

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

Semester - III

Sr. No.	Course Code	Course Title	Teaching Scheme			
			L	LPW/PW	T	C
1	BP301T	Pharmaceutical Organic Chemistry II – Theory	3	-	1	4
2	BP305P	Pharmaceutical Organic Chemistry II –Practical	-	4	-	2
3	BP302T	Physical Pharmaceutics I – Theory	3	-	1	4
4	BP306P	Physical Pharmaceutics I– Practical	-	4	-	2
5	BP303T	Pharmaceutical Microbiology – Theory	3	-	1	4
6	BP307P	Pharmaceutical Microbiology – Practical	-	4	-	2
7	BP309T	Biochemistry – Theory	3	-	1	4
8	BP310P	Biochemistry – Practical	-	4	-	2
9	BP311T	Pathophysiology – Theory	3	-	1	4
		Total	15	16	5	28
			36			

L: Lectures, P/T: Practicals/Tutorial, C: Credits
 LPW: Laboratory / Project Work

SEE: Semester End Examination
 CE: Continuous Evaluation

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

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

Sr. No.	Course Code	Course Title	Internal Assessment				Semester End Examination		
			Continuous Mode	Sessional Exams		Total	Marks	Duration	Total Marks
				Marks	Duration				
1	BP301T	Pharmaceutical Organic Chemistry II – Theory	10	15	1 Hr	25	75	3 Hr	100
2	BP305P	Pharmaceutical Organic Chemistry II –Practical	5	10	4 Hr	15	35	4 Hr	50
3	BP302T	Physical Pharmaceutics I – Theory	10	15	1 Hr	25	75	3 Hr	100
4	BP306P	Physical Pharmaceutics I– Practical	5	10	4 Hr	15	35	4 Hr	50
5	BP303T	Pharmaceutical Microbiology – Theory	10	15	1 Hr	25	75	3 Hr	100
6	BP307P	Pharmaceutical Microbiology – Practical	5	10	4 Hr	15	35	4 Hr	50
7	BP309T	Biochemistry – Theory	10	15	1 Hr	25	75	3 Hr	100
8	BP310P	Biochemistry – Practical	5	10	4 Hr	15	35	4 Hr	50
9	BP311T	Pathophysiology – Theory	10	15	1 Hr	25	75	3 Hr	100
Total			70	115	25 Hrs	185	515	31 Hrs	700

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

NIRMA UNIVERSITY
Institute of Pharmacy
(B. Pharm.)
(Semester - III)

L	T	P	C
3	1	-	4

Course Code	BP301T
Course Title	Pharmaceutical Organic Chemistry II - Theory

Scope:

This subject deals with general methods of preparation and reactions of some organic compounds. Reactivity of organic compounds are also studied here. The syllabus emphasizes on mechanisms and orientation of reactions. Chemistry of fats and oils are also included in the syllabus.

Objectives:

Upon completion of the course student shall be able to -

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

Course Learning Outcomes (CLO):

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

1. Remember properties, reactions and analysis of fats and oils.
2. Understand physical properties, preparations, reactions, structure and uses of various phenols.
3. Describe stability and reactions of cycloalkanes.
4. Discuss properties, preparation and reactions of aromatic amines and acids.
5. Explain aromaticity, properties, preparations, reactions and uses of benzene and its derivatives.
6. Draw synthesis, reaction with medicinal uses of polynuclear hydrocarbons.

Syllabus:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained. To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

Teaching hours: 45 Hours

w.e.f. academic year 2018-19 and onwards

UNIT I**10 Hours****Benzene and its derivatives:**

Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule.

Reactions of benzene - nitration, sulphonation, halogenation- reactivity, Friedel crafts alkylation- reactivity, limitations, Friedel crafts acylation.

Substituents, 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.

UNIT II**10 Hours****Phenols*:**

Acidity of phenols, effect of substituents on acidity, qualitative tests, structure and uses of phenol, cresols, resorcinol, naphthols.

