



SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR CHHATTISGARH
BACHELOR OF PHARMACY SEMESTER III

SCHEME OF TEACHING AND EXAMINATION

Table-I: Course of study for semester III

Sr. No.	Subject Code	Name of the Course with PCI code	Internal assessment						End semester exams			Total Marks		
			TA	Sessional exams			Teaching hours per week			Credit	Marks		Duration	
				CT	Duration	Total	L	T	P					
1	BPH301T	Pharmaceutical Organic Chemistry II – Theory	10	15	1 Hr	25	3	1		4	75	25	3 Hrs	100
2	BPH302T	Physical Pharmaceutics I – Theory	10	15	1 Hr	25	3	1		4	75	25	3 Hrs	100
3	BPH303T	Pharmaceutical Microbiology – Theory	10	15	1 Hr	25	3	1		4	75	25	3 Hrs	100
4	BPH304T	Pharmaceutical Engineering – Theory	10	15	1 Hr	25	3	1		4	75	25	3 Hrs	100
5	BPH301P	Pharmaceutical Organic Chemistry II – Practical	05	10	4 Hrs	15			4	2	35	15	4 Hrs	50
6	BPH302P	Physical Pharmaceutics I – Practical	05	10	4 Hrs	15			4	2	35	15	4 Hrs	50
7	BPH303P	Pharmaceutical Microbiology – Practical	05	10	4 Hrs	15			4	2	35	15	4 Hrs	50
8	BPH304P	Pharmaceutical Engineering – Practical	05	10	4 Hrs	15			4	2	35	15	4 Hrs	50
			60	100	20 Hrs	160	Credit: 24			440	160	28 Hrs	600	

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Course Title	Pharmaceutical Organic Chemistry II – Theory				
Course Code	BPH301T	Total theory periods : 45 Hrs		Total Tutorial periods : 15	
Course Credits	L	T	P	Credits	Total marks in the end semester : 75
	3	1		4	Minimum of class tests to be conducted : 02
Prerequisites	Basic fundamental concept studied in brief in diploma in Pharmacy in Organic chemistry				
Course objectives	Upon completion of the course the student shall be able to; 1. write the structure, name and the type of isomerism of the organic compound 2. write the reaction, name the reaction and orientation of reactions 3. account for reactivity/stability of compounds, 4. prepare organic compounds				
Course Contents	Course Content: <ul style="list-style-type: none">• 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 <p style="text-align: center;">Unit I</p> <p style="text-align: right;">10 Hours</p> <ul style="list-style-type: none">• Benzene and its derivatives<ul style="list-style-type: none">A. Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's ruleB. Reactions of benzene - nitration, sulphonation, halogenation- reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation.C. Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reactionD. Structure and uses of DDT, Saccharin, BHC and Chloramine <p style="text-align: center;">Unit II</p> <p style="text-align: right;">10 Hours</p> <ul style="list-style-type: none">• 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.				

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	<ul style="list-style-type: none">• Aromatic Acids* –Acidity, effect of substituents on acidity and important reactions of benzoic acid. <p style="text-align: right;">Unit III</p> <p style="text-align: right;">10 Hours</p> <ul style="list-style-type: none">• Fats and Oils<ul style="list-style-type: none">a. Fatty acids – reactions.b. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.c. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination. <p style="text-align: right;">Unit IV</p> <p style="text-align: right;">08 Hours</p> <ul style="list-style-type: none">• Polynuclear hydrocarbons:<ul style="list-style-type: none">a. Synthesis, reactionsb. Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives <p style="text-align: right;">Unit V</p> <p style="text-align: right;">07 Hours</p> <ul style="list-style-type: none">• 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
Course outcomes	Write nomenclature, preparation and properties of aniline, phenols, and aromatic carboxylic acids. Discuss biochemical organization/ functioning of the cell and of its enzymatic machinery. Write synthetic routes to prepare organic compounds And nomenclature, preparation and properties of heterocyclic compounds.

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Text Books	<ul style="list-style-type: none">• Recommended Books (Latest Editions)<ol style="list-style-type: none">1. Organic Chemistry by Morrison and Boyd2. Organic Chemistry by I.L. Finar , Volume-I3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.4. Vogel's text book of Practical Organic Chemistry5. Organic Chemistry by P.L.Soni6. Advanced Practical organic chemistry by N.K.Vishnoi.
Reference books	<ol style="list-style-type: none">1. Practical Organic Chemistry by Mann and Saunders.2. Organic Chemistry by Morrison and Boyd3. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

