



L. M. College of Pharmacy
(An Autonomous Institution)

Syllabus for
Bachelor of Pharmacy (B. Pharm.)
(w.e.f. Academic Year 2024-25)



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Programme Outcomes (POs)

A student completing this program will possess the following graduate attributes:

PO1: Pharmacy Knowledge: Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.

PO2: Planning Abilities: Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

PO3: Problem analysis: Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.

PO4: Modern tool usage: Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

PO5: Leadership skills: Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfilment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.

PO6: Professional Identity: Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).

PO7: Pharmaceutical Ethics: Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.



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PO8: Communication: Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

PO9: Pharmacist and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

PO10: Environment and sustainability: Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO11: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis



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Teaching and Examination Scheme for B. Pharm Program

Teaching and Examination Scheme for B. Pharm Semester I											
Sr. No.	Course Name	Course Code	L	T	P	C	E	M	I	V	Total
1	Pharmaceutical Inorganic Chemistry	BP24101TP	3	1	4	6	75	25	25	75	200
2	Human Anatomy and Physiology I	BP24102TP	3	1	4	6	75	25	25	75	200
3	Pharmaceutical Engineering	BP24103TP	3	1	4	6	75	25	25	75	200
4	Communication Skills	BP24104TP	2	0	2	3	35	15	15	35	100
5	Environmental Sciences	BP24105T	3	0	0	3	35	15	0	0	50
6	Remedial Biology*	BP24106TP	2	0	2	3	35	15	15	35	100
7	Remedial Mathematics [#]	BP24107T	2	0	0	2	35	15	0	0	50
	Total		14 ^{\$} / 16 ^{#*}	3	14 ^{\$#} / 16 [*]	24 ^{\$} /26 [#] / 27 [*]	295 ^{\$} / 330 ^{#*}	105 ^{\$} / 120 ^{#*}	90 ^{\$#} / 105 [*]	260 ^{\$#} / 295 [*]	750 ^{\$} /800 [#] / 850 [*]
*: Elective for students of XII A group, #: Elective for students of XII B group; Students from AB ^{\$} group would be exempted from both the electives. L= Lectures, P = Practical, T = Tutorial, C = Credit, E = External (T), M = Internal (T), I = Internal (P), V = External (P)											



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Teaching and Examination Scheme for B. Pharm Semester II											
Sr. No.	Course Name	Course Code	L	T	P	C	E	M	I	V	Total
1	Pharmaceutical Organic Chemistry I	BP24201TP	3	1	4	6	75	25	25	75	200
2	Human Anatomy and Physiology II	BP24202TP	3	1	4	6	75	25	25	75	200
3	Pharmaceutics	BP24203TP	3	1	4	6	75	25	25	75	200
4	Computer Applications in Pharmacy	BP24204TP	3	0	2	4	35	15	15	35	100
5	Contributor Personality Development Program (CPDP)**	BP24205T	4	0	0	4	35	15	15	35	100
6	Integrated Personality Development Course (IPDC)**	BP24206T									
Total			16	3	14	26	295	105	105	295	800

** : Elective: Anyone to be selected by the student
 L= Lectures, P = Practical, T = Tutorial, C = Credit, E = External (T), M = Internal (T), I = Internal (P), V = External (P)

Teaching and Examination Scheme for B. Pharm Semester III											
Sr. No.	Course Name	Course Code	L	T	P	C	E	M	I	V	Total
1	Pharmaceutical Organic Chemistry II	BP24301T	3	1	0	4	75	25	0	0	100
2	Pharmaceutical Analysis I	BP24302TP	3	1	4	6	75	25	25	75	200
3	Pathophysiology	BP24303T	3	1	0	4	75	25	0	0	100
4	Physical Pharmaceutics I	BP24304TP	3	1	4	6	75	25	25	75	200
5	Pharmacognosy and Phytochemistry I	BP24305TP	3	1	4	6	75	25	25	75	200
Total			15	5	12	26	375	125	75	225	800

L= Lectures, P = Practical, T = Tutorial, C = Credit, E = External (T), M = Internal (T), I = Internal (P), V = External (P)



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Teaching and Examination Scheme for B. Pharm Semester IV

