenauer-oxidation and Dakin reaction. Beckmanns rearrangement and Schmidt rearrangement. Claisen-Schmidt condensation.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Organic chemistry by I.L. Finar, Volume-I & II.
2. A text book of organic chemistry – Arun Bahl, B.S. Bahl.
3. Heterocyclic Chemistry by Raj K. Bansal.
4. Organic Chemistry byMorrison and Boyd.
5. Heterocyclic Chemistry by T.L. Gilchrist.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: IVth
Subject Title: MEDICINAL CHEMISTRY – I (Theory)		**Subject Code:** BP 402T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Introduction, history, development, and physiochemical properties of Medicinal Chemistry.**	Students will be able to learn Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, and Optical and Geometrical isomerism.	06
I	**Drug metabolism**	Students will be able to learn the drug metabolism principles- Phase I and Phase II. Factors affecting drug metabolism include stereochemical aspects.	04
II	**Drugs acting on ANS: Adrenergic Neurotransmitters, Sympathomimetic agents: SAR of Sympathomimetic agents**	Students will be able to learn the biosynthesis and catabolism of catecholamine. Adrenergic receptors (Alpha & Beta) and their distribution. Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine, Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline, and Xylometazoline. Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine. Agents with mixed mechanism: Ephedrine, Metaraminol.	06
II	**Adrenergic antagonists: Alpha adrenergic blockers, Beta adrenergic blockers**	Students will be able to learn the Tolazoline, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide. SAR of beta blockers, Propranolol, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetalol, Carvedilol.	04
III	**Cholinergic neurotransmitters, Parasympathomimetic agents, Direct acting agents, Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible)**	Students will be able to learn the Biosynthesis and catabolism of acetylcholine. Cholinergic receptors (Muscarinic & Nicotinic) and their distribution. SAR of Parasympathomimetic agents. Acetylcholine, Carbachol, Bethanechol, Methacholine, Pilocarpine. Physostigmine, Neostigmine, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophateiodide, Parathione, Malathion.	05
III	**Cholinesterase reactivator, Cholinergic Blocking agents, Solanaceous alkaloids and analogues, Synthetic cholinergic blocking agents**	Students will be able to learn the Pralidoxime chloride, SAR of cholinolytic agents, Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide, Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride	05
IV	**Drugs acting on CNS: Sedatives and Hypnotics, Benzodiazepines, Barbiturates,**	Students will be able to learn the SAR of Benzodiazepines, Chlordiazepoxide, Diazepam, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem, SAR of barbiturates, Barbital, Phenobarbital, Mephobarbital, Amobarbital, Students Students will be able to learn the Butabarbital, Pentobarbital,	03

	Miscellaneous	Secobarbital, Amides & imides: Glutethmide. Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol, Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.	
IV	**Antipsychotics, Phenothiazines, Ring Analogues of Phenothiazeines, Fluro buterophenones, Beta amino ketones, Benzamides**	Students will be able to learn the SAR of Phenothiazeines - Promazine hydrochloride, Chlorpromazine hydrochloride, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride. Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine. Haloperidol, Droperidol, Risperidone. Molindone hydrochloride, Sulpieride.	03
IV	**Anticonvulsants, Barbiturates, Hydantoins, Oxazolidine diones, Succinimides, Urea and monoacyl ureas, Benzodiazepines, Miscellaneous**	Students will be able to learn the SAR of Anticonvulsants**,** mechanism of anticonvulsant action. Phenobarbitone, Methabarbital, Phenytoin, Mephenytoin, Ethotoin, Trimethadione, Paramethadione, Phensuximide, Methsuximide, Ethosuximide, Phenacemide, Carbamazepine, Clonazepam, Primidone, Valproic acid, Gabapentin, Felbamate	02
V	**Drugs acting on CNS: General anesthetics, Ultra-short-acting barbitutrates, Narcotic and non-narcotic analgesics-anti-agonist, Anti-inflammatory agents.**	Students will be able to learn about Halothane, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane, Methohexital sodium, Thiamylal sodium, Thiopental sodium, Ketamine hydrochloride, SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate, Methadone hydrochloride, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartrate. Nalorphine hydrochloride, Levallorphan tartrate, Naloxone hydrochloride. Sodium salicylate, Aspirin, Mefenamic acid, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Wilson and Giswold‘s Organic medicinal and Pharmaceutical Chemistry.
2. Foye‘s Principles of Medicinal Chemistry.
3. Burger‘s Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington‘s Pharmaceutical Sciences.
6. Martindale‘s extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: IVth
Subject Title: PHYSICAL PHARMACEUTICS-II (Theory)		**Subject Code:** BP 403T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 47	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Colloidal dispersions**	Students will be able to learn optical isomerism –Optical activity, enantiomerism, diastereo-isomerism, and meso compounds. Elements of symmetry, chiral and achiral molecules, DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers, Reactions of chiral molecules, Racemic modification and resolution of racemic mixture. Asymmetric synthesis.	07
II	**Rheology and Deformation of solids**	Students will be able to learn the Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy informulation, determination of viscosity, capillary, falling Sphere, rotational viscometers. Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus	10
III	**Coarse dispersion**	Students will be able to learn the Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.	10
IV	**Micromeretics**	Students will be able to learn the Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.	10
V	**Drug stability**	Students will be able to learn about Reaction kinetics: zero, pseudo-zero, first & second order, units of basicrate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention.	10

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1,2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C, and Manavalan R. Organic chemistry by I.L. Finar, Volume-I & II.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: IVth
Subject Title: PHARMACOLOGY-I (Theory)		**Subject Code:** BP 404 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**General Pharmacology Introduction to Pharmacology, Pharmacokinetics**	Students will be able to learn Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists (competitive and non-competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy. Membrane transport, absorption, distribution, metabolism and excretion of drugs. Enzyme induction, enzyme inhibition, kinetics of elimination.	07
II	**General Pharmacology Pharmacodynamics**	Students will be able to learn the Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme-linked receptors, transmembrane JAK-STAT binding receptor, and receptors that regulate transcription factors, dose-response relationship, therapeutic index, combined effects of drugs and factors modifying drug action. Adverse drug reactions, Drug interactions (pharmacokinetic and pharmacodynamic), Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.	10
III	**Pharmacology of drugs acting on peripheral nervous system**	Students will be able to learn the organization and function of ANS. Neurohumoral transmission, co-transmission, and classification of neurotransmitters. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).Local anesthetic agents.Drugs used in myasthenia gravis and glaucoma.	10
IV	**Pharmacology of drugs acting on central nervous system**	Students will be able to learn the neurohumoral transmission in the C.N.S. special emphasis on importance of various neurotransmitters like GABA, Glutamate, Glycine, serotonin, and dopamine. General anesthetics and pre-anesthetics**.** Sedatives, hypnotics and centrally acting muscle relaxants. Anti-epileptics, Alcohols, and disulfiram.	08
V	**Pharmacology of drugs acting on central nervous system**	Students will be able to learn about psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens. Drugs used in Parkinson's disease and Alzheimer's disease.CNS stimulants and nootropics. Opoid analgesics and antagonists, Drug addiction, drug abuse, tolerance and dependence.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier.
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata McGraw-Hill.
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics.
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A.K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams &Wilkins.

