## SEMESTER-II
## SCHEME OF TEACHING

| SUB CODE | NAME OF SUBJECT | CONTACT HOURS PER WEEK | | CREDITS | |
|---|---|---|---|---|---|
| | | T | P | T | P |
| B201T | Human Anatomy Physiology & Health Education-II Theory | 4 | -- | 3 | -- |
| B201P | Human Anatomy Physiology & Health Education-II Practical | -- | 3 | -- | 3 |
| B202T | Pharmaceutical Practice Theory | 4 | -- | 3 | -- |
| B202P | Pharmaceutical Practice Practical | -- | 3 | -- | 3 |
| B203T | Pharmaceutical Jurisprudence Theory | 4 | -- | 3 | -- |
| B204T | Physical Chemistry Theory | 4 | -- | 3 | -- |
| B204P | Physical Chemistry Practical | -- | 3 | -- | 3 |
| B205P | Seminar Presentation-I | -- | 3 | -- | 3 |
| B206T | Pharmaceutical Analysis-I Theory | 4 | -- | 3 | -- |
| B206P | Pharmaceutical Analysis-I Practical | -- | 3 | -- | 3 |
| | Tutorial | 1 | -- | -- | -- |
| | Total | 36 | | 30 | |

## SCHEME OF EXAMINATION

| SUB CODE | NAME OF SUBJECT | DURATION OF EXAM (HRS) | | MARKS | | | |
|---|---|---|---|---|---|---|---|
| | | | | THEORY | | PRACTICAL | |
| | | T | P | University level evaluation | Institute level evaluation | University level evaluation | Institute level evaluation |
| B201T | Human Anatomy Physiology & Health Education-II Theory | 3 | -- | 80 | 20 | -- | -- |
| B201P | Human Anatomy Physiology & Health Education-II Practical | -- | 3 | -- | -- | 80 | 20 |
| B202T | Pharmaceutical Practice Theory | 3 | -- | 80 | 20 | -- | -- |
| B202P | Pharmaceutical Practice Practical | -- | 3 | -- | -- | 80 | 20 |
| B203T | Pharmaceutical Jurisprudence Theory | 3 | -- | 80 | 20 | -- | -- |
| B204T | Physical Chemistry Theory | 3 | -- | 80 | 20 | -- | -- |
| B204P | Physical Chemistry Practical | -- | 3 | -- | -- | 80 | 20 |
| B205P | Seminar Presentation-I | -- | 3 | -- | -- | 80 | 20 |
| B206T | Pharmaceutical Analysis-I Theory | 3 | -- | 80 | 20 | -- | -- |
| B206P | Pharmaceutical Analysis-I Practical | -- | 3 | -- | -- | 80 | 20 |
| | Total | 30 | | 400 | 100 | 400 | 100 |

**SUBJECT : Human Anatomy Physiology & Health Education-II**
**SUBJECT CODE : B201T & B201P**

**RATIONALE** : Anatomy and Physiology is a course designed to introduce the student to the structure and functions that occur in the human body. An understanding of each of the body systems and their function, along with the interactions and relationships between each body system is necessary for the nurse to comprehend. The principles and concepts of human anatomy and physiology is a significant element to the foundation of nursing.

**COURSE OBJECTIVES:** The primary objective and outcome of this course is to make the student understand the construction of the human body and how this construction is related to the function of the human body.

This will be achieved by:

1. To provide a forum where critical thinking is developed.
2. To provide basic understanding and working knowledge of the human body.
3. To provide an introduction to the language of anatomy and physiology and use anatomical terms fluently when describing different tissues and organs.
4. To provide an understanding of the techniques and tools to analyze anatomical structures and function.
5. To specifically use these techniques and tools to enrich the understanding of human anatomy and physiology

**LEARNING OUTCOMES:**

1. Recognize and understand anatomical and physiological terminology
2. Apply the concept of homeostasis to human physiological activity.
3. Know major organic and inorganic chemicals as they relate to the human body.
4. Describe cellular structure and cellular activity.
5. Discuss anatomical and physiological features of the integumentary, skeletal, Muscular, nervous and sensory systems.
6. Evaluate select pathological conditions as they relate to normal functioning of the above-named systems.
7. Prepare for the subsequent course (bsc 1086) by paying particular emphasis to
8. General features of biochemical and cellular physiology, as well as neuronal Integration of various body processes