Sr. No.	Course Name	Course Code	L	T	P	C	E	M	I	V	Total
1	Pharmaceutical Organic Chemistry III	BP24401TP	3	1	4	6	75	25	25	75	200
2	Biochemistry	BP24402TP	3	1	4	6	75	25	25	75	200
3	Pharmacology I	BP24403TP	3	1	4	6	75	25	25	75	200
4	Physical Pharmaceutics II	BP24404TP	3	1	4	6	75	25	25	75	200
Total			12	4	16	24	300	100	100	300	800

L= Lectures, P = Practical, T = Tutorial, C = Credit, E = External (T), M = Internal (T), I = Internal (P), V = External (P)

Teaching and Examination Scheme for B. Pharm Semester V

Sr. No.	Course Name	Course Code	L	T	P	C	E	M	I	V	Total
1	Medicinal Chemistry I	BP24501TP	3	1	4	6	75	25	25	75	200
2	Pharmacology II	BP24502TP	3	1	4	6	75	25	25	75	200
3	Pharmaceutical Microbiology	BP24503TP	3	1	4	6	75	25	25	75	200
4	Biopharmaceutics and Pharmacokinetics	BP24504T	3	1	0	4	75	25	0	0	100
5	Pharmacognosy and Phytochemistry II	BP24505TP	3	1	4	6	75	25	25	75	200
Total			15	5	16	28	375	125	100	300	900

L= Lectures, P = Practical, T = Tutorial, C = Credit, E = External (T), M = Internal (T), I = Internal (P), V = External (P)



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Teaching and Examination Scheme for B. Pharm Semester VI

Sr. No.	Course Name	Course Code	L	T	P	C	E	M	I	V	Total
1	Medicinal Chemistry II	BP24601T	3	1	0	4	75	25	0	0	100
2	Instrumental Methods of Analysis	BP24602TP	3	1	4	6	75	25	25	75	200
3	Pharmacology III	BP24603TP	3	1	4	6	75	25	25	75	200
4	Industrial Pharmacy I	BP24604TP	3	1	4	6	75	25	25	75	200
5	Herbal Drug Technology	BP24605TP	3	1	4	6	75	25	25	75	200
Total			15	5	16	28	375	125	100	300	900

L= Lectures, P = Practical, T = Tutorial, C = Credit, E = External (T), M = Internal (T), I = Internal (P), V = External (P)

Teaching and Examination Scheme for B. Pharm Semester VII

Sr. No.	Course Name	Course Code	L	T	P	C	E	M	I	V	Total
1	Medicinal Chemistry III	BP24701TP	3	1	4	6	75	25	25	75	200
2	Quality Assurance	BP24702T	3	1	0	4	75	25	0	0	100
3	Pharmacy Practice	BP24703T	3	1	0	4	75	25	0	0	100
4	Industrial Pharmacy II	BP24704T	3	1	0	4	75	25	0	0	100
5	Pharmaceutical Biotechnology	BP24705T	3	1	0	4	75	25	0	0	100
6	Practice School	BP24706P	0	0	12	6	0	0	100	0	100
Total			15	5	16	28	375	125	125	75	700

L= Lectures, P = Practical, T = Tutorial, C = Credit, E = External (T), M = Internal (T), I = Internal (P), V = External (P)



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Teaching and Examination Scheme for B. Pharm Semester VIII											
Sr. No.	Course Name	Course Code	L	T	P	C	E	M	I	V	Total
1	Social and Preventive Pharmacy	BP24801T	3	1	0	4	75	25	0	0	100
2	Novel Drug Delivery System	BP24802T	3	1	0	4	75	25	0	0	100
3	Pharmaceutical Jurisprudence	BP24803T	3	1	0	4	75	25	0	0	100
4	Biostatistics and Research Methodology	BP24804T	3	1	0	4	75	25	0	0	100
5	Project Work	BP24805P	0	0	12	6	0	0	50	100	150
Elective Group 1											
6	Computer Aided Drug Design*	BP24821T	3	1	0	4	75	25	0	0	100
7	Pharmacovigilance*	BP24822T									
8	Epidemiology*	BP24823T									
9	Cosmetic Science*	BP24824T									
10	Quality Control and Standardization of Herbals*	BP24825T									
11	Pharmaceutical Regulatory Science*	BP24826T									
Elective Group 2											
12	Advanced Instrumentation Techniques**	BP24851T	3	1	0	4	75	25	0	0	100
13	Cell and Molecular Biology**	BP24852T									
14	Experimental Pharmacology**	BP24853T									
15	Pharmaceutical Product Development**	BP24854T									
16	Dietary Supplements and Nutraceuticals**	BP24855T									
17	Pharma Marketing Management **	BP24856T									
Total			18	6	12	30	450	150	50	100	750
**/: The student has to opt for any one elective from the two groups of electives – Elective group 1 or Elective group 2 L= Lectures, P = Practical, T = Tutorial, C = Credit, E = External (T), M = Internal (T), I = Internal (P), V = External (P)											