5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott‘s Illustrated Reviews-Pharmacology.
6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers MedicalPublishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher.
8. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert.
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: IVth
Subject Title: PHARMACOGNOSY AND PHYTOCHEMISTRY-I (Theory)		**Subject Code:** BP 404T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Introduction to Pharmacognosy, Classification of drugs, Quality control of Drugs of Natural Origin**	Students will be able to learn the definition, history, scope and development of Pharmacognosy. Sources of Drugs – Plants, Animals, Marine & Tissue culture. Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins). Classification of drugs: Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and serotaxonomical classification of drugs Quality control of Drugs of Natural Origin Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties. Quantitative microscopy of crude drugs including lycopodium spore method, leaf constants, camera lucida and diagrams of microscopic objects to scale with camera lucida.	08
II	**Cultivation, Collection, Processing and storage of drugs of natural origin**	Students will be able to learn the cultivation and collection of drugs of natural origin, f actors influencing cultivation of medicinal plants.Plant hormones and their applications. Polyploidy, mutation and hybridization with reference to medicinal plants, conservation of medicinal plants.	10
III	**Plant tissue culture**	Students will be able to learn the historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy. Edible vaccines.	07
IV	**Pharmacognosy in various systems of medicine and Introduction to secondary metabolites**	Students will be able to learn the role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine. Introduction to secondary metabolites: Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins.	10
V	**Plant Products, Primary metabolites, Carbohydrates, Protein, Enzymes, Lipids and Marine Drugs**	Students will be able to learn about study of biological source, chemical nature and uses of drugs of natural origin containing following drugs Plant Products: Fibers - Cotton, Jute, Hemp Hallucinogens, Teratogens, Natural allergens Primary metabolites: General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites: Carbohydrates: Acacia, Agar, Tragacanth, Honey Proteins and Enzymes : Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin). Lipids (Waxes, fats, fixed oils) : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax Marine Drugs: Novel medicinal agents from marine sources.	08

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis.

4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers &Distribution, New Delhi.
5. Textbook of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
6. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007.
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae.
9. Anatomy of Crude Drugs by M.A. Iyengar.

5th SEMESTER

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: Vth
Subject Title: MEDICINAL CHEMISTRY – II (Theory)		**Subject Code:** BP 501 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Antihistaminic agents H-1, H-2 antagonists, PPI, Alkylating agent etc.**	Students will be able to learn the Histamine, receptors and their distribution in the human body, Diphenhydramine hydrochloride, Dimenhydrinate, Doxylamines scuccinate, Clemastine fumarate, Diphenyl phyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine etc. Cimetidine, Famotidine, Ranitidine, Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole.	05
I	**Anti-neoplastic agents: Alkylating agents, Antimetabolites, Antibiotics, Plant products**	Students will be able to learn the Mechlorethamine, Cyclophosphamide, Melphalan, Chlorambucil, Busulfan, Thiotepa, Mercaptopurine, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate, Azathioprine, Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin, Etoposide, Vinblastine sulfate,Vincristine sulphate, Cisplatin, Mitotane.	05
II	**Anti-anginal: Vasodilators, Calcium channel blockers, Diuretics, Anti-hypertensive Agents**	Students will be able to learn the Amyl nitrite, Nitroglycerin, Pentaerythritol tetranitrate, Iso-sorbidedinitrite, Dipyridamole, Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine. Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide. Thiazides: Chlorthiazide, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide. Loop diuretics: Furosemide, Bumetanide, Ethacrynic acid. Potassium-sparing Diuretics: Spironolactone, Triamterene, Amiloride. Osmotic Diuretics: Mannitol. Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride, Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.	10
III	**Anti-arrhythmic Drugs: Anti-hyperlipidemic agents, Coagulant & Anticoagulants**	Students will be able to learn the Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol, Clofibrate, Lovastatin, Cholestyramine and Cholestipol, Menadione, Acetomenadione, Warfarin, Anisindione, clopidogrel, Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.	10
IV	**Drugs acting on Endocrine system, Sex hormones, Drugs for erectile dysfunction, Oral contraceptives, Corticosteroids, Thyroid and antithyroid drugs**	Students will be able to learn the Nomenclature, Stereochemistry and metabolism of steroids, Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol, Sildenafil, Tadalafil, Mifepristone, Norgestril, Levonorgestrol, Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone, L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.	08
V	**Antidiabetic agents, Local Anesthetics,**	Students will be able to learn about Insulin and its preparations, Sulfonyl ureas: Tolbutamide, Chlorpropamide, Glipizide, Glimepiride., Biguanides: Metformin., Thiazolidinediones:	08

	Benzoic Acid Derivatives, Amino Benzoic acid derivatives, Lidocaine/Anilide derivatives, Miscellaneous	Pioglitazone, Rosiglitazone., Meglitinides: Repaglinide, Nateglinide. Glucosidase inhibitors: Acrabose, Voglibose. SAR of Local anesthetics, Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine. Benzocaine, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate, Lignocaine, Mepivacaine, Prilocaine, Etidocaine. Phenacaine, Diperodon, Dibucaine.	

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References: -

1. Wilson and Giswold's Organic Medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1 to 5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: Vth
Subject Title: INDUSTRIAL PHARMACY-I (Theory)		**Subject Code:** BP 502 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Preformulation Studies: Physical properties, Chemical Properties**	Students will be able to learn the Introduction to preformulation, goals and objectives, the study of physicochemical characteristics of drug substances, Physical form (crystal & amorphous), particle size, shape, flow-properties, solubility profile (pKa, pH, partition coefficient), polymorphism, Hydrolysis, oxidation, reduction, racemisation, polymerization, BCS classification of drugs & itsand parenteral significant, Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.	07
II	**Tablets, Tablet coating, Liquid orals**	Students will be able to learn the Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling. Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating. Quality control tests: In process and finished product tests. Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia.	10
III	**Capsules Hard gelatin capsules, Soft gelatin capsules, Pellets**	Students will be able to learn the Introduction, Production of hard gelatin capsule shells. Size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules. Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications. Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets.	08
IV	**Parenteral Products, Ophthalmic Preparations**	Students will be able to learn the definition, types, advantages and limitations. Preformulation factors and essential equirements, vehicles, additives, importance of isotonicity, Production procedure, production facilities and controls,aseptic processing. Formulation of injections, sterile powders, large volume parenterals and lyophilized products. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products. Introduction, formulation considerations; formulation of eyedrops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations.	10
V	**Cosmetics Miscellaneous, Pharmaceutical Aerosols, Packaging Materials Science**	Students will be able to learn about Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens. Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies. Materials used for packaging of pharmaceutical	10

		products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.	