**PREREQUISITES:** General Biology and General chemistry.

**TEACHING AND EVALUATION SCHEME:**

| SUB CODE | TITLE OF SUBJECT | TEACHING SCHEME | | | CREDITS | | EVALUATION SCHEME | | | | TOTAL MARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INTERNAL | | EXTERNAL | | |
| | | T | P | TOTAL HRS | T | P | T | P | T | P | |
| B201T & B201P | Human Anatomy Physiology & Health Education-II | 4 | 3 | 7 | 3 | 3 | 20 | 20 | 80 | 80 | 200 |

**CONTENT:**

| | | |
|---|---|---|
| 1 | Central Nervous System: Functions of different parts of brain and spinal cord. Neurohumoral transmission in the Central Nervous System, reflex action, electroencephalogram (EEG), cranial nerves and their functions. | 18 |
| 2 | Autonomic Nervous System: Physiology and functions of the Autonomic Nervous System (ANS). Mechanism of neurohumoral transmission in the ANS. | 07 |
| 3 | Sense Organs: Basic anatomy and physiology of the eye (vision), ear (hearing), taste buds (taste sensation), nose (smell) and skin (superficial receptors). | 16 |
| 4 | Digestive System: Gross anatomy of the gastrointestinal (GI) tract functions of different parts of GIT of liver, pancreas and gall bladder. Various GI secretions and their role in the absorption and digestion of food, disorders of digestive system. | 16 |
| 5 | Urinary System: Various parts of urinary tract, structures and functions of the kidney. Anatomy and Physiology of urine formation and acid base balance. Diseases of the urinary system. | 10 |
| 6 | Reproductive system: Anatomy of Male and Female reproductive system and their hormones. Physiology of menstruation, coitus, fertilization and sex. | 16 |
| 7 | Endocrine System: Basic anatomy and physiology of Pituitary, Thyroid, Parathyroid, Adrenal, Pancreas, Testes and Ovary, glands, their hormones and functions. | 17 |

**B201P Human Anatomy Physiology & Health Education-II Practical**

| | |
|---|---|
| 1 | Introduction to microscope. |
| 2 | To find out the total RBC count of own blood. |
| 3 | To find out the total WBC count of own blood. |
| 4 | To find out the differential WBC count of own blood. |
| 5 | To study the central nervous system (CNS) using model (brain, spinal cord, etc.) |
| 6 | To study the various sense organs (eye, ear, nose and skin). |
| 7 | To study the digestive system using model. |
| 8 | To study the male reproductive system using model. |
| 9 | To study the female reproductive system using model. |
| 10 | To study the urinary system using model. |
| 11 | To study the histology of various system (part I) |
| 12 | To study the histology of various system (part II) |
| 13 | To study the properties of normal urine and perform the tests for normal constituents of urine. |
| 14 | To analyze the abnormal constituents of a given sample of urine. |

**BOOKS RECOMMENDED: (LATEST EDITION OF BOOK)**


1. Principles Of Human Anatomy And Physiology By Tortora
2. Textbook Of Medical Physiology By Guyton And Hall
3. Basic Human Physiology By Guyton
4. Practical Anatomy And Physiology By C.L.Ghai
5. Review Of Medical Physiology By William F. Ganong
6. Practical Anatomy And Physiology By R. K. Goyal
7. Human Physiology By C. C. Chatterjee
8. Principles Of Anatomy And Physiology By Marieb
9. Principles of Anatomy and Physiology by Martini
10. The Living Body By Best And Taylor
11. Community Pharmacy by P.C. Dandiya
12. Biochemistry by Satyanarayan

**SUBJECT : Pharmaceutical Practice**
**SUBJECT CODE : B202T & B202P**
**RATIONALE** : The aim of this course is to familiarize participants with some of the issues of formulation and stability in compounding extemporaneous preparations and safe systems of work for extemporaneous dispensing. Patient specific issues such as nasogastric administration and patient information leaflets for exempts are also covered.