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Detailed Syllabi for Each Course



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Course Name:	B. Pharm, Semester: I		
Course Code:	Pharmaceutical Inorganic Chemistry		
Learning Hours (Theory):	60 (Lectures: 3; Tutorial: 1 per week)	Credits:	4
Learning Hours (Practical):	4 hours/ week	Credits:	2

Scope: This subject deals with the monographs of inorganic drugs and pharmaceuticals

Objectives: On learning the course, a student will be able to:

1. know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
2. understand the medicinal and pharmaceutical importance of inorganic compounds

Sr No	Course Contents	Total Hrs
1	Impurities in pharmaceutical substances: History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate General methods of preparation, assay for the compounds superscripted with asterisk (*), properties and medicinal uses of inorganic compounds belonging to the following classes	10
2	Acids, Bases and Buffers: Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity. Major extra and intracellular electrolytes: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance. Dental products: Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.	10
3	Gastrointestinal agents Acidifiers: Ammonium chloride* and Dil. HCl Antacid: Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture Cathartics: Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations	10
4	Miscellaneous compounds Expectorants: Potassium iodide, Ammonium chloride*. Emetics: Copper sulphate*, Sodium potassium tartarate Haematinics: Ferrous sulphate*, Ferrous gluconate Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodium nitrite Astringents: Zinc Sulphate, Potash Alum	8



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5	Radiopharmaceuticals: Radio activity, Measurement of radioactivity, Properties of α , β , γ radiations, Half-life, radio isotopes and study of radio isotopes - Sodium iodide I131, Storage conditions, precautions & Pharmaceutical application of radioactive substances.	7
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Practical

Suggested list of experiments

Introduction to glassware & equipment

Safe working in laboratory and techniques for planning an experiment

I. Limit tests for following

Limit test for Chlorides and Sulphates

Modified limit test for chlorides and sulphates

Limit test for Heavy metals

Limit test for Lead

Limit test for Arsenic

II. Identification Test

Magnesium hydroxide, Ferrous sulphate, Sodium bicarbonate, Calcium gluconate, Copper sulphate, Calcium carbonate, Calcium chloride, magnesium chloride, magnesium sulphate

III. Test for Purity

Swelling power of Bentonite

Neutralizing capacity of aluminum hydroxide gel

Determination of potassium iodate and iodine in potassium iodide

IV. Preparation of inorganic pharmaceuticals

Boric acid, Potash alum, Ferrous sulphate

Recommended Text Books:

1. Chatwal, G. R. Pharmaceutical Chemistry-Inorganic. India: Himalaya Publishing House
2. Bentley and Driver. Textbook of Pharmaceutical Chemistry, Oxford University Press
3. Vogel, A. I., Bassett, J. Vogel's Textbook of Quantitative Inorganic Analysis: Including Elementary 4. Instrumental Analysis. United Kingdom: English Language Book Society
5. Beckett, A. H., Stenlake, J. B. Practical Pharmaceutical Chemistry: Part II Fourth Edition. United Kingdom: Bloomsbury Academic
6. Indian Pharmacopoeia, Indian Pharmacopoeia Commission (Latest edition)

Recommended Reference Books:

1. Schroff, M. L. Pharmaceutical chemistry. Calcutta: National Book Centre
2. Kasture, A. V. Pharmaceutical Inorganic Chemistry. (2008). India: Nirali Prakashan.
3. Bothara, K.G., Inorganic Pharmaceutical Chemistry. India: Nirali Prakashan.
4. Bhandari A. Pharmaceutical Chemistry I. India: CBS Publisher
5. Rao, P. G. Inorganic Pharmaceutical Chemistry. India: Vallabh Prakashan.



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B. Pharm, Semester: I

Course Name:	Human Anatomy and Physiology I		
Course Code:	BP24102TP		
Learning Hours (Theory):	60 (Lectures: 3, Tutorial: 1 per week)	Credits:	04
Learning Hours (Practical):	4 hours/ week	Credits:	02

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives: Upon completion of this course the student should be able to

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of the human body.
4. Perform various experiments related to special senses and nervous systems.
5. Appreciate coordinated working pattern of different organs of each system.