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman & J.B.Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman &Lachman
3. Pharmaceutical dosage form disperse system Vol-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchilllivingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C. Ansel, Lea & Febiger, Philadelphia, 5th edition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: Vth
Subject Title: PHARMACOLOGY-II (Theory)		**Subject Code:** BP 503 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Pharmacology of drugs acting on cardiovascular system**	Students will be able to learn the Introduction to hemodynamic and electrophysiology of heart. Drugs used in congestive heart failure, anti-hypertensive drugs, anti-anginal drugs, anti-arrhythmic drugs, anti-hyperlipidemic drugs.	10
II	**Pharmacology of drugs acting on cardiovascular system and urinary system**	Students will be able to learn the Drug used in the therapy of shock. hematinics, coagulants and anticoagulants, fibrinolytics and anti-platelet drugs, plasma volume expanders. Diuretics and anti-diuretics.	10
III	**Autocoids and related drugs**	Students will be able to learn the introduction to autacoids and classification, histamine, 5-HT and their antagonists, prostaglandins, thromboxanes and leukotrienes, angiotensin, bradykinin and Substance P, non-steroidal anti-inflammatory agents, anti-gout drugs, antirheumatic drugs.	10
IV	**Pharmacology of drugs acting on endocrine system**	Students will be able to learn the basic concepts in endocrine pharmacology, anterior pituitary hormones- analogues and their inhibitors, thyroid hormones- analogues and their inhibitors, hormones regulating plasma calcium level- parathormone, calcitonin and Vitamin-D, insulin, oral hypoglycemic agents and glucagon, ACTH and corticosteroids.	08
V	**Pharmacology of drugs acting on the endocrine system, Bioassay**	Students will be able to learn the androgens and anabolic steroids, estrogens, progesterone and oral contraceptives, drugs acting on the uterus. Principles and applications of bioassay, types of bioassay, bioassay of insulin, oxytocin, vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5-HT.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier.
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata McGraw-Hill.
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics.
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A.K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins.
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology.
6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher.
8. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert.
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company,Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: Vth
Subject Title: PHARMACOGNOSY AND PHYTOCHEMISTRY II (Theory)		**Subject Code:** BP 504 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Metabolic pathways in higher plants and their determination**	Students will be able to learn the brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway. Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.	07
II	**General introduction, Alkaloids, Phenylpropanoids and Flavonoids, Steroids, Cardiac Glycosides & Triterpenoids, Volatile oils, Tannins etc.**	Students will be able to learn the general introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of secondary metabolites: Alkaloids: Vinca, Rauwolfia, Belladonna, Opium, Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta Steroids, Cardiac Glycosids & Triterpenoids: Liquorice, Dioscorea, Digitalis. Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander, Tannins: Catechu, Pterocarpus Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony Glycosides: Senna, Aloes, Bitter Almond Iridoids, Other terpenoids & Naphtha quinones: Gentian, Artemisia, taxus, carotenoids.	14
III	**Isolation, Identification and Analysis of Phytoconstituents**	Students will be able to learn the isolation, identification and analysis of phytoconstituents terpenoids: Menthol, Citral, Artemisin Glycosides: Glycyrhetinic acid & Rutin, Alkaloids: Atropine, Quinine, Reserpine, Caffeine Resins: Podophyllotoxin, Curcumin.	06
IV	**Industrial production, estimation and utilization**	Students will be able to learn the industrial production, estimation and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine.	10
V	**Basics of Phytochemistry**	Students will be able to learn the modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.	08

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers &Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition,Nirali Prakashan, New Delhi.
4. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
5. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, NewDelhi, 2007.
6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, M arilyn KS, VE Tylor.
10. The formulation and preparation of cosmetic, fragrances and flavours.
11. Remington‘s Pharmaceutical sciences.
12. Text Book of Biotechnology by Vyas and Dixit.
13. Text Book of Biotechnology by R.C. Dubey.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: Vth	
Subject Title: PHARMACEUTICAL JURISPRUDENCE (Theory)		**Subject Code:** BP 505 T	
Subject Teacher:		**Session**:	
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week	

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Drugs and Cosmetics Act, 1940 and its rules 1945**	Students will be able to learn the objectives, definitions, legal definitions of schedules to the act and rules, import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties**.** Manufacture of drugs – Prohibition of manufacture and sale of certain drugs, Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.	10
II	**Drugs and Cosmetics Act, 1940 and its rules 1945.**	Students will be able to learn the detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA)Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties, Labeling & Packing of drugs- General labelling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties. Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors.	10
III	**Pharmacy Act –1948, Medicinal and Toilet Preparation Act – 1955, Narcotic Drugs and Psychotropic substances Act-1985 and Rules**	Students will be able to learn the Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and Penalties. Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties. Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties.	10
IV	**Study of Salient Features of Drugs and Magic Remedies Act and its rules, Prevention of Cruelty to animals Act-1960, National Pharmaceutical Pricing Authority**	Students will be able to learn the study of salient features of drugs and Magic Remedies Act and its rules: Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties Prevention of Cruelty to animals Act-1960: Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties National Pharmaceutical Pricing Authority: Drugs Price Control Order (DPCO)-2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)	08

V	**Pharmaceutical Legislations, Code of Pharmaceutical ethics, Medical Termination of Pregnancy Act, RTI, and IPR**	Students will be able to learn the Pharmaceutical Legislations – A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee Code of Pharmaceutical ethics Definition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist‘s oath Medical Termination of Pregnancy Act Right to Information Act Introduction to Intellectual Property Rights (IPR).	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Forensic Pharmacy by B. Suresh.
2. Text book of Forensic Pharmacy by B.M. Mithal.
3. Hand book of drug law-byM.L. Mehra.
4. A text book of Forensic Pharmacy by N.K. Jain.
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
7. Narcotic drugs and psychotropic substances act by Govt. of India publications.
8. Drugs and Magic Remedies act by Govt. of India publication.
9. Bare Acts of the said laws published by Government. Reference books (Theory).