**COURSE OBJECTIVES:**

The learning objectives of the study day are that participants will be able to:

1. Understand some of the issues of pharmaceutical formulation with regard to drug stability and be able to identify and discuss what the roles of various excipients in a formulation are.
2. Understand the factors affecting the choice of preservative in a formulation and its effect on in use of shelf life.
3. Understand the official BP test for determining the effectiveness of preservative systems.
4. List the basic principles for establishing a safe system of work for extemporaneous dispensing.
5. Understand some of the Physical and Clinical problems associated with administration of medicines by enteral feeding tubes.
6. Define a safe system for drug administration by enteral feeding tube.
7. Draw up an extemporaneous dispensing worksheet and devise a generic patient information leaflet for extemporaneous products.

**LEARNING OUTCOMES:**

1. To understand the philosophy and practice of pharmaceutical care
2. To develop positive attitudes toward pharmaceutical care
3. To apply pharmaceutical care philosophy in pharmacy practice

**PREREQUISITES**: Knowledge about routes of administration and dosage forms' classes.

**TEACHING AND EVALUATION SCHEME:**

| SUB CODE | TITLE OF SUBJECT | TEACHING SCHEME | | | CREDITS | | EVALUATION SCHEME | | | | TOTAL MARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INTERNAL | | EXTERNAL | | |
| | | T | P | TOTAL HRS | T | P | T | P | T | P | |
| B202T & B202P | Pharmaceutical Practice | 4 | 3 | 7 | 3 | 3 | 20 | 20 | 80 | 80 | 200 |

**CONTENT:**

| | | |
|---|---|---|
| 1 | The prescription:<br>Handling of prescription, Source of errors in prescription, Care required in dispensing procedures including labeling of dispensed products | 15 |
| 2 | Calculations in dispensing :<br>Formulations-Reducing formulas, increasing formulas, Formula involving parts, Formula containing percentages. Calculations of doses—Dose, Dosage regimen, Dose based on units/weight, on body Surface area, on age. Preparing inject able medications-I.V. medications, Calculations for compounding. Apothecary system—Importance and conversions. House hold measures and conversions. | 20 |
| 3 | Classification of dispensed products: Brief description and applications of each product.<br>Difference between extemporaneous preparations and Non extemporaneous preparations.<br>Classification as per physical state—Solids, Liquids, Semisolids, Inhalations. | 40 |

| | | |
|---|---|---|
| | Classification as per route of administration<br>Classification as Sterile and non sterile preparations<br>Classification as Galenicals and non-Galenicals | |
| 4 | Packaging of dispensed products—Containers and closures. | 10 |
| 5 | Labeling of dispensed products | 10 |
| 6 | Off the shelf dispensing—The concept and practice. | 05 |

**B202P Pharmaceutical Practice Practical**

| | |
|---|---|
| 1 | Conversion tables. |
| 2 | Household measures and conversions |
| 3 | Apothecary system units' conversions. |
| 4 | Compounding of preparations—<br>Solutions Suspensions Emulsions Ointments Lotions Liniments Powders |

**BOOKS RECOMMENDED:**


1. "Pharmaceutical Practice" By Diana M. Collett and Michale E. Aulton. Elbs Publishers.
2. "Dispensing For Pharmaceutical Students" By Cooper And Gunn By S.J.Carter, CBS Publishers
3. "Pharmaceutical Calculations" By Mitchell J. Stoklosa & Howard C. Ansel, By B.I. Waverly Pvt. Ltd., New Delhi
4. "Pharmaceutical Dosage Forms And Drug Delivery Systems" By Howard C. Ansel By Lippincott Williams & Wilkins
5. "Remington: The Science And Practice Of Pharmacy", Mac Publishers
6. "Drug And Cosmetics Act And Rules" By Vijay Malik
7. "A Practical Guide To Pharmaceutical Care", Rovers John P. Ed. (Et Al...), American Pharmaceutical Association
8. "Current Dispensing Practices", Nanda Arun, Vallabh Prakashan
9. "Pharmacy Practice For Technicians", Bollington Don A., New Age International Publication

**SUBJECT** **: Pharmaceutical Jurisprudence**
**SUBJECT CODE** **: B203T**
**RATIONALE** : Pharmacy profession is a highly regulated profession. Knowledge of these laws is must for any professional.
**COURSE OBJECTIVES** **:** To learn the various laws governing the manufacturing, sale, research and usage of drugs.