Sr. No.	Course Contents	Total Hrs
1.	Introduction to human body: Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology. Cellular level of organization: Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signalling pathway activation by extracellular signal molecule, Forms of intracellular signalling: a) Contact dependent b) Paracrine c) Synaptic d) Endocrine Tissue level of organization: Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues	10
2.	Integumentary system: Structure and functions of skin Skeletal system: Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction Joints Structural and functional classification, types of joints movements and its articulation	10



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3.	Body fluids and blood: Body fluids, composition and functions of blood, hemopoiesis, formation of hemoglobin, mechanisms of coagulation, blood grouping, Rh factors, Blood transfusion, its significance and disorders of blood, Reticuloendothelial system Lymphatic system: Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system	10
4.	Peripheral nervous system: Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves Special senses: Structure and functions of eye, ear, nose and tongue and their disorders	8
5.	Cardiovascular system: Heart: Anatomy of heart, blood circulation. Blood vessels: structure and functions of artery, vein and capillaries. Elements of conduction system of heart and heartbeat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart	7

Practical

Practical physiology is complementary to the theoretical discussions in physiology. Practical allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

Suggested list of experiments

1. Study of compound microscopes.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones
6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count
8. Enumeration of total red blood corpuscles (RBC) count
9. Determination of bleeding time
10. Determination of clotting time
11. Estimation of hemoglobin content
12. Determination of blood group.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.



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15. Recording of blood pressure.
16. Osmotic Fragility of Red Blood Cells
17. Interpretation of Absolute corpuscular Values and Indices
18. Estimation of Differential WBCs Count

Recommended Text Books:

1. Sembulingam, K., & Sembulingam, P. (2012). Essentials of medical physiology. JP Medical Ltd.
2. Patton, K. T., Bell, F. B., Thompson, T., & Williamson, P. L. (2022). Anatomy & Physiology with Brief Atlas of the Human Body and Quick Guide to the Language of Science and Medicine-E-Book: Anatomy & Physiology with Brief Atlas of the Human Body and Quick Guide to the Language of Science and Medicine-E-Book. Elsevier Health Sciences.
3. Tandon, O. P., and Tripathi, Y. (2011). Best & Taylor's Physiological Basis of Medical Practice, 13/e with the Point Access Scratch Code. Wolters Kluwer India Pvt Ltd.
4. Jackson, J. E. H. (2006). Textbook of Medical Physiology, Arthur C. Guyton & John E. Hall by Elsevier Inc. Elsevier Inc.
5. Tortora, G. J., & Derrickson, B. H. (2012). Principles of Anatomy and Physiology, 2012. Hoboken: John Wiley & Sons.
6. Singh, I. (2011). Textbook of human histology.
7. Ghai, C. L. (2012). A textbook of practical physiology. JP Medical Ltd.

Recommended Reference Books:

1. John, N. A. (2018). *CC Chatterjee's Human Physiology*. CBS Publishers & Distributors Private Limited.
2. Barrett, K. E., Barman, S. M., Yuan, J., & Brooks, H. L. (2019). *Ganong's review of medical physiology*. Mcgraw Hill Professional.

Important URLs:

'Meet the heart and double lung transplant recipient turned triathlete champion' by SBS provides an article and video about a Brisbane woman who has received a heart and double lung transplant: www.sbs.com.au/topics/life/health/article/2016/10/07/meet-heart-and-double-lungtransplant-recipient-turned-triathlete-champion



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Course Name:	B. Pharm, Semester: I		
Course Code:	Pharmaceutical Engineering		
	BP24103TP		
Learning Hours (Theory):	60 (Lectures: 3; Tutorial: 1 per week)	Credits:	4
Learning Hours (Practical):	4 hours/ week	Credits:	2

Scope: This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.

Objectives:

Upon completion of the course the student shall be able to

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

Sr No	Course Contents	Total Hrs
1	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	10
2	Heat Transfer: Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers. 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.	10



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3	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	8
4	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.	8
5	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.	7

Practical

Suggested list of experiments

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



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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
14. To study flow meter (Venturi meter)
15. To study flow meter (Orifice meter)
16. To study flow meter (Rotameter meter)
17. To measure pressure of gas and other fluids using different manometers. (U-tube manometer, Inclined tube manometer)
18. To study the factors affecting rate of drying.