6th SEMESTER

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIth
Subject Title: MEDICINAL CHEMISTRY – III (Theory)		**Subject Code:** BP 601 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Antibiotics, β-Lactam antibiotics, Aminoglycosides, Tetracyclines**	Students will be able to learn the Antibiotics Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes. β-Lactam antibiotics: Penicillin, Cepholosporins, β- Lactamase inhibitors, Monobactams Aminoglycosides: Streptomycin, Neomycin, Kanamycin Tetracyclines: Tetracycline, Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline.	10
II	**Antibiotics, Macrolide, Miscellaneous, Prodrugs, Antimalarials, Quinolines, Biguanides and dihydro triazines, Miscellaneous**	Students will be able to learn the Antibiotics Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes. Macrolide: Erythromycin Clarithromycin, Azithromycin. Miscellaneous: Chloramphenicol, Clindamycin. Prodrugs: Basic concepts and application of prodrugs design. Antimalarials: Etiology of malaria. Quinolines: SAR, Quinine sulphate, Chloroquine, Amodiaquine, Primaquine phosphate, Pamaquine, Quinacrine hydrochloride, Mefloquine. Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil. Miscellaneous: Pyrimethamine, Artesunete, Artemether, Atovoquone.	10
III	**Anti-tubercular Agents Synthetic anti tubercular agents, Anti tubercular antibiotics, Urinary tract anti-infective agents Quinolones, Miscellaneous, Antiviral agents**	Students will be able to learn the Anti-tubercular Agents Synthetic anti tubercular agents: Isoniozid, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid. Anti tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine, Streptomycine, Capreomycin sulphate. Urinary tract anti-infective agents Quinolones: SAR of quinolones, Nalidixic Acid, Norfloxacin, Enoxacin, Ciprofloxacin, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin Miscellaneous: Furazolidine, Nitrofurantoin, Methanamine. Antiviral agents: Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine, trifluoride, Acyclovir, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.	10
IV	**Antifungal agents: Antifungal antibiotics, Synthetic Antifungal agents, Anti-protozoal Agents, Anthelmintics, Sulphonamides and Sulfones, Folate reductase inhibitors, Sulfones**	Students will be able to learn the Antifungal agents: Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin. Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconozole, Miconazole, Ketoconazole Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate. Anti-protozoal Agents: Metronidazole, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine. Anthelmintics: Diethylcarbamazine citrate, Thiabendazole, Mebendazole, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin. Sulphonamides and Sulfones Historical development, chemistry, classification and SAR of Sulfonamides: Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide, Sulphapyridine, Sulfamethoxaole, Sulphadiazine, Mefenide acetate, Sulfasalazine. Folate reductase inhibitors: Trimethoprim, Cotrimoxazole. Sulfones: Dapsone.	08
V	**Introduction to Drug Design,**	Students will be able to learn the introduction to Drug Design Various approaches used in drug design. Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition	07

	Combinatorial Chemistry	coefficient, Hammet's electronic parameter, Tafts steric parameter and Hansch analysis. Pharmacophore modeling and docking techniques. Combinatorial Chemistry: Concept and applications chemistry: solid phase and solution phase synthesis of combinatorial.	

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIth
Subject Title: PHARMACOLOGY-III (Theory)		**Subject Code:** BP 602 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Pharmacology of drugs acting on Respiratory system, Pharmacology of drugs acting on the Gastrointestinal Tract**	Students will be able to learn the pharmacology of drugs acting on Respiratory system, anti-asthmatic drugs, drugs used in the management of COPD, expectorants and antitussives, nasal decongestants, respiratory stimulants Pharmacology of drugs acting on the gastrointestinal tract, antiulcer agents, drugs for constipation and diarrhoea, appetite stimulants and suppressants, digestants and carminatives, emetics and anti-emetics.	10
II	**Chemotherapy**	Students will be able to learn the Chemotherapy: - general principles of chemotherapy, sulfonamides and cotrimoxazole, antibiotics-penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides.	10
III	**Chemotherapy**	Students will be able to learn the Chemotherapy**: -** antitubercular agents, antileprotic agents, antifungal agents, antiviral drugs anthelmintics, antimalarial drugs, anti-amoebic agents.	10
IV	**Chemotherapy, Immunopharmacology**	Students will be able to learn the Chemotherapy: Urinary tract infections and sexually transmitted diseases. Chemotherapy of malignancy. Immunopharmacology Immunostimulants Immunosuppressant Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars.	08
V	**Principles of toxicology, Chrono pharmacology**	Students will be able to learn the Principles of toxicology Definition and basic knowledge of acute, subacute and chronic toxicity. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity General principles of treatment of poisoning Clinical symptoms and management of barbiturates, morphine, organo-phosphosphorus compound and lead, mercury and arsenic poisoning. Chronopharmacology: Definition of rhythm and cycles, biological clock and their significance leading to chronotherapy.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier.
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata McGraw-Hill.
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics.
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A.K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point LippincottWilliams &Wilkins.
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology Text book of practical organic chemistry- A.I.Vogel.
6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R. Craig& Robert.
8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
9. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.
10. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIth
Subject Title: HERBAL DRUG TECHNOLOGY (Theory)		**Subject Code:** BP 603 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Herbs as raw materials, Biodynamic Agriculture, Indian Systems of Medicine**	Students will be able to learn the herbs as raw materials Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation, Source of Herbs, Selection, identification and authentication of herbal materials, Processing of herbal raw material. Biodynamic Agriculture Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides. Indian Systems of Medicine, Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy, Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas,Ghutika,Churna, Lehya and Bhasma.	11
II	**Nutraceuticals, Herbal-Drug and Herb-Food Interactions**	Students will be able to learn the Nutraceuticals General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases. Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.	07
III	**Herbal Cosmetics, Herbal excipients, Herbal formulations**	Students will be able to learn the Herbal Cosmetics Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skincare, hair care and oral hygiene products. Herbal excipients: Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes. Herbal formulations: Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes.	10
IV	**Evaluation of Drugs, Patenting and Regulatory requirements of natural products, Regulatory Issues**	Students will be able to learn the Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs Stability testing of herbal drugs. Patenting and Regulatory requirements of natural products: definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy, patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem. Regulatory Issues - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.	10
V	**General Introduction to Herbal Industry, Schedule T – GMP of Indian systems of medicine**	Students will be able to learn the General Introduction to Herbal Industry Herbal drugs industry: Present scope and future prospects. A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India. Schedule T – Good Manufacturing Practice of Indian systems of medicine Components of GMP (Schedule – T) and its objectives Infrastructural requirements, working space, storage area, machinery and	07

		equipments, standard operating procedures, health and hygiene, documentation and records.	