Aromatic Amines*:

Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts.

Aromatic Acids*:

Acidity, effect of substituents on acidity and important reactions of benzoic acid.

UNIT III**10 Hours****Fats and Oils:**

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.

UNIT IV**08 Hours****Polynuclear hydrocarbons:**

Synthesis, reactions.

Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives.

UNIT V**07 Hours****Cyclo alkanes*:**

Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only.

Tutorials**Teaching Hours: 15 Hours**

Tutorials will be based on above syllabus.

Suggested Readings^:(Latest edition)

1. Morrison, R. T., Boyd, R. N. *Organic Chemistry*. Prentice Hall, Inc., USA.
2. Finar, I. L. *Organic Chemistry*, Vol. I, ELBS.
3. Bahl, B. S. *Text Book Of Organic Chemistry {For B. Sc. Students}*. S. Chand And Company Ltd Ram Nagar, New Delhi.
4. March, J. *Advanced organic chemistry: reactions, mechanisms, and structure*. John Wiley & Sons,.
5. Soni, P. L. *Fundamental organic chemistry*. New Delhi: S. Chand.
6. Mann, F. G., & Saunders, B. C. *Practical organic chemistry*. London: Longman.
7. Solomons, T. W., Fryhle, C. B., & Johnson, R. G. *Organic chemistry*. New York: Wiley.

w.e.f. academic year 2018-19 and onwards

8. Ahluwalia, V. K. *Organic Reaction Mechanism*. New Delhi: Ane Books India.
9. Mann, F. G. *Practical organic chemistry*. Pearson Education India.
10. Vishnoi, N. K. *Advanced practical organic chemistry*. Vikas Publishing House Pvt. Limited.
11. Pavia, D. L. *Introduction to organic laboratory techniques: a small scale approach*. Cengage Learning.
12. Gurudeep, C. R., & Gurudeep, C. R. *Reaction Mechanism and Reagents in Organic Chemistry*. Bombay: Himalaya Publishing House.
13. Furniss, B. S. *Vogel's textbook of practical organic chemistry*. Pearson Education India.

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 ^ this is not an exhaustive list

(B. Pharm)
(Semester - III)

L	T	P	C
-	-	4	2

Course Code	-	BP305P
Course Title	Pharmaceutical Organic Chemistry II – Practical	

Syllabus:

Teaching hours: 60 Hours

I. Experiments involving laboratory techniques:

- Recrystallization
- Steam distillation

II. Determination of following oil values (including standardization of reagents):

- Acid value
- Saponification value
- Iodine value

III. Preparation of compounds:

- Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction.
- 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline.
- Acetanilide by halogenation (Bromination) reaction.
- 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction.
- Benzoic acid from Benzyl chloride by oxidation reaction.
- Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
- 1-Phenyl azo-2-naphthol from Aniline by diazotization and coupling reactions.
- Benzil from Benzoin by oxidation reaction.
- Dibenzal acetone from Benzaldehyde by Claisen Schmidt reaction.
- Cinnamic acid from Benzaldehyde by Perkin reaction.
- *p*-Iodo benzoic acid from *p*-amino benzoic acid.

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w.e.f. academic year 2018-19 and onwards

(B. Pharm)
(Semester - III)

L	T	P	C
3	1	-	4

Course Code	BP302T
Course Title	Physical Pharmaceutics I - Theory

Scope:

The course deals with the various physical and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Objectives:

After completion of course student is able to know

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms.
2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations.
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Learning Outcomes (CLO):

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

1. Recognize basic concepts of physical and chemical properties of various materials
2. Describe principles and methodology related to above properties.
3. Determine properties of solid and liquid samples using various methods.
4. Discuss factors affecting properties of drug and excipients.
5. Explain particle properties and its impact on various parameters.
6. Solve calculations related to above topics.