Recommended Text Books:

1. David B. Troy, Paul Beringer, Remington-The science and practice of pharmacy, Lippincott Williams & Wilkins, 2006 - Medical - 2393 pages.
2. S. j Carter, Cooper and Gunn's Tutorial pharmacy, latest edition, CBS Publisher, India, 2008
3. C.V. S Subrahmanayam, Pharmaceutical Engineering unit operations Principles and practice, New age International Limited, 2015
4. G. K. Jani, Pharmaceutical Engineering, Vallabh Prakashan.
5. Dr. A. R. Paradkar, Introduction to Pharmaceutical Engineering, 10th Edition, Nirali Parakashan, 2007.

Recommended Reference Books:

1. Walter L Badger, Introduction to chemical engineering, McGraw Hill Book Company-United States, 1957.
2. Lachman Liebermans -The Theory and Practice of Industrial Pharmacy, CBS Publisher, India, 2020.
3. Robert H. Perry, Don W. Green, Perry's Chemical Engineers Handbook, 7th Edition, Don W. Green, James O. Maloney, McGraw Hill, 1997.
3. Unit operation of chemical engineering – McCabe Smith, Latest edition.
4. James Swarbrick & James C. Boylon, Encyclopedia of Pharmaceutical Technology, Marcel Dekker, INC, New York, 1994.
5. K. Sambamurthy, Pharmaceutical Engineering, New age international (P) Limited Publishers, 1998

Recommended URLs:

1. <https://allinfoche.com/>
2. WWW.ISPE.ORG



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B. Pharm, Semester: I

Course Name:	Communication Skills		
Course Code:	BP24104TP		
Learning Hours (Theory):	30 (Lectures: 2 per week)	Credits:	2
Learning Hours (Practical):	2 hours/ week	Credits:	1

Scope: This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

Objectives: Upon completion of the course the student shall be able to;

1. Understand the behavioural needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
2. Communicate effectively (Verbal and Non-Verbal)
3. Effectively manage the team as a team player
4. Develop interview skills
5. Develop Leadership qualities and essentials

Sr No	Course Contents	Total Hrs
1	Communication Skills: Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment.	7
2	Elements of Communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication Communication Styles: Introduction, The Communication Styles Matrix with example for each - Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style	7
3	Basic Listening Skills: Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations Effective Written Communication: Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication Writing Effectively: Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message	7
4	Interview Skills: Purpose of an interview, Do's and Dont's of an interview Giving Presentations: Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques	5



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	of Delivery	
5	Group Discussion: Introduction, Communication skills in group discussion, 4 Do's and Dont's of group discussion	4

Practical

The following learning modules are to be **conducted using Any Software English** language lab software

Basic communication covering the following topics

1. Meeting People
2. Asking Questions
3. Making Friends
4. What did you do?
5. Do's and Dont's

Pronunciations covering the following topics

1. Pronunciation (Consonant Sounds)
2. Pronunciation and Nouns
3. Pronunciation (Vowel Sounds)

Advanced Learning

1. Listening Comprehension / Direct and Indirect Speech
2. Figures of Speech
3. Effective Communication
4. Writing Skills
5. Effective Writing
6. Interview Handling Skills
7. E-Mail etiquette
8. Presentation Skills

Recommended Books: (Latest Edition)

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



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	B. Pharm, Semester: I	
Course Name:	Environmental Sciences	
Course Code:	BP24105T	
Learning Hours (Theory):	45 (Lectures: 3 per week)	Credits: 3
Learning Hours (Practical):	-	Credits: 0

Scope: Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.

Objectives: Upon completion of the course the student shall be able to

1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.
6. Strive to attain harmony with Nature.

Course Learning Outcomes: Upon the completion of the course, a student shall be able to:

CO1: Discuss different Renewable and non-renewable natural resources, their values and preservation.

CO2: Describe the concept of Ecosystems and importance of different Ecosystems in environment.

CO3: Explain types of pollution and hazards.

CO4: Examine the ways to reduce pollution and prevent hazards.