**LEARNING OUTCOMES**: The student should be able to narrate the:

1. Basic principles, purpose and dimensions of the laws
2. Important inclusions and exclusions of the laws
3. Important rules and regulations and procedures made to execute the laws
4. Important penalties for breaking these laws.

**PREREQUISITES: NONE**

**TEACHING AND EVALUATION SCHEME:**

| SUB CODE | TITLE OF SUBJECT | TEACHING SCHEME | | | CREDITS | EVALUATION SCHEME | | | | TOTAL MARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL | | EXTERNAL | | |
| | | T | P | TOTAL HRS | | T | P | T | P | |
| B203T | Pharmaceutical Jurisprudence | 4 | -- | 4 | 3 | 20 | -- | 80 | -- | 100 |

**CONTENT:**

| | | |
|---|---|---|
| 1 | An elaborate study of the following: | 55 |
| | Pharmaceutical ethics | |
| | Pharmacy act 1948 | |
| | Drugs and Cosmetics act 1940 and rules 1945 | |
| | Medicinal and toilet preparations (Excise Duties) act 1955 | |
| | Narcotic drugs and psychotropic substances act 1985 and rules | |
| | Drugs price control order | |
| | | |
| 2 | A brief study of the following with special reference to the main provisions: | 30 |
| | Drugs and Magic remedies (objectionable Advertisements) act 1954 | |
| | Prevention of cruelty to animals act 1960 | |
| | States Shops & Establishments act and rules | |
| | AICTE act 1987 | |
| | Factories act 1948 | |
| | | |
| 3 | Patents act 1970 | 10 |
| 4 | A brief study of the various legal aspects of miscellaneous products, medical/surgical accessories, diagnostic aids, appliances available in the market | 05 |

**BOOKS RECOMMENDED**

1. "A Text Book Of Forensic Pharmacy", Jain N.K., Vallabh Prakashan
2. "A Textbook Of Forensic Pharmacy", Mithal B.M., National Book Centre
3. The Poisons Act, 1919", Law Publication.
4. "The Opium Act, 1857 with Opium Act, 1878 and Opium and Revenue Laws" Law Publication

5. The Drugs And Cosmetics Act, 1940", Law Publication
6. Drugs And Cosmetics Act , 1940", Malik Vijay, Eastern Book Company
7. The Drugs ( Prices Control) Order, 1987: Along with New Drugs Policy, 1994 And Drugs (Prices Control) Order 1995", Law Publication
8. The Pharmacy Act, 1948", Law Publication
9. The Prevention Of Illicit Traffic In Narcotic Drugs And Psychotropic Substances Act, 1988", Law Publication
10. The Standards of Weights and Measures Act, 1976", Law Publication.

**SUBJECT** : **Physical Chemistry**
**SUBJECT CODE** : **B204T & B204P**
**RATIONALE** : Physical properties of drugs and chemicals have immense effect on drug manufacturing, efficacy and stability. Strong knowledge of these subjects becomes mandatory for any professional.

**COURSE OBJECTIVES:**

1. To learn the important Physical properties of drugs and chemicals, that can significantly affect the drug manufacturing.
2. To quantify these physical properties and methods to alter the same so as to avail desired levels

**LEARNING OUTCOMES:** The student should be able to:

1. Define and explain the various physical properties.
2. Measure the physical properties and demonstrate the methods to alter the same by different ways.
3. Narrate and explain the laws, theories pertaining to these properties.
4. Carry out simple calculations involved with these properties.