Syllabus:

Teaching hours: 45 Hours

UNIT I

10 Hours

Solubility of drugs:

Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, 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.

UNIT II

12 Hours

States of Matter and properties of matter:

State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point,

eutectic mixtures, gases, aerosols-inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid- crystalline, amorphous & polymorphism and its applications.

Physicochemical properties of drug molecules:

Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications.

UNIT III

08 Hours

Surface and interfacial phenomenon:

Liquid interface, surface & interfacial tensions, surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface and its determination.

UNIT IV

08 Hours

Complexation and protein binding:

Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.

UNIT V

07 Hours

pH, buffers and Isotonic solutions:

Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.

TUTORIALS

Teaching hours: 15 Hours

Tutorials will be based on above syllabus

Suggested Readings[^]: (Latest edition)

1. Martin, A. *Physical Pharmacy*. New York, Lippincott Williams & Wilkins
2. Eugene, P. *Experimental Pharmaceutics*. USA, Burgess Pub. Co.
3. Cooper and Gunn. *Tutorial Pharmacy*. Delhi. CBS Publishers & Distributors
4. Stocklosam, J. *Pharmaceutical Calculations*. Philadelphia, USA, Lea & Febiger
5. Liberman, H.A, Lachman, C. *Pharmaceutical Dosage forms, Tablets. Volume-1 to 3*, New York; USA, Marcel Dekker Inc
6. Liberman, H.A, Lachman, C. *Pharmaceutical Dosage forms, Disperse systems. Volume-1 to 3*, New York, USA, Marcel Dekker Inc
7. Ramasamy, C. Manavalan, R. *Physical Pharmaceutics*. Chennai, Vignesh Publisher.
8. Subramanyam, C.V.S, Thimmasettee, J. *Laboratory Manual of Physical Pharmaceutics*. Delhi, Vallabh Prakashan
9. Subramanyam, C.V.S. *Physical Pharmaceutics*. Delhi, Vallabh Prakashan
10. Jain, G. Khar, R.K. *Test book of Physical Pharmacy*. India, Elsevier

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(B. Pharm.)
(Semester - III)

L	T	P	C
-	-	4	2

Course Code	BP306P
Course Title	Physical Pharmaceutics I - Practical

Syllabus:

Teaching hours: 60 Hours

1. Determination the solubility of drug at room temperature
2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl₄ and water
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of surface tension of given liquids by drop count and drop weight method
7. Determination of HLB number of a surfactant by saponification method
8. Determination of Freundlich and Langmuir constants using activated char coal
9. Determination of critical micellar concentration of surfactants
10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method
11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method

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(B. Pharm.)
(Semester - III)

L	T	P	C
3	1	-	4

Course Code	BP303T
Course Title	Pharmaceutical Microbiology - Theory

Scope:

Study of all categories of microorganisms especially for the production of alcohol antibiotics, vaccines, vitamins, enzymes etc.

Objectives:

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

1. Understand methods of identification, cultivation and preservation of various microorganisms.

w.e.f. academic year 2018-19 and onwards

2. To understand the importance and implementation of sterilization in pharmaceutical processing and industry.
3. Learn sterility testing of pharmaceutical products.
4. Carried out microbiological standardization of Pharmaceuticals.
5. Understand the cell culture technology and its applications in pharmaceutical industries.

Course Learning Outcomes (CLO):

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

1. Understand fundamentals of pharmaceutical microbiology and cell culturing.
2. Identify various types of microorganisms.
3. Describe principle, operations and applications of various sterilization techniques.
4. Explain concept of disinfection, sterility testing, contamination and its prevention.
5. Practice aseptic processing for cultivation and isolation of microorganism.
6. Evaluate antibiotics, vitamins and amino acids by microbiological assay.

Syllabus:

Teaching hours: 45 Hours

UNIT I

10 Hours

Basics of Microbiology:

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).

Types of Microscopy:

Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy.