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale.
4. Essential of Pharmacognosy by Dr.S.H.Ansari.
5. Pharmacognosy & Phytochemistry by V.D.Rangari.
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy).
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of aBotanicals. Business Horizons Publishers, New Delhi, India, 2002.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIth
Subject Title: BIOPHARMACEUTICS AND PHARMACOKINETICS (Theory)		**Subject Code:** BP 604 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Introduction to Biopharmaceutics, Absorption, Distribution**	Students will be able to learn the mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from Non per oral extra-vascular routes, Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs.	10
II	**Elimination, Bioavailability and Bioequivalence**	Students will be able to learn the drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs. Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, *in-vitro* drug dissolution models, *in-vitro-in-vivo* correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.	10
III	**Pharmacokinetics**	Students will be able to learn the Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model, intravenous Injection (Bolus), intravenous infusion and extravascular administrations. Pharmacokinetics parameters - KE, t1/2, Vd, AUC, Ka, Clt and CLR- definitions methods of eliminations, understanding of their significance and application	10
IV	**Multicompartment models**	Students will be able to learn the Two compartment open model. IV bolus Kinetics of multiple dosing, steady state drug levels, calculation of loading and maintenance doses and their significance in clinical settings.	08
V	**Nonlinear Pharmacokinetics**	Students will be able to learn about the introduction, factors causing non-linearity, Michaelis-menton method of estimating parameters, Explanation with example of drugs.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.
2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari.
3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition,Prentice-Hall Inernational edition. USA.
4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar andSunil B. Jaiswal, Vallabh Prakashan Pitampura, Delhi
5. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.
6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott byADIS Health Science Press.
7. Biopharmaceutics; By Swarbrick.
8. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland.
9. Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
10. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack,Publishing Company,Pennsylvania 1989.
11. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987.
12. Remington's Pharmaceutical Sciences, ByMack Publishing Company, Pennsylvnia.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIth
Subject Title: PHARMACEUTICAL BIOTECHNOLOGY (Theory)		**Subject Code:** BP 605 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Brief Introduction to Biotechnology, Enzyme biotechnology, Biosensors, Protein Engineering, Microbes used in industries.**	Students will be able to learn the brief introduction to Biotechnology with reference to pharmaceutical sciences, enzyme biotechnology- methods of enzyme immobilization and applications, biosensors- working and applications of biosensors in Pharmaceutical Industries, brief introduction to protein engineering, use of microbes in industry. production of enzymes- general consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase, basic principles of genetic engineering.	10
II	**Cloning vectors, restriction endonucleases, rDNA technology, Genetic engineering in medicine, Vaccines, PCR**	Students will be able to learn the study of cloning vectors, restriction endonucleases and DNA ligase, recombinant DNA technology. Application of genetic engineering in medicine, application of r DNA technology and genetic engineering in the production of Interferon, vaccines- hepatitis- B, Hormones-Insulin. Brief introduction to PCR.	10
III	**Immunity types, MHC, bacterial vaccine, Hybridoma technology, Blood products and plasma substitutes.**	Students will be able to learn the Types of immunity- humoral immunity, cellular immunity, structure of immunoglobulins, structure and function of MHC, hypersensitivity reactions, immune stimulation and immune suppressions. General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity. Storage conditions and stability of official vaccines, hybridoma technology- production, purification and applications, blood products and plasma Substitutes.	10
IV	**Immuno-blotting techniques, Genetic organization, Microbial biotransformation, Mutations.**	Students will be able to learn the immuno-blotting techniques- ELISA, western blotting, southern blotting, genetic organization of eukaryotes and prokaryotes, microbial genetics including transformation, transduction, conjugation, plasmids and transposons. Introduction to microbial biotransformation and applications. Mutation: Types of mutation/mutants.	08
V	**Fermentation methods, Industrial scale fermenter design, blood products.**	Students will be able to learn about the fermentation methods and general requirements, study of media, equipment's, sterilization methods, aeration process, stirring, large scale production fermenter design and its various controls, study of the production of - penicillin's, citric acid, Vitamin B12, Glutamic acid, Griseofulvin, blood products: - collection, processing and storage of whole human blood, dried human plasma, plasma Substitutes.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of Recombinant DNA: ASM Press Washington D.C.
2. RA Goldshy et. al., : Kuby Immunology.
3. J.W. Goding: Monoclonal Antibodies.
4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by RoyalSociety of Chemistry.
5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.
6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell ScientificPublication.
7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology,2nd edition, Aditya books Ltd., New Delhi.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIth
Subject Title: PHARMACEUTICAL QUALITY ASSURANCE (Theory)		**Subject Code:** BP 606 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Quality Assurance and Quality Management concepts, TQM, ICH Guidelines, QbD, ISO 9000 & ISO14000 NABL accreditation.**	Students will be able to learn the Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP Total Quality Management (TQM): Definition, elements, philosophies ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines Quality by design (QbD): Definition, overview, elements of QbD program, tools ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration NABL accreditation : Principles and procedures.	10
II	**Organization and personnel, Premises, Equipment's and raw materials.**	Students will be able to learn the organization and personnel: Personnel responsibilities, training, hygiene and personal records. Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination. Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.	10
III	**Quality Control, Good Laboratory Practices.**	Students will be able to learn the quality control test for containers, rubber closures and secondary packing materials. Good Laboratory Practices: General Provisions, organization and personnel, facilities, equipment, testing facilities operation, test and control articles, protocol for conduct of a nonclinical laboratory study, records and reports, disqualification of testing facilities.	10
IV	**Complaints, Document maintenance in pharmaceutical industry.**	Students will be able to learn the complaints and evaluation of complaints, handling of return good, recalling and waste disposal. Document maintenance in pharmaceutical industry: batch formula record, master formula record, SOP, quality audit, quality review and quality documentation, reports and documents, distribution records.	08
V	**Calibration and Validation, Warehousing**	Students will be able to learn about the Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation. Warehousing: Good warehousing practice, materials management.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications.
4. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh.
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total Quality Management – Sadhank G Ghosh.
7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification f or Pharmaceutical Substances, Excipients and Dosage forms.
8. Good laboratory Practices – Marcel Deckker Series.
9. ICH guidelines, ISO 9000 and 14000 guidelines.