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Course Title	Physical Pharmaceutics I – Theory				
Course Code	BPH302T	Total theory periods : 45 Hrs		Total Tutorial periods : 15	
Course Credits	L	T	P	Credits	Total marks in the end semester : 75
	3	1		4	Minimum of class tests to be conducted : 02
Prerequisites	Basic fundamental concept studied in brief in B.Pharm. I Sem in Physical chemistry				
Course objectives	<p>Upon the completion of the course student shall be able to;</p> <ol style="list-style-type: none"> 1. Understand various physicochemical properties of drug molecules in the designing the dosage form 2. Know the principles of chemical kinetics & to use them in assigning expiry date for formulation 3. Demonstrate use of physicochemical properties in evaluation of dosage forms. 4. Appreciate physicochemical properties of drug molecules in formulation research and development 				
Course Contents	Unit I				10 Hours
	<ul style="list-style-type: none"> • Solubility of drugs: Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, Dissolution & drug release, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions, azeotropic mixtures, fractional distillation. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications 				
	Unit II				10Hours
	<ul style="list-style-type: none"> • States of Matter and properties of matter: 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. • Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications 				
	Unit III				10Hours

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	<ul style="list-style-type: none">• 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. <p style="text-align: center;">Unit IV</p><p style="text-align: right;">08Hours</p>• 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. <p style="text-align: center;">Unit V</p><p style="text-align: right;">07 Hours</p>• 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.
Course outcomes	Differentiate and analyze disperse system in different pharmaceutical preparation and their stability. Students are able to assess half-life and expiry date of drug product and Describe solubility & complex phenomenon of substance in different state.
Text books	<ul style="list-style-type: none">• Recommended Books: (Latest Editions)<ol style="list-style-type: none">1. Physical pharmacy by Alfred Martin2. Tutorial pharmacy by Cooper and Gunn.3. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.4. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.5. Physical pharmaceutics by Ramasamy C and ManavalanR.6. Laboratory manual of physical pharmaceutics, C.V.S. Subramanyam, J. Thimma settee
Reference books	<ol style="list-style-type: none">1. Experimental pharmaceutics by Eugene, Parott.2. Stocklosam J. Pharmaceutical calculations, Lea &Febiger, Philadelphia.

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Course Title	Pharmaceutical Microbiology – Theory				
Course Code	BPH303T	Total theory periods : 45 Hrs		Total Tutorial periods : 15	
Course Credits	L	T	P	Credits	Total marks in the end semester : 75
	3	1		4	Minimum of class tests to be conducted : 02
Prerequisites	Common basic knowledge of fundamental aspects studied in biology in higher secondary education				
Course objectives	<p>Upon completion of the subject student shall be able to;</p> <ol style="list-style-type: none"> 1. Understand methods of identification, cultivation and preservation of various microorganisms 2. Importance of sterilization in microbiology. and pharmaceutical industry 3. Learn sterility testing of pharmaceutical products. 4. Microbiological standardization of Pharmaceuticals. 5. Understand the cell culture technology and its applications in pharmaceutical industries. 				
Course Contents	Unit I				
	10 Hours				
	<ul style="list-style-type: none"> • Introduction, history of microbiology, its branches, scope and its importance. <ol style="list-style-type: none"> a) Introduction to Prokaryotes and Eukaryotes b) 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). c) Study of different types of phase contrast microscopy, dark field microscopy and electron microscopy. 				
Unit II					
10 Hours					
<ol style="list-style-type: none"> a) Identification of bacteria using staining techniques (simple, Gram's & Acid fast staining) and biochemical tests (IMViC). b) Study of principle, procedure, merits, demerits and applications of Physical, chemical and mechanical method of sterilization. c) Evaluation of the efficiency of sterilization methods. d) Equipments employed in large scale sterilization. e) Sterility indicators. 					
Unit III					

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	<p style="text-align: right;">10 Hours</p> <p>a) Study of morphology, classification, reproduction/replication and cultivation of Fungi and Virus. b) Classification and mode of action of disinfectants c) Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions d) Evaluation of bactericidal & Bacteriostatic. e) Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.</p> <p style="text-align: center;">Unit IV</p> <p style="text-align: right;">08 Hours</p> <p>• Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification. a) Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids. b) Assessment of a new antibiotic and testing of antimicrobial activity of a new substance.</p> <p style="text-align: center;">Unit V</p> <p style="text-align: right;">07Hours</p> <p>a) Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage. b) Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations. c) Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures. d) Application of cell cultures in pharmaceutical industry and research.</p>
Course outcomes	Recall the knowledge about modern concept and scope of Microbiology and describe the fundamental principles of microbial taxonomy and their classification. Employ general information on sterilization, disinfection, mutation ,and defensive system of body.

