

MRSPTU B. PHARMACY SYLLABUS 2016 BATCH ONWARDS
(Approved in 1st MRSPTU Standing Committee of Academic Council on 20.12.2016)

B. Pharmacy (1st Year)

Total Contact Hours = 36

Total Marks = 1000

Total Credits = 28

SEMESTER 1 st		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BHUM0-104	Communicative English	2	1	0	40	60	100	3
BPHA1101	Pharmacognosy-I	2	1	-	40	60	100	3
BPHA1 102	Pharmaceutical Chemistry-I(Inorganic pharmaceutical Chemistry)	3	1	-	40	60	100	4
BPHA1 103	Pharmaceutical Analysis-I	3	1	-	40	60	100	4
BCAP0 195	Computer Science & Application	2	1	-	40	60	100	3
BPHA1 104	Introduction to Dosage Form	2	1	-	40	60	100	3
BPHA1 105	Lab Pharmacognosy-I	-	-	4	60	40	100	2
BPHA1 106	Lab Pharmaceutical Chemistry-I(Inorganic pharmaceutical Chemistry)	-	-	4	60	40	100	2
BPHA1 107	Lab Pharmaceutical Analysis-I	-	-	4	60	40	100	2
BCAP0196	Lab Computer Science & Application	-	-	4	60	40	100	2
Total	Theory = 6 Labs = 4	14	6	16	480	520	1000	28

Total Contact Hours = 37/39

Total Marks = 1000/1100

Total Credits = 29/30

SEMESTER 2 nd		Contact Hrs			Marks			Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.	Total	
BPHA1-208	Human Anatomy and Physiology-I	3	1	-	40	60	100	4
BPHA1-209	Pharmaceutical Organic Chemistry - I	3	1	-	40	60	100	4
BPHA1-210	Biochemistry	3	1	-	40	60	100	4
BPHA1-211	Physical Pharmaceutics-I	3	1	-	40	60	100	4
*BPHA1-212/ *BPHA1-213	Remedial Biology OR Remedial Mathematics	2 3	- -	- -	40 40	60 60	100 100	2 3
BPHA1-214	Environmental Sciences	3	-	-	40	60	100	3
BPHA1-215	Human Anatomy and Physiology –I Lab	-	-	4	60	40	100	2
BPHA1-216	Pharmaceutical Organic Chemistry- I Lab	-	-	4	60	40	100	2
BPHA1-217	Biochemistry – Lab	-	-	4	60	40	100	2
BPHA1-218	Physical Pharmaceutics I - Lab	-	-	4	60	40	100	2
BPHA1-219	Remedial Biology - Lab	-	-	2	60	40	100	1
Total		17/ 18	4	16[#]/18 *	480/ 540	520/ 560	1000/ 1100	30

* Non-medical students opt for Remedial Biology and Medical students opt for remedial mathematics

Overall

Semester	Marks	Credits
1 st	1000	28
2 nd	1000/1100	30
Total	2000/2100	58

COMMUNICATIVE ENGLISH

Subject Code: BHUM0-104

L T P C
2 1 0 3

Duration – 35Hrs

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.

Learning 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

UNIT-I (3 Hrs)

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

UNIT-II (5 Hrs)

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

UNIT-III (5 Hrs)

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

UNIT-IV (22 Hrs)

Interview Skills: Purpose of an interview, Do's and Don'ts of an interview

Giving Presentations: Dealing with Fears, planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