7th SEMESTER

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIIth
Subject Title: INSTRUMENTAL METHODS OF ANALYSIS (Theory)		**Subject Code:** BP 701 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**UV Visible spectroscopy**	Students will be able to learn the electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, derivation, and deviations. Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors-Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode, and applications.	07
I	**Fluorimetry**	Students will be able to learn the theory, concepts of singlet, doublet, and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation, and applications.	03
II	**IR spectroscopy**	Students will be able to learn the introduction, fundamental modes of vibrations in poly atomic, molecules, sample handling, factors affecting vibrations, instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications.	06
II	**Flame Photometry Atomic absorption spectroscopy Nephelo-turbidometry**	Students will be able to learn the Principle, interferences, instrumentation and applications of flame photometry, atomic absorption spectroscopy and nephlo-turbidometry.	04
III	**Chromatography (Adsorption and partition column, TLC and Paper chromatography)**	Students will be able to learn the Introduction, Principle, Methodology, values, advantages, disadvantages and applications of Adsorption and partition column, TLC and Paper chromatography.	08
III	**Electrophoresis**	Students will be able to learn the introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications.	02
IV	**Gas chromatography and HPLC**	Students will be able to learn the introduction, theory, instrumentation, advantages, disadvantages and applications of gas chromatography and high-performance liquid chromatography (HPLC).	08
V	**Ion exchange, Gel and Affinity chromatography**	Students will be able to learn about the Introduction, theory, instrumentation, factors affecting advantages, disadvantages and applications of ion exchange chromatography, gel chromatography and affinity chromatography.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Instrumental Methods of Chemical Analysis by B.K Sharma.
2. Organic spectroscopy by Y.R Sharma.
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors.
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel.
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake.
6. Organic Chemistry by I. L. Finar.
7. Organic spectroscopy byWilliam Kemp.
8. Quantitative Analysis of Drugs by D. C. Garrett.
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi.
10. Spectrophotometric identification of Organic Compounds by Silverstein.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIIth
Subject Title: INDUSTRIAL PHARMACY-II (Theory)		**Subject Code:** BP 702 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Pilot plant scale up techniques**	Students will be able to learn the General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology	10
II	**Technology development and transfer**	Students will be able to learn the WHO guidelines for Technology Transfer (TT):Terminology, Technology transfer protocol, Quality risk management, Transfer from R& D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipment's, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE /SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues.	10
III	**Regulatory affairs, Regulatory requirements for drug approval**	Students will be able to learn the introduction, historical overview of regulatory affairs, regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals. Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.	10
IV	**Quality management systems**	Students will be able to learn the Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP.	08
V	**Indian Regulatory Requirements**	Students will be able to learn about the Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http//en.wikipedia.org/wiki/Regulatory_ Affairs.
2. International Regulatory Affairs Updates, 2005. available athttp://www.iraup.com/about.php
3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guidefor Prescription Drugs, Medical Devices, and Biologics Second Edition.
4. Regulatory Affairs brought by learning plus, inc. available athttp.//www.cgmp.com/ra.htm.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIIth
Subject Title: PHARMACY PRACTICE (Theory)		**Subject Code:** BP 703 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Hospital, Hospital pharmacy and it's organization,**	Students will be able to learn the definition, classification of hospital- primary, secondary and tertiary hospitals, classification based on clinical and non- clinical basis, organization structure of a hospital, and medical staffs involved in the hospital and their functions. Hospital pharmacy and its organization: Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.	04
I	**Adverse drug reaction, Community Pharmacy**	Adverse drug reaction: Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction- beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management. Community Pharmacy: Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.	06
II	**Technology development and transfer**	Students will be able to learn the WHO guidelines for Technology Transfer (TT):Terminology, Technology transfer protocol, Quality risk management, Transfer from R& D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipment's, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE /SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues.	10
III	**Regulatory affairs, Regulatory requirements for drug approval**	Students will be able to learn the introduction, historical overview of regulatory affairs, regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals. Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.	10
IV	**Quality management systems**	Students will be able to learn the Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP.	08

V	**Indian Regulatory Requirements**	Students will be able to learn about the Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http//en.wikipedia.org/wiki/Regulatory_ Affairs.
2. International Regulatory Affairs Updates, 2005. available athttp://www.iraup.com/about.php
3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guidefor Prescription Drugs, Medical Devices, and Biologics‘ Second Edition.
4. Regulatory Affairs brought by learning plus, inc. available athttp.//www.cgmp.com/ra.htm.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIIth
Subject Title: PHARMACY PRACTICE (Theory)		**Subject Code:** BP 704 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Hospital, Hospital pharmacy and it's organization,**	Students will be able to learn the definition, classification of hospital- primary, secondary, and tertiary hospitals, classification based on clinical and non- clinical basis, organization structure of a hospital, and medical staffs involved in the hospital and their functions. Hospital pharmacy and its organization: Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.	04
I	**Adverse drug reaction, Community Pharmacy**	Adverse drug reaction: Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction- beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management. Community Pharmacy: Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.	06
II	**Drug distribution system in a hospital, Hospital formulary, Therapeutic drug monitoring**	Students will be able to learn the dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labeling, dispensing, definition contents of hospital formulary, and Differentiation of hospital formulary and drug list. Therapeutic Drug Monitoring, Factors to be considered during the therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring.	05
II	**Medication adherence, Patient medication history interview, Community pharmacy management.**	Students will be able to learn the causes of medication non-adherence, the pharmacist's role, monitoring of patient medication adherence. Need for the patient medication history interview, and medication interview forms. Financial, materials, staff, and infrastructure requirements.	05
III	**Pharmacy and therapeutic committee, Drug information services, Patient counseling**	Students will be able to learn the organization, functions, Policies of the pharmacy and therapeutic committee and emergency drug list preparation. Drug and Poison information Centre, Sources of drug information, Computerized services, and storage and retrieval of information. Definition of patient counseling; steps involved in patient counseling, and Special case.	06
III	**Education and training program in the hospital, Prescribed medication order**	Students will be able to learn the role of pharmacist in the education and training program, Internal and external training program, services to the nursing homes/clinics, code of ethics for community pharmacy and role of pharmacist.	04