**PREREQUISITES: Basic chemistry**

**TEACHING AND EVALUATION SCHEME:**

| SUB CODE | TITLE OF SUBJECT | TEACHING SCHEME | | | CREDITS | | EVALUATION SCHEME | | | | TOTAL MARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INTERNAL | | EXTERNAL | | |
| | | T | P | TOTAL HRS | T | P | T | P | T | P | |
| B204T & B204P | Physical Chemistry | 4 | 3 | 7 | 3 | 3 | 20 | 20 | 80 | 80 | 200 |

**CONTENT:**

| | | |
|---|---|---|
| 1 | Gaseous and solid state chemistry | 15 |
| | Behavior of Gases: Kinetic theory of gases, deviation from behaviors and explanation. | |
| | Solid State: Crystalline structures, lattices, physical properties. | |
| | Adsorption: Freudlich and Gibbs adsorption isotherms, Langmuir theory of adsorption. | |
| 2 | The Liquid State | 15 |
| | The Liquid State: Physical properties (surface tension, perachor, viscosity, refractive index, optical rotation, dipole moments and chemical constituents). | |
| | Solutions: Ideal and real solutions, solutions of gases in liquids, colligative properties, partition coefficient, conductance and its measurement, Debye Huckel theory. | |
| 3 | Thermodynamics | 25 |
| | Thermodynamics: first, second and third laws, Zeroth law, absolute temperature scale, thermo chemical equations, phase equilibria and phase rule. | |
| 4 | Photochemistry | 10 |
| | Photochemistry: Consequences of light absorption, Jablenski diagram, Lambert-Beer Law, Quantum efficiency. | |
| 5 | Chemical Kinetics | 25 |
| | Chemical Kinetics: Zero, first and second order reactions, complex reactions, theories of reaction kinetics, characteristics of homogeneous and heterogeneous catalysts, acid base and enzyme catalysis. | |
| 6 | Inorganic Radio Pharmaceuticals | 10 |
| | Inorganic Radio Pharmaceuticals: Nuclear radio pharmaceuticals, Reactions, Nomenclature, Methods of obtaining their standards and units of activity, measurement of activity, clinical applications and dosage, hazards and precautions. | |

**B204P Physical Chemistry**

| | |
|---|---|
| 1 | Introduction to laboratory glass wares and analytical balance. |
| 2 | To determine the viscosity and specific gravity of the given liquid. |

| | |
|---|---|
| 3 | To determine the surface tension of the given liquids. |
| 4 | To study the effect of temperature on viscosity of the given liquid. |
| 5 | To study the effect of temperature on surface tension of the given liquid. |
| 6 | To determine the molecular weight of unknown compound by Rast's Camphor method. |
| 7 | To study the first order reaction kinetics and to determine its rate constant. |
| 8 | To study the second order reaction kinetics and to determine its rate constant. |
| 9 | To check the validation of Freudlich and Langmuir adsorption isotherm using charcoal and acetic acid. |
| 10 | To determine heat of solution of a substance by solubility method |
| 11 | To determine order of reaction by half-life method |
| 12 | To study the phase Behaviour of three component system and construct ternary phase diagram for the same, showing the two phases and one phase. |
| 13 | To determine the concentration and its specific rotation of optically active substance by polarimetry. |
| 14 | To determine relative strength of two acids. |
| 15 | To determine the energy of activation of methyl acetate hydrolysis in presence of an acid. |
| 16 | To verify Ostwald's dilution law by conductance measurement. |