Sr No	Course Content	Total Hrs
1	The Multidisciplinary nature of environmental studies Natural Resources Renewable and non-renewable resources: Natural resources and associated problems a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources	15
2.	Ecosystems: Concept of an ecosystem. Structure and function of an ecosystem. Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	15
3.	Environmental Pollution: Air pollution; Water pollution; Soil pollution	15

Recommended Text Books:

1. Sing, Y.K., 2006. Environmental Science, New Age International Pvt. Publishers, Bangalore.



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2. Agarwal, K.C., 2001. Environmental Biology, Nidi Publishers. Ltd. Bikaner.
3. Bharucha Erach., 2002. Textbook for Environmental Science, University Grants Commission and Bharti Vidyapeeth Institute of Environment Education and Research, Pune.
4. Trivedi R. K., Goel, P.K., 2003. Introduction to air pollution, Techno-Science Publication, Maharashtra.
5. Clark R.S., 1997. Marine Pollution, Clarendon Press Oxford, New York.

Recommended Reference Books:

1. Hawkins RE, 1983. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay.
2. Brunner R.C., 1989. Hazardous Waste Incineration, McGraw Hill Inc. Clarendon Press Oxford. New York.
3. Cunningham, W.P., Cooper, T.H. Gorhani, E & Hepworth, M.T. 2006, Environmental Encyclopedia, Jaico Publishing House Mumbai.
4. Down to Earth, Center for Science and Environment, Indian environment Magazine, India.
5. De A.K., 2018. Environmental Chemistry, New Age International Pvt. Publishers, Bangalore.

Recommended URLs:

1. https://books.google.com/books/about/Environmental_Science.html?id=N3doxz71UIsC
2. <https://www.ugc.gov.in/oldpdf/modelcurriculum/env.pdf>
3. <https://global.oup.com/academic/product/marine-pollution-9780198792925>
4. <https://archive.org/details/hazardouswastein0000brun>
5. https://rajneeshrajaoria.weebly.com/uploads/4/9/0/6/49069889/environmental_science_birm301.pdf



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B. Pharm, Semester I

Course Name:	Remedial Biology	
Course Code:	BP24106TP	
Learning Hours (Theory):	30 (Lectures: 2 per week)	Credits: 2
Learning Hours (Practical):	2 hours/ week	Credits: 1

Scope: This subject deals with the monographs of inorganic drugs and pharmaceuticals
Scope: To learn and understand the components of the living world, as well as the structure and functional systems of the plant and animal kingdoms.

Objectives: On learning the course, a student will be able to:

1. Classify and describe the salient features of the five kingdoms of life.
2. Understand the basic components of plant anatomy and physiology.
3. Understand the basic components of animal anatomy and physiology, with special reference to humans.

Sr No	Course Contents	Total Hrs
1	<p>Living world Definition and characters of living organisms, Diversity in the living world, Binomial nomenclature, Five kingdoms of life and basis of classification. Salient features of Monera, Protista, Fungi, Animalia and Plantae, Virus</p> <p>Morphology of Flowering plants Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed. General Anatomy of root, stem, leaf of monocotyledons and dicotyledones</p>	7
2	<p>Body fluids and circulation Composition of blood, blood groups, coagulation of blood Composition and functions of lymph Human circulatory system- Structure of human heart and blood vessels, Cardiac cycle, cardiac output and ECG</p> <p>Digestion and Absorption Human alimentary canal and digestive glands, Role of digestive enzymes, Digestion, absorption and assimilation of digested food</p> <p>Breathing and respiration Human respiratory system, Mechanism of breathing and its regulation, Exchange of gases, transport of gases and regulation of respiration, Respiratory volumes</p>	7
3	<p>Excretory products and their elimination Modes of excretion, Human excretory system- structure and function Urine formation, Renin angiotensin system Neural control and coordination</p> <p>Neural control and coordination Definition and classification of nervous system, Structure of a neuron Generation and conduction of nerve impulse, Structure of brain and</p>	7



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	spinal cord, Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata Chemical coordination and regulation Endocrine glands and their secretions, Functions of hormones secreted by endocrine glands Human reproduction Parts of female reproductive system, Parts of male reproductive system, Spermatogenesis and Oogenesis, Menstrual cycle	
4	Plants and mineral nutrition Essential mineral, macro and micronutrients Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation, Photosynthesis Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.	5
5	Plant respiration Respiration, glycolysis, fermentation (anaerobic). Plant growth and development Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators Cell - The unit of life Structure and functions of cell and cell organelles. Cell division Tissues Definition, types of tissues, location and functions	4