	and communication skills	Prescribed medication order- interpretation and legal requirements, and communication skills- communication with prescribers and patients.	
IV	**Budget preparation and implementation, Clinical Pharmacy OTC sales.**	Students will be able to learn the Budget preparation and implementation. Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation. Introduction and sale of over the counter, and Rational use of common over the counter medications.	08
V	**Drug store management and inventory control, Investigational use of drugs, Interpretation of Clinical Laboratory Tests (CLT)**	Students will be able to learn about the Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and analysis methods. Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee. Blood chemistry, hematology, and urinalysis.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Merchant S.H. and Dr. J.S.Quadry. *A textbook of hospital pharmacy*, 4th ed.Ahmadabad: B.S. Shah Prakakshan; 2001.
2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of ClinicalPharmacy Practice- essential concepts and skills,* 1st ed. Chennai: OrientLongman Private Limited; 2004.
3. William E. Hassan. *Hospital pharmacy*, 5th ed. Philadelphia: Lea & Febiger;1986.
4. Tipnis Bajaj. *Hospital Pharmacy*, 1st ed. Maharashtra: Career Publications; 2008.
5. Scott LT. *Basic skills in interpreting laboratory data*, 4th edition. American Society of Health System Pharmacists Inc; 2009.
6. Parmar N.S. *Health Education and Community Pharmacy,* 18th ed. India: CBSPublishers & Distributers; 2008.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIIth
Subject Title: NOVEL DRUG DELIVERY SYSTEMS (Theory)		**Subject Code:** BP 704 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Controlled drug delivery systems**	Students will be able to learn the introduction, terminology/definitions, and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution, and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations.	07
I	**Polymers**	Students will be able to learn the introduction, classification, properties, advantages, and application of polymers in the formulation of controlled-release drug delivery systems.	03
II	**Microencapsulation Mucosal Drug Delivery system, Implantable Drug Delivery Systems.**	Students will be able to learn the definition, advantages and disadvantages, microspheres/microcapsules, microparticles, methods of microencapsulation, and applications. Introduction, Principles of bioadhesion /mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability, and formulation considerations of buccal delivery systems. Introduction, advantages and disadvantages, the concept of implants and osmotic pump.	10
III	**Transdermal Drug Delivery Systems, Gastro retentive drug delivery systems, Naso-pulmonary drug delivery system**	Students will be able to learn the Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches. Introduction, advantages, disadvantages, approaches for GRDDS Floating, high density systems, inflatable and gastro adhesive systems and their applications. Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers.	10
IV	**Targeted drug Delivery**	Students will be able to learn the concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications.	08
V	**Ocular Drug Delivery Systems, Intrauterine Drug Delivery Systems**	Students will be able to learn about the introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations and ocuserts. Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.
3. Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim
4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
5. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIIth (For Lateral Entry Students Only)
Subject Title: COMMUNICATION SKILLS		**Subject Code:** BP 105 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 30	**Credits:** 02	**Lectures & Tutorial**: 2/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Communication Skills**	Students will be able to learn the introduction, definition, importance, and process of communication.	03
I	**Barriers to communication and Perspectives in Communication**	Students will be able to learn about various barriers to communication. Introduction, Visual Perception, Language, Other factors affecting our perspective.	04
II	**Elements of Communication**	Students will be able to learn the introduction, face-to-face communication voice tone, body language, verbal communication, and physical communication.	03
II	**Communication Styles**	Students will be able to learn the introduction, and communication styles matrix with examples.	04
III	**Basic Listening Skills**	Students will be able to learn the introduction, self-awareness, active listening.	03
III	**Effective Written Communication**	Students will be able to learn the introduction, written communication, shades of meaning, formal communication.	02
III	**Writing Effectively**	Students will be able to learn the subject lines, know your audience, and message organization.	02
IV	**Interview Skills**	Students will be able to learn about purpose of an interview, Do's and Don'ts of an interview.	02
IV	**Giving Presentations**	Students will be able to learn the dealing with fears, presentation planning, presentation structuring, presentation delivering, and techniques of delivery.	03
V	**Group Discussion**	Students will be able to learn the introduction, communication skills in group discussion, Do's and Don'ts of group discussion.	04

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1stEdition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1stEdition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5thEdition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Greenhall, 1st Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konar nira, 2ndEdition, New arrivals –PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1stEdition, Oxford Press,2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt. ltd,2011
10. Soft skills and professional communication, Francis Peters SJ, 1stEdition, Mc Graw Hill Education, 2011
11. Effective communication, John Adair, 4thEdition, Pan Mac Millan, 2009
12. Bringing out the best in people, Aubrey Daniels, 2nd Edition, Mc Graw Hill, 1999