UNIT II

10 Hours

Identification of Bacteria:

Identification of bacteria using staining techniques (simple, Gram's & Acid fast staining) and biochemical tests (IMViC).

Sterilization:

Study of principle, procedure, merits, demerits and applications of physical, chemical, gaseous, radiation and mechanical method of sterilization and concept of D, Z and F Value. Evaluation of the efficiency of sterilization methods. Equipment employed in large scale sterilization. Sterility indicators.

UNIT III

10 Hours

Fungi and Viruses:

Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses.

Disinfection:

Classification and mode of action of disinfectants, Factors influencing disinfection, antiseptics and their evaluation for bacteriostatic and bactericidal actions.

Sterility Testing:

Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

w.e.f. academic year 2018-19 and onwards

UNIT IV

08 Hours

Aseptic Practice:

Designing of aseptic area, laminar flow equipment; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.

Microbiological Assay:

Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. Assessment of a new antibiotic.

UNIT V

07 Hours

Contamination and Prevention:

Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage. Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.

Cell Culture:

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.

Tutorials

Teaching hours: 15 Hours

Tutorials will be based on above syllabus

Suggested Readings[^]: (Latest edition)

1. Denyer, Stephen P.; Hodges, Norman; Gorman, Sean P.; Gilmore, Brendan F. *Hugo and Russell's Pharmaceutical Microbiology*. Hoboken, NJ: Wiley-Blackwell
2. Prescott and Dunn's *Industrial Microbiology*. Delhi, India: CBS Publishers & Distributors.
3. Pelczar, Chan, Kreig. *Microbiology*. India: Tata McGraw-Hill Education
4. Malcolm, Harris. *Pharmaceutical Microbiology*. London, UK: Baillière, Tindall and Cox.
5. Rose Anthony H. *Industrial Microbiology*. London, UK: Butterworths
6. Frobisher, Hinsdill, Crabtree, Goodheart. *Fundamentals of Microbiology*. Japan: W.B. Saunders Company.
7. Carter, S.J. *Cooper and Gunn's Tutorial Pharmacy*. Delhi, India: CBS Publisher and Distribution.
8. Pepler, H. J.; Perlman, D. *Microbial Technology: Fermentation technology*. USA: Academic Press of University of Michigan.
9. Indian Pharmacopoeia, British Pharmacopoeia, United States Pharmacopoeia
10. Ananthnarayan, Paniker. *Text Book of Microbiology*. Chennai, India: Orient-Longman Publisher.
11. Edward, Alcamo. *The Fundamentals of Microbiology*. USA: Jones & Bartlett Publishers
12. Jain N. K. *Pharmaceutical Microbiology*. Delhi, India: Vallabh Prakashan
13. Holt J. G.. *Bergey's Manual of Systematic Bacteriology*. Baltimore, MD, USA: Williams and Wilkins

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(B. Pharm.)
(Semester - III)

L	T	P	C
-	-	4	2

Course Code	BP307P
Course Title	Pharmaceutical Microbiology - Practical

Syllabus:

Teaching hours: 60 Hours

1. Introduction and study of different equipment and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.

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File

(B. Pharm)
(Semester - III)

L	T	P	C
3	1	-	4

Course Code	BP309T
Course Title	Biochemistry - Theory

Scope:

Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

Objectives:

Upon completion of course, student shall able to -

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

Course Learning Outcomes (CLO):

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

1. Understand the general principles of biochemistry.
2. Discuss the basic metabolic pathways and mechanisms in biological energy transduction.

3. Report the biochemical reactions and calculate the bioenergetics of energy yielding biochemical reactions.
4. Describe the structure and function of biomolecules and their roles in energy transduction.
5. Discuss the consequences of a variety of metabolic and genetic diseases.
6. Identify the enzyme catalyzed reactions in the body with its kinetics.

Syllabus:

Teaching hours: 45 Hours

UNIT I

08 Hours

Biomolecules:

Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

Bioenergetics:

Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.