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Text Books	<ul style="list-style-type: none">• Recommended Books (Latest edition)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. Japan7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.8. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai9. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
Reference Books	<ol style="list-style-type: none">1. Pepler: Microbial Technology.2. I.P., B.P., U.S.P.- latest editions.3. Edward: Fundamentals of Microbiology.4. Be rgeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company

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Course Title	Pharmaceutical Engineering – Theory				
Course Code	BPH304T	Total theory periods : 45 Hrs		Total Tutorial periods : 15	
Course Credits	L	T	P	Credits	Total marks in the end semester : 75
	3	1		4	Minimum of class tests to be conducted : 02
Prerequisites	Basic fundamental studied in previous class in B.Pharm.				
Course objectives	<p>Upon completion of the course student shall be able:</p> <ol style="list-style-type: none"> 1. To know various unit operations used in Pharmaceutical industries. 2. To understand the material handling techniques. 3. To perform various processes involved in pharmaceutical manufacturing process. 4. To carry out various test to prevent environmental pollution. 5. To appreciate and comprehend significance of plant lay out design for optimum use of resources. 6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries. 				
Course Contents	Unit I				
	<p style="text-align: right;">10 Hours</p> <ul style="list-style-type: none"> • Flow of fluids: Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer. • Size Reduction: Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill. • Size Separation: Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank. 				
	Unit II				
	<p style="text-align: right;">10 Hours</p> <ul style="list-style-type: none"> • Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers. 				

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- **Evaporation:**
Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator & Economy of multiple effect evaporator.
- **Distillation:** Basic Principles and methodology of simple distillation, flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

Unit III

10 Hours

- **Drying:**
Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.
- **Mixing:** Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier,

Unit IV

08 Hours

- **Filtration:**
Objectives, applications, Theories & Factors influencing filtration, filter aids, filter 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.
- **Centrifugation:**
Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

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	Unit V	07 Hours .
	<ul style="list-style-type: none">• Materials of pharmaceutical plant construction, Corrosion and its prevention: Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals. Basic of Material handling systems	
Course outcomes	Demonstrate adequate knowledge on basic principles of, air conditioning system and cam at conceptual level. Describe materials used in plant construction, pilot plant scale up techniques and explain industrialhazards with safety measures.	
Text books	<ul style="list-style-type: none">• Recommended Books: (Latest Editions)<ol style="list-style-type: none">1. Introduction to chemical engineering – Walter L Badger & Julius Banchemo, Latest edition.2. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.3. Cooper and Gunn’s Tutorial pharmacy, S.J. Carter, Latest edition.4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.5. Remington practice of pharmacy- Martin, Latest edition.6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.	
Reference books	<ol style="list-style-type: none">1. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson- Latest edition.2. Unit operation of chemical engineering – McCabe Smith, Latest edition.3. Remington practice of pharmacy- Martin, Latest edition.	

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Course Title	PHARMACEUTICAL ORGANIC CHEMISTRY II - Practical				
Course Code	BPH301P		Total Practical periods : 04 Hrs / week		
Course Credits	L	T	P	Credits	Total marks in the end semester : 35
			4	2	
Prerequisites	Basic fundamental concept studied in brief in diploma in Pharmacy in Organic chemistry				
Course objectives	Knowledge upgrade in basic concept in detail of nomenclatural, method of preparation of different organic compounds.				
Course Contents					4 Hrs/week
	<p>I</p> <ul style="list-style-type: none">• Experiments involving laboratory techniques<ol style="list-style-type: none">1. Recrystallization2. Steam distillation <p>II</p> <ul style="list-style-type: none">• Determination of following oil values (including standardization of reagents)<ol style="list-style-type: none">1. Acid value2. Saponification value3. Iodine value <p>III</p> <ul style="list-style-type: none">• Preparation of compounds<ol style="list-style-type: none">1. Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction.2. 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/3. Acetanilide by halogenation (Bromination) reaction.4. 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction.5. Benzoic acid from Benzyl chloride by oxidation reaction.6. Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.7. 1-Phenyl azo-2-naphthol from Aniline by diazotization and coupling reactions.8. Benzil from Benzoin by oxidation reaction.9. Dibenzal acetone from Benzaldehyde by Claisen Schmidt reaction10. Cinnamic acid from Benzaldehyde by Perkin reaction				

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	11. P-Iodo benzoic acid from P-amino benzoic acid
Course outcomes	Write synthetic routes to prepare organic compounds and nomenclature, preparation and properties of heterocyclic compounds.
Text books	<ul style="list-style-type: none">• Recommended Books (Latest Editions)1. Organic Chemistry by Morrison and Boyd2. Organic Chemistry by I.L. Finar , Volume-I3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.4. Vogel's text book of Practical Organic Chemistry5. Advanced Practical organic chemistry by N.K.Vishnoi.6. Organic Chemistry by P.L.Soni
Reference books	<ol style="list-style-type: none">1. Organic Chemistry by P.L.Soni2. Practical Organic Chemistry by Mann and Saunders.3. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