8th SEMESTER

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIIIth
Subject Title: BIOSTATISTICS AND RESEARCH METHODOLOGY (Theory)		**Subject Code:** BP 801 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Introduction, Measures of central tendency, Measures of dispersion, Correlation**	Students will be able to learn statistics, biostatistics, and frequency distribution. Mean, Median, Mode- Pharmaceutical examples. Dispersion, Range, standard deviation, Pharmaceutical problems. Definition, Karl Pearson's coefficient of correlation, Multiple correlations -Pharmaceuticals examples.	10
II	**Regression, Probability and Parametric test**	Students will be able to learn the curve fitting by the method of least squares, fitting the lines y= a + bx and x= a + by, Multiple regression, standard error of regression– Pharmaceutical examples. Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties – problems. Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, the essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of the mean (SEM) - Pharmaceutical examples. t-test(Sample, Pooled or Unpaired and Paired), ANOVA, (One way and Two way), Least Significance difference.	10
III	**Non Parametric tests, Introduction to Research, Graphs, and Designing the methodology**	Students will be able to learn the non-parametric tests**:** Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallistest, and Friedman Test. Introduction to Research**:** Need for research, need for design of experiments, Experiential Design Technique, plagiarism. Graphs**:** Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph. Designing the methodology**:** Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.	10
IV	**Two-level factorials, Regression modeling, Introduction to Practical components of Industrial and Clinical Trials Problems**	Students will be able to learn the blocking and confounding system for Two-level factorials. Regression modeling: Hypothesis testing in Simple and Multiple regression models. Introduction to Practical components of Industrial and Clinical Trials Problems: Statistical Analysis Using Excel, SPSS, MINITAB, DOE, R -Online Statistical Software's to Industrial and Clinical trial approach.	08
V	**DOE-Factorial Design, RSM**	Students will be able to learn about the Design and Analysis of experiments: Factorial Design: Definition, 2^2, 2^3 design. Advantage of factorial design Response Surface methodology: Central composite design, Historical design, Optimization Techniques	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton,publisher Marcel Dekker Inc. NewYork.
2. Fundamental of Statistics – Himalaya Publishing House- S.C.Guptha
3. Design and Analysis of Experiments –PHI Learning Private Limited, R.Pannerselvam.
4. Design and Analysis of Experiments – Wiley Students Edition,Douglas and C. Montgomery.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIII[th]
Subject Title: SOCIAL AND PREVENTIVE PHARMACY (Theory)		**Subject Code:** BP 802 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Concept of health and disease, Social and health education, Sociology, health Socio-cultural, and Hygiene and health.**	Students will be able to learn the concept of health and disease**:** Definition, concepts, and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases, and social problems of the sick**.** Social and health education**:** Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, malnutrition, and its prevention. Sociology and health Socio-cultural: factors related to health and disease, Impact of urbanization on health and disease, Poverty and health Hygiene and health**:** personal hygiene and health care; avoidable habits.	10
II	**Preventive medicine**	Students will be able to learn the preventive medicine**:** general principles of prevention and control of diseases such ascholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse.	10
III	**National health programs, objectives, functioning, and outcomes**	Students will be able to learn the national health programs, its objectives, functioning and outcome of the following: HIV AND AIDS control program, TB, Integrated disease surveillance program (IDSP), National leprosy control program, National mental health program, National program for prevention and control of deafness, Universal immunization program, National program for control of blindness, Pulse polio program.	10
IV	**National health intervention program for mother and child**	Students will be able to learn about the National health intervention program for mother and child, National family welfare program, National tobacco control program, National Malaria Prevention Program, National program for health care for the elderly, Social health program; role of WHO in Indian national program.	08
V	**Community services in rural, urban, and school health**	Students will be able to learn about the community services in rural, urban, and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion, and education in school.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Textbook of Preventive and Social Medicine, Prabhakara GN, 2nd Edition, 2010, ISBN: 9789380704104, JAYPEE Publications.
2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy Rabindra Nath, Saha Indranil, 4th edition, 2013, ISBN: 9789350901878, JAYPEE Publications.
3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th edition, 2014, ISBN: 9789351522331, JAYPEE Publications.
4. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D,Hiremath Dhananjaya A, 2nd edition, 2012, ISBN: 9789350250440, JAYPEE Publications.
5. Park Textbook of Preventive and Social Medicine, K Park, 21st edition, 2011, ISBN-14: 9788190128285, BANARSI DAS BHANOT PUBLISHERS.
6. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIIIth
Subject Title: PHARMACEUTICAL REGULATORY SCIENCE (Elective Subjects) (Theory)		**Subject Code:** BP 804 ET
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**New Drug Discovery and development**	Students will be able to learn the stages of drug discovery, Drug development process, pre-clinical studies, non-clinical activities, clinical studies, Innovator and generics, Concept of generics, and Generic drug product development.	10
II	**Regulatory Approval Process, Regulatory authorities and agencies**	Students will be able to learn the Regulatory Approval Process-Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), and Abbreviated New Drug Application (ANDA). Changes to an approved NDA / ANDA. Regulatory authorities and agencies: Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada.	10
III	**Registration of Indian drug products in overseas market**	Students will be able to learn the procedure for the export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical Document (eCTD), ASEAN Common Technical Document (ACTD) research.	10
IV	**Clinical trials**	Students will be able to learn about the developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance – safety monitoring in clinical trials.	08
V	**Regulatory Concepts**	Students will be able to learn about the basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, Nirali Prakashan.
2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol. 185. Informa Healthcare Publishers.
3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol. 190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley &Sons. Inc.
5. FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics /edited by Douglas J. Pisano, David Mantus.
6. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel andIsader Kaufer, Marcel Dekker series, Vol. 143.
7. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance by Fay A. Rozovsky and Rodney K. Adams
8. Principles and Practices of Clinical Research, Second Edition Edited by John I.Gallin and Frederick P. Ognibene.
9. Drugs: From Discovery to Approval, Second Edition By Rick Ng.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIIIth
Subject Title: CELL AND MOLECULAR BIOLOGY (Elective Subject) (Theory)		**Subject Code:** BP 808 ET
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Cell and Molecular Biology**	Students will be able to learn the cell and Molecular Biology: definitions, theory, history, summation, basics and applications of cell and molecular biology. Properties of cells and cell membrane, Prokaryotic versus Eukaryotic, Cellular Reproduction, Chemical Foundations – an Introduction and Reactions (Types).	10
II	**DNA molecular information, Functions and Types.**	Students will be able to learn the DNA and the Flow of molecular information, DNA functioning, DNA and RNA, Types of RNA. Transcription and Translation.	10
III	**Proteins and Amino Acids**	Students will be able to learn the definitions of proteins and amino acids, protein structure. Regularities in Protein pathways. Cellular processes. Positive control and significance of protein synthesis.	10
IV	**Science of Genetics**	Students will be able to learn about the science of genetics. Transgenics and genomic analysis. Cell cycle analysis. Mitosis and meiosis. Cellular activities and checkpoints	08
V	**Cell signals**	Students will be able to learn about the introduction of cell signals, receptors for cell signals. Signaling pathways: overview. Mis regulation of signaling pathways. Protein-kinases: Functioning.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers &Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Peppler: Microbial Technology.
9. Edward: Fundamentals of Microbiology.
10. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi.
11. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIIIth
Subject Title: COSMETIC SCIENCE (Elective Subject) (Theory)		**Subject Code:** BP 809 ET
Subject Teacher:		**Session**:
Total Lectures Prescribed: 45	**Credits:** 04	**Lectures & Tutorial**: 4/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Cosmetic and cosmeceutical products**	Students will be able to learn the classification of cosmetic and cosmeceutical products. Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs. Cosmetic excipients: Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application. Skin: Basic structure and function of skin. Hair: Basic structure of hair. Hair growth cycle. Oral Cavity: Common problem associated with teeth and gums**.**	10
II	**Building blocks of skin care products**	Students will be able to learn the principles of formulation and building blocks of skin care products: face wash, moisturizing cream, cold cream, vanishing cream and their advantages and disadvantages. Application of these products in formulation of cosmeceuticals. Antiperspirants & deodorants- actives & mechanism of action. Principles of formulation and building blocks of hair care products-conditioning shampoo, hair conditioner, anti-dandruff shampoo, hair oils. Chemistry and formulation of Paraphylene diamine-based hair dye. Principles of formulation and building blocks of oral care products: toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.	10
III	**Skin care Products**	Students will be able to learn the sun protection, classification of sunscreens and SPF. Role of herbs in cosmetics**:** Skin Care: Aloe and turmeric. Hair care: Henna and amla Oral care: Neem and clove. Analytical cosmetics: BIS specification and analytical methods for shampoo, skin cream and toothpaste**.**	10
IV	**Principles of Cosmetic Evaluation**	Students will be able to learn about the principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties Soaps, and syndet bars. Evolution and skin benefits.	08
V	**Skin and Skin moisturization.**	Students will be able to learn about the oily and dry skin, causes leading to dry skin, skin moisturization. Basic understanding of the terms comedogenic, dermatitis. Cosmetic problems associated with hair and scalp: dandruff, hair fall causes cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor. Antiperspirants and deodorants- actives and mechanism of action.	07

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Harry's cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
2. Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.
3. Text book of cosmelicology by Sanju Nanda & Roop K. Khar, Tata Publishers.

LESSON PLAN

GOVERNMENT COLLEGE OF PHARMACY ROHRU SHIMLA

Course: B. Pharmacy	**Scheme**: PCI	**Semester**: VIII[th] (For Lateral Entry Students Only)
Subject Title: COMPUTER APPLICATIONS IN PHARMACY (Theory)		**Subject Code:** BP 205 T
Subject Teacher:		**Session**:
Total Lectures Prescribed: 30	**Credits:** 03	**Lectures & Tutorial**: 3/ Week

Unit to be Covered	Topic to be Covered	Learning Outcomes	No. of Lectures
I	**Number system**	Students will be able to learn the 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.	03
I	**Concept of Information Systems and Software**	Students will be able to learn the information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project.	03
II	**Web technologies**	Students will be able to learn the Introduction to HTML, XML, CSS, and programming languages, introduction to web servers and Server Products, Introduction to databases, MYSQL, MS ACCESS, and Pharmacy Drug database.	06
III	**Application of computers in Pharmacy**	Students will be able to learn Drug information storage and retrieval, Pharmacokinetics, Mathematical modelsl 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.	06
IV	**Bioinformatics**	Students will be able to learn the Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, and Impact of Bioinformatics in Vaccine Discovery.	06
V	**Computers as data analysis in Preclinical development**	Students will be able to learn about Chromatographic data analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS).	06

Note: The subject in charge shall adjust the number of lecture hours as per the available working days in the session.

References: -

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins –Wiley-Inter science, A John Willey and Sons, INC., Publication, USA.
3. Bioinformatics (Concept, Skills and Applications) – S.C. Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002 (INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N. Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002