Practical

Suggested list of experiments

1. Introduction to experiments in biology a) Study of Microscope b) Section cutting techniques c) Mounting and staining d) Permanent slide preparation
2. Study of cell and its inclusions
3. Study of Stem, Root, Leaf, seed, fruit, flower and their modifications
4. Detailed study of frog by using computer models
5. Microscopic study and identification of tissues pertinent to Stem, Root Leaf, seed, fruit and flower
6. Identification of bones
7. Determination of blood group
8. Determination of blood pressure
9. Determination of tidal volume
10. Enumeration of white blood cell (WBC) count
11. Enumeration of total red blood corpuscles (RBC) count
12. Determination of bleeding time
13. Determination of clotting time
14. Estimation of hemoglobin content

Recommended Text Books:

1. Text book of Biology by S. B. Gokhale
2. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.

Recommended Reference Books:



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1. A Text book of Biology by B.V. Sreenivasa Naidu
2. A Text book of Biology by Naidu and Murthy
3. Botany for Degree students By A. C. Dutta.
4. Outlines of Zoology by M. Ekambaranatha ayyer and T. N. Ananthakrishnan.
5. A manual for pharmaceutical biology practical by S.B. Gokhale and C. K. Kokate
6. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
7. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
8. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
9. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
10. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
11. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi
12. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi
13. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi



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B. Pharm, Semester: I
Remedial Mathematics
BP24107T
 Course Name: **Remedial Mathematics**
 Course Code: **BP24107T**
 Learning Hours (Theory): 30 (Lectures: 2; Tutorial: 0 per week) Credits: 2
 Learning Hours (Practical): 0 hours / week Credits: 0

Scope: This subject deals with the application of Mathematical principles and tools in Pharmacy

Objectives: On learning the course, a student will be able to:

1. Use mathematical tools and principles to make calculations simpler.
2. Apply mathematical principles to solve problems in Pharmacy.
3. Use mathematical principles to derive equations, create graphical representation.

Sr No	Course Contents	Total Hrs
1	<p>Partial fraction Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction , Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics</p> <p>Logarithms Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems</p> <p>Function: Real Valued function, Classification of real valued functions, Limits and continuity: Introduction , Limit of a function, Definition of limit of a function</p> $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = n \cdot a^{n-1} \quad \lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$	6
2	<p>Matrices and Determinant: Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations</p>	6
3	<p>Calculus: Differentiation : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function , Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – Without Proof, Derivative of x^n w.r.t.x, where n is any rational number, Derivative of e^x, Derivative of $\log_e x$, Derivative of a^x, Derivative of trigonometric functions from first principles (without Proof), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application</p>	6



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4	Analytical Geometry Introduction: Signs of the Coordinates, Distance formula, Straight Line : Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line. Integration: Introduction, Definition, Standard formulae, Rules of integration , Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application	6
5	Differential Equations: Some basic definitions, Order and degree, Equations in separable form, Homogeneous equations, Linear Differential equations, Exact equations, Application in solving Pharmacokinetic equations Laplace Transform: Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, Application in solving Chemical kinetics and Pharmacokinetics equations	6

Recommended Text Books:

1. Grewal B.S., (2014), Higher Engineering Mathematics, Khanna Publishers (40th ed.)
2. Sharma R.D., (2021), Mathematics Class XII, Dhanpat Rai Publications. (2021 ed.)
3. Sharma R.D., (2021), Mathematics Class XI, Dhanpat Rai Publications. (2021 ed.)
4. Bais V. K., Bais, Kumar D., Goyal P., (2017), PV Remedial Mathematics, S Vikas and company.
5. Aggarwal R.S., Secondary School Mathematics for Class 12, (2020), Bharati Bhawan.

Recommended Reference Books:

1. Shanti Narayan, Mittal P. K., (2005), Differential Calculus, S. Chand and Company.
2. Panchaksharappa Gowda D.H. (2014), Pharmaceutical Mathematics with application to Pharmacy (1st ed.), BSP Books Pvt. Ltd.
3. Shanti Narayan, Mittal P. K., (2005), Integral Calculus, S. Chand and Company.
4. Kachot K. R., (2010), Remedial Mathematics for Pharmacy, Mahajan Publishing house (3rd ed.).
5. Vashistha A.R., Sharma S. K., Vashistha A.K., (2009), Differential Calculus, Krishna Prakashan media (P) ltd. (21st ed.).

Recommended URLs:

1. <https://www.desmos.com/calculator>
2. <https://www.mathway.com/Graph>
3. <https://www.symbolab.com/solver/laplace-transform-calculator>