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Course Title	PHYSICAL PHARMACEUTICS I - Practical				
Course Code	BPH302P		Total Practical periods : 04 Hrs / week		
Course Credits	L	T	P	Credits	Total marks in the end semester : 35
			4	2	
Prerequisites	Basic fundamental concept studied in brief in B.Pharm. I Sem in Physical chemistry				
Course objectives	1. Know the principles of chemical kinetics & to use them in assigning expiry date for formulation 2. Demonstrate use of physicochemical properties in evaluation of dosage forms.				
Course Contents	1. Determination the solubility of drug at room temperature 4 Hrs/week 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 CCl ₄ 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				
Course outcomes	Students are able to assess half-life and expiry date of drug product and Describe solubility & complex phenomenon of substance in different state.				
Text Books	<ul style="list-style-type: none"> • Recommended Books: (Latest Editions) <ol style="list-style-type: none"> 1. Physical pharmacy by Alfred Martin 2. Experimental pharmaceutics by Eugene, Parott. 3. Tutorial pharmacy by Cooper and Gunn. 4. Laboratory manual of physical pharmaceutics, C.V.S. Subramanyam, J. Thimma settee 5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc. 				

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	6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc
Reference books	1. Physical pharmaceutics by Ramasamy C and ManavalanR. 2. Stocklosam J. Pharmaceutical calculations, Lea &Febiger, Philadelphia.

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Course Title	PHARMACEUTICAL MICROBIOLOGY (Practical)				
Course Code	BPH303P		Total Practical periods : 04 Hrs / week		
Course Credits	L	T	P	Credits	Total marks in the end semester : 35
			4	2	
Prerequisites	Common basic knowledge of fundamental aspects studied in biology in higher secondary education				
Course objectives	<ol style="list-style-type: none">1. Understand methods of identification, cultivation and preservation of various microorganisms2. Importance of sterilization in microbiology. and pharmaceutical industry3. Learn sterility testing of pharmaceutical products.				
Course Contents	<p style="text-align: right;">4 Hrs/week</p> <ol style="list-style-type: none">1. Introduction and study of different equipments 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 methods7. Motility determination by Hanging drop method.8. Sterility testing of pharmaceuticals.9. Bacteriological analysis of water10. Biochemical test (IMViC reactions)				
Course outcomes	Recall the knowledge about modern concept and scope of Microbiology and describe the fundamental principles of microbial taxonomy and their classification. Employ general information on sterilization, disinfection, mutation, and defensive system of body.				

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SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR CHHATTISGARH
BACHELOR OF PHARMACY SEMESTER III

Text books	<ul style="list-style-type: none">• Recommended Books (Latest edition)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. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi7. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company8. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai9. Edward: Fundamentals of Microbiology.10. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan11. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
Reference books	<ul style="list-style-type: none">1. Pepler: Microbial Technology.2. I.P., B.P., U.S.P.- latest editions.

Board of Studies Members

Prof. (Dr.) Vijay Kumar Singh

Dr. Veena Devi Singh

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Course Title	PHARMACEUTICAL ENGINEERING (Practical)				
Course Code	BPH304P		Total Practical periods : 04 Hrs / week		
Course Credits	L	T	P	Credits	Total marks in the end semester : 35
			4	2	
Prerequisites	Basic fundamental studied in previous class in B.Pharm.				
Course objectives	Basic practical fundamental concept in microbiological studied in pharmaceutical aspects in industrial production.				
Course Contents	4 Hours/week				
	<ol style="list-style-type: none">1. Determination of radiation constant of brass, iron, unpainted and painted glass.2. Steam distillation – To calculate the efficiency of steam distillation.3. To determine the overall heat transfer coefficient by heat exchanger.4. Construction of drying curves (for calcium carbonate and starch).5. Determination of moisture content and loss on drying.6. Determination of humidity of air – i) from wet and dry bulb temperatures –use of Dew point method.7. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.8. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic and logarithmic probability plots.9. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.10. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such other major equipment.11. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity)12. To study the effect of time on the Rate of Crystallization.13. To calculate the uniformity Index for given sample by using Double Cone Blender.				
Course outcomes	Studied preparation materials used in plant construction, pilot plant scale up techniques and explain industrial hazards with safety measures.				

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Text Books	<ul style="list-style-type: none">• Recommended Books: (Latest Editions)<ol style="list-style-type: none">1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.2. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.3. Remington practice of pharmacy- Martin, Latest edition.4. Theory and practice of industrial pharmacy by Lachmann., Latest edition.5. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.6. Cooper and Gunn’s Tutorial pharmacy, S.J. Carter, Latest edition.
Reference books	<ol style="list-style-type: none">1. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson-.2. Unit operation of chemical engineering – McCabe Smith,

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