**BOOKS RECOMMENDED**


1. B.S. Bahl, G.D. Tuli, Arun Bahl, Essentials of Physical Chemistry, Reprinted 24th Edition, S. Chand and Company Ltd., New Delhi, 2004.
2. L.M. Atherden, Bentley and Driver's Textbook of Pharmaceutical Chemistry, 8th Edition, Oxford University Press, Bombay, 1994.
3. S. Glasstone. Textbook of Physical Chemistry, 2nd Ed, Rajiv Beri Macmillan India Ltd, New Delhi, 1995.
4. G. Raj, Advanced Physical Chemistry, 20th Edition, Goel Publishing House, Meerut, 1996-97.
5. J. B. Yadav, Advanced Practical Physical Chemistry, 15th Ed. Goel Publishing House, Meerut, 1997.
6. W. J. Moore, Physical Chemistry, 5th Edition, Orient Longman Pvt. Ltd., New Delhi, 2004.
7. I. Das, A. Sharma, N. R. Agrawal, An Introduction to Physical Chemistry, Revised 2nd Edition, New Age International Publishers, New Delhi, 2005.
8. B. Viswanathan, P.S. Raghawan, Practical Physical Chemistry, 1st Edition, Viva Books Pvt. Ltd., 2005.
9. P.L. Soni, O.P. Dharmarha, U.N. Dash, Textbook of Physical Chemistry, 22nd Edition, Sultan Chand and Sons, New Delhi, 2001.
10. Dr. J.N. Gurtu, Dr. Hemant Snehi, Advanced Physical Chemistry, 7th Revised and Enlarged Edition, Pragati Prakashan, Meerut, 2000.
11. D.P. Shoemaker, C.W. Garland, J.W. Nibler, Experiments in Physical Chemistry, 5th Edition, McGraw Hill International Edition, New York, 1989.
12. S. Glasstone, D. Levis, Elements of Physical Chemistry, 2nd Edition, Macmillan and Co. Ltd, 1970.
13. R.M. Verma, A Textbook of Physical Chemistry, Volume – I & II, 1st Edition, CBS Publishers and Distributors, Delhi, 1992.
14. P.W. Atkins, Physical Chemistry, 5th Edition, Oxford University Press, UK, 1994.
15. P.S. Rachavan, M.S. Shethi, Concepts and Problems in Physical Chemistry, 1st Edition, Discovery Publishing House, New Delhi, 1997.
16. A.W. Adamson, Physical Chemistry of Surfaces, 5th Edition, A Wiley Interscience Publication, New York, 1990.
17. C.K. Vemulapathi, Physical Chemistry, 1st Edition, Prentice-Hall of India Pvt. Ltd., New Delhi, 1997.
18. C.R. Metz, Schaum's Solved Problems Series, 2000 solved problems in Physical Chemistry, 2nd Edition, McGraw Hill Publishing Company, USA, 1989.
19. R. Chang, Physical Chemistry with Applications to Biological Systems, 2nd Edition, Macmillan Publishing Co., New York, 1981.
20. Prof. S.K. Dutta, Principles of Physical Chemistry and Biophysical Chemistry, 1st Edition, Books and Allied (P) Ltd., Kolkata, 2007.

**SUBJECT** **: Seminar presentation-I**
**SUBJECT CODE** **: B205P**
**RATIONALE** : The subject is an extension of English Communication taught in first semester. The seminar presentation will help the student to gather literature, compile, comprehend, prepare power point presentation and present the same in the class. This will sharpen the communication skill and also develop confidence.

**COURSE OBJECTIVES** **:** To make the student capable of undergoing literature survey, compile the collected literature in a presentable form and then actually present the same in the class

**LEARNING OUTCOMES:** The student will be able to:

1. Collect literature from library books, journals and through internet sources.
2. Compile the literature and prepare a written report
3. Make power point presentations

**PREREQUISITES:** Basic knowledge of computers and MS-power point is must

**TEACHING AND EVALUATION SCHEME:**

| SUB CODE | TITLE OF SUBJECT | TEACHING SCHEME | | | CREDITS | EVALUATION SCHEME | | | | TOTAL MARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | INTERNAL | | EXTERNAL | | |
| | | T | P | TOTAL HRS | | T | P | T | P | |
| B205P | Seminar Presentation-I | - | 3 | 3 | 3 | -- | 20 | -- | 80 | 100 |

**SUBJECT : Pharmaceutical Analysis -I**
**SUBJECT CODE : B206T & B206P**
**RATIONALE** : Measuring Drug purity is a primary requirement to ensure the quality of drugs. Quantifying the purity of compound can be done by different techniques. Some of the most commonly used techniques will be taught in this subject. This will make the student capable to work in a quality control department of the pharmaceutical industry.

**COURSE OBJECTIVES:**

1. To make student learn the basic principles of various assay techniques commonly used in quality control department of any pharmaceutical industry.
2. To provide the hands-on experience by actually conducting these assays in the lab.

**LEARNING OUTCOMES:** The student should be able to:

1. Correctly sample the drug for testing
2. Carry out calculations involved in basic statistics.
3. Narrate the principles of methods and instruments used in assay of various drugs and chemicals.
4. Conduct assays of some drugs using these methods and instruments.