Energy rich compounds; classification; biological significances of ATP and cyclic AMP

UNIT II

10 Hours

Carbohydrate metabolism:

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

Hormonal regulation of blood glucose level and Diabetes mellitus

Biological oxidation:

Electron transport chain (ETC) and its mechanism.

Oxidative phosphorylation & its mechanism and substrate level phosphorylation Inhibitors ETC and oxidative phosphorylation/Uncouplers

UNIT III

10 Hours

Lipid metabolism:

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: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.

Amino acid metabolism:

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, alcaptonuria, tyrosinemia)

Synthesis and significance of biological substances: 5-HT, melatonin, dopamine, noradrenaline, adrenaline

Catabolism of heme: hyperbilirubinemia and jaundice

UNIT IV

10 Hours

Nucleic acid metabolism and genetic information transfer:

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
Genetic code, Translation or Protein synthesis and inhibitors

UNIT V

07 Hours

Enzymes and Vitamin:

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 including design of new drugs.
Coenzymes –Structure and biochemical functions.
Details of Vitamin.

Tutorials

Teaching hours: 15 Hours

Tutorials will be based on above syllabus.

Suggested Readings[^]: (Latest Editions)

1. Nelson, D. L., Lehninger, A. L., & Cox, M. M. *Lehninger principles of biochemistry*. Macmillan.
2. Murray, R. K., Granner, D. K., Mayes, P., & Rodwell, V. *Harper's illustrated biochemistry*. New York: McGraw-Hill.
3. Berg, J. M., Tymoczko, J. L., & Stryer, L. *Biochemistry*. New York: WH Freeman,
4. Satyanarayan, U. & Chakrapani, D. *Biochemistry*. India: Elsevier.
5. Rama Rao, A. V. S., & Devlin, T. M. *Textbook of Biochemistry: For Medical Students*. UBS publishers.
6. Deb, A. C., *Fundamentals of biochemistry*. New Central Book Agency (P) Limited.
7. Conn, E., & Stumpf, P. *Outlines of biochemistry*. John Wiley & Sons.
8. Gupta, R.C. & Bhargava, S. *Practical Biochemistry*. CBS Publishers & Distributors Pvt. Ltd
9. Mu, P., & Plummer, D. T. *Introduction to practical biochemistry*. Tata McGraw-Hill Education.
10. Rajagopal, G. & Ramakrishna S. *Practical Biochemistry for Medical Students*. orient blackswan
11. Varley, H. *Practical clinical biochemistry*. London: William Heine-mann Medical Books. Ltd.

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(B. Pharm)
(Semester - III)

L	T	P	C
-	-	4	2

Course Code	BP310P
Course Title	Biochemistry - Practical

Syllabus:

Teaching hours: 60 Hours

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)
2. Identification tests for Proteins (albumin and Casein)
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
4. Qualitative analysis of urine for abnormal constituents
5. Determination of blood creatinine
6. Determination of blood sugar
7. Determination of serum total cholesterol
8. Preparation of buffer solution and measurement of pH
9. Study of enzymatic hydrolysis of starch
10. Determination of Salivary amylase activity
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.

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(B. Pharm)
(Semester - III)

L	T	P	C
3	1	-	4

Course Code	BP311T
Course Title	Pathophysiology – Theory

Scope:

Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes. This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

Objectives:

Upon completion of the subject student shall be able to –

1. Describe the etiology and pathogenesis of the selected disease states;
2. Name the signs and symptoms of the diseases; and
3. Mention the complications of the diseases.

Course Learning Outcomes (CLO):

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

1. Recall the basic principles of Cell injury and Adaptation.
2. Understand pathophysiology of cardiovascular diseases, respiratory diseases, and renal disorders.
3. Explain hematological diseases, diseases of endocrine system, nervous system and gastrointestinal system.
4. Summarize about inflammatory disorders, liver disorders and disorders of bones and joints.
5. Discuss about pathophysiology of cancer.
6. Elaborate upon infectious diseases including sexually transmitted diseases.