**PREREQUISITES:** Basic knowledge of physics, chemistry and pharmaceutical calculations taught in earlier semesters

**TEACHING AND EVALUATION SCHEME:**

| SUB CODE | TITLE OF SUBJECT | TEACHING SCHEME | | | CREDITS | | EVALUATION SCHEME | | | | TOTAL MARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | INTERNAL | | EXTERNAL | | |
| | | T | P | TOTAL HRS | T | P | T | P | T | P | |
| B206T & B206P | Pharmaceutical Analysis -I | 4 | 3 | 7 | 3 | 3 | 20 | 20 | 80 | 80 | 200 |

**CONTENT:**

| | | |
|---|---|---|
| 1 | **Errors and statistics**<br>Types of error, Precision and accuracy, Mean and Standard deviation, Confidence interval, Comparison of results and means of two samples, Paired T-test, Q-test, Correlation and linear regression, comparison of more than two means, Significant figures, Rules for retaining significant digits. | 20 |
| 2 | **Sampling**<br>Basis of sampling, sampling procedure and selection of sample, factors affecting sampling: sampling and physical state, crushing, grinding and hazards in sampling | 10 |
| 3 | **Introduction to titrimetric analysis:**<br>Significance of quantitative analysis in quality control, Different techniques of analysis, Preliminaries and definitions, Fundamentals of volumetric analysis, methods of expressing concentration, primary and secondary standards | 10 |
| 4 | **Titrimetric methods**<br>**Acid Base Titrations:** Acid base concepts, Role of solvent, Relative strengths of acids and bases, Ionization, Law of mass action, Common-ion effect, Ionic product of water, pH, Hydrolysis of salts, Henderson-Hessel batch equation, Buffer solutions, Buffer capacity, Neutralization curves, Acid-base indicators, Theory of indicators, Choice of indicators, Choice of indicators, mixed indicators, Polyprotic system, Polyamine and amino acid systems, Amino acid titration, applications in assay of $H_3PO_4$, NaOH, $CaCO_3$ etc. | 50 |

| | | |
|---|---|---|
| | **Oxidation Reduction Titrations:** Concepts of oxidation and reduction, Redox reactions, Strengths and equivalent weights of oxidizing and reducing agents, Theory of redox titrations, Redox indicators, Cell representations, Measurement of electrode potential, Oxidation-reduction curves, Iodimetry and Iodometry, Titrations involving Ceric sulphate, Potassium iodate, Potassium bromate, Potassium permanganate, Titanous chloride and Sodium 2,6-dichlorophenol indophenol.<br>**Non-aqueous titrations:** Introduction and theory, solvents and indicators, application<br>**Complexometric titrations:** Introduction, complex ions, complexation, stability of complexes, factors influencing stability of complexes, complexones, stability constants of EDTA complexes, types of EDTA titration, Metal ion indicator, determination of cations like aluminium, barium, bismuth, calcium, copper, iron (III), silver, determination of cations in mixture i.e. Ca and Mg ions, Hardness of water, $Ca^{+2}$, $Ba^{+2}$, $Mg^{+2}$, $Mn^{+2}$ and $Zn^{+2}$, determination of anions e.g. Halides, Phosphates, Sulphates. | |
| 5 | **Miscellaneous Determinations**<br>**Miscellaneous Determinations:** Exercise involving Diazotization, Kjeldahl, Oxygen flask combustion, Karl-Fischer titration, Geometry methods. | 10 |

**B206P Pharmaceutical Analysis –I Practicals**

| | |
|---|---|
| The students should be introduced to the main analytical tools through demonstrations. They should have a clear understanding of typical analytical balance, the requirements of a good balance, weights, care and use of balance, methods of weighing and errors in weighing. The students should also be acquainted with the general apparatus required in various analytical procedures. | |
| 1 | Standardization of analytical weights and calibration of volumetric apparatus. |
| 2 | Acid base titrations: Preparation and standardization of acids and bases; some exercises related with determination of acids and bases separately or in mixture form, some official assay procedures e.g. boric acid should also be covered. |
| 3 | Oxidation Reduction Titrations: Preparation and standardization of some redox titrants e.g. potassium permanganate, potassium dichromate, iodine, sodium thiosulphate, etc. Some exercises related to determination of oxidizing and reducing agents in the sample shall be covered. Exercises involving potassium iodate, potassium bromate, iodine solution, tetanous chloride, and Sodium 2, 6-dichlorophenol indophenol and ceric ammonium sulphate. |
| 4 | Non-aqueous titrations: Preparation and standardization of perchloric acid and sodium/potassium/lithium methoxides solutions; Estimations of some Pharmacopoeial products. |
| 5 | Complexometric titrations: Preparation and standardization of EDTA solution, some exercise related to pharmacopoeial assays by Complexometric titrations. |
| 6 | Miscellaneous Determinations: Exercise involving Diazotization, Kjeldahl, Oxygen flask combustion, Gasometry an electrophoresis methods. Determination of alcohol content in liquid Galenicals, procedure (BPC) shall be covered. |

**BOOKS RECOMMENDED:**


| | |
|---|---|
| 1 | Vogel's Text book of Quantitative Chemical Analysis, J. Mandham, R.C. Denney, J.D. Bernes, M.J.K. Thomas, 5th Edition, ELBS, UK, 1996. |
| 2 | Dr. A.V. Kasture, Dr. K.R. Mahadik, Dr. S.G. Wadodkar, Dr. H.N. More, A Textbook of Pharmaceutical Analysis, Volume – I, 8th Edition, Nirali Prakashan, Pune, 2002. |
| 3 | G.D. Christian, Analytical Chemistry, 5th Edition, John Wiley & Sons, New York, 1994. |
| 4 | R.A. Day and A.L. Underwood, Quantitative Analysis, 6th Edition, Prentice-Hall of India Pvt. Ltd., New Delhi, 1993. |
| 5 | K.A. Connors, A Textbook of Pharmaceutical Analysis, 3rd Edition, John Wiley & Sons, New York, 1982. |
| 6 | J.H. Kennedy, Analytical Chemistry Principles, 2nd Edition, Saunders College Publishing, New York, 1990. |
| 7 | D.A. Skoog, D.M. West, F.J. Holler, Analytical Chemistry: An Introduction, 6th Edition, Saunders College Publishing, New York, 1994. |
| 8 | D.A. Skoog, D.M. West, F.J. Holler, Fundamentals of Analytical Chemistry, 7th Edition, Saunders College Publishing, New York, 1996. |
| 9 | The Indian Pharmacopoeia 2007, Volume-I, II & III, Controller of Publication, 2007. |
| 10 | R.M. Verma, Analytical Chemistry, 2nd Edition, CBS Publishers, New Delhi, 1991. |
| 11 | S.M. Khopkar, Basic Concepts of Analytical Chemistry, 2nd Edition, New Age International Publishers, New Delhi, 1998. |
| 12 | A.H. Backett, J.B. Stenlake, Practical Pharmaceutical Chemistry, 4th Edition, CBS Publishers, Delhi, 1997. |
| 13 | V. Alexeyev, Quantitative Chemical Analysis, 1st Edition, Mir Publishers, Moscow, 1994. |
| 14 | I.M. Pande, Systemic Analytical Chemistry, 1st Edition, Central Book Depot, Allahabad, 1965. |
| 15 | R. Kellner, J.M. Mermet, M. Otto, H.M. Widmer, Analytical Chemistry, 1st Edition, Wiley-VCH, 1998. |
| 16 | J.A. Dean, Analytical Chemistry Handbook, 1st Edition, Mc Graw Hill Inc., New York, 1995. |
| 17 | T. Higuchi, Pharmaceutical Analysis, 1st Edition, CBS Publishers, New Delhi, 1997 |
| 18 | P.D. Sethi, Quantitative Analysis of Drugs in Pharmaceutical Formulations, 3rd Edition, CBS Publishers, New Delhi, 1997. |
| 19 | Y. Anjaneyulu, K. Chandrasekhar, Valli Manickam, A Textbook of Analytical Chemistry, 1st Edition, Pharma Book Syndicate, Hyderabad, 2006. |
| 20 | F.W. Fifield, D. Kealey, Principle and Practice of Analytical Chemistry, 5th Edition, Blackwell Science Ltd., 2000. |