Syllabus:

Teaching hours: 45 Hours

UNIT I

10 Hours

Basic principles of cell injury and adaptation:

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 Acidosis & Alkalosis, Electrolyte imbalance.

Basic mechanism involved in the process of inflammation and repair:

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, Pathophysiology of Atherosclerosis.

UNIT II

10 Hours

Cardiovascular System:

Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis).

Respiratory system:

Asthma, Chronic obstructive airways diseases.

Renal system:

Acute and chronic renal failure.

UNIT III

10 Hours

Haematological Diseases:

Iron deficiency, megaloblastic anemia (Vit B₁₂ and folic acid); sickle cell anemia, thalassemia, hereditary acquired anemia, hemophilia.

Endocrine system:

Diabetes, thyroid diseases, disorders of sex hormones.

Nervous system:

Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.

Gastrointestinal system:

Peptic ulcer, inflammatory bowel diseases, jaundice, hepatitis (A,B,C,D,E,F) alcoholic liver disease.

UNIT IV**8 Hours****Disease of bones and joints:**

Rheumatoid arthritis, osteoporosis and gout.

Pathophysiology of cancer:

Classification, etiology and pathogenesis of cancer.

Diseases of Genitourinary system:

Disorders of bladder and ureter, infertility.

UNIT V**7 Hours****Infectious diseases:**

Meningitis, Typhoid, Leprosy, Tuberculosis, Urinary tract infections.

Sexually transmitted diseases:

AIDS, Syphilis, Gonorrhea.

Tutorials**Teaching hours: 15 Hours**

Tutorials will be based on above syllabus.

Suggested Readings[^]: (Latest Edition)

1. Kumar, V., Abbas, A. K., Fausto, N., & Aster, J. C. *Robbins and Cotran Pathologic Basis of Disease*. Professional Edition E-Book. Elsevier Health Sciences.
2. Mohan, H. *Textbook of pathology* (pp. 280-283). New Delhi: Jaypee Brothers Medical Publishers.
3. Laurence B, Bruce C, Bjorn K. *Goodman Gilman's The Pharmacological Basis of Therapeutics*. New York; McGraw-Hill.
4. Best and Taylor. *Physiological basis of Medical Practice*. MI USA, Williams & Wilkins Co, Riverview.
5. Walker, B. R., Colledge, N. R. *Davidson's Principles and Practice of Medicine*. E-Book. Elsevier Health Sciences.
6. Hall, J. E. Guyton and Hall. *Textbook of Medical Physiology*. E-Book. Elsevier Health Sciences.
7. Dipiro, J.T., Talbert, R.L., Yee, G.C., Matzke, G.R. Wells, B.G., Posey, M.L. *Pharmacotherapy: A Pathophysiologic Approach*. New York: Mc Graw Hills Publishers.
8. Robbins, S. L., Kumar, V., Cotran, R. S. *Robbins Basic Pathology*. Philadelphia, USA, Saunders.
9. Walker, R., & Edwards, C. *Clinical Pharmacy and Therapeutics*. Churchill Livingstone, London.
10. Sylvia, P. A., Wilson, L. M., et al. *Pathophysiology: Clinical Concepts of Disease Processes*. Elsevier Science Publishers.
11. Bullock B. A., Henze R. I. *Focus on Pathophysiology*. Lippincott Williams & Wilkins, Philadelphia.

Recommended Journals

1. The Journal of Pathology. ISSN: 1096-9896 (Online)
2. The American Journal of Pathology. ISSN: 0002-9440
3. Pathology. ISSN: 1465-3931 (Online)
4. International Journal of Physiology, Pathophysiology and Pharmacology. ISSN: 1944-8171 (Online)
5. Indian Journal of Pathology and Microbiology. ISSN-0377-4929.

L= Lecture, T= Tutorial, P= Practical, C= Credit

^this is not an exhaustive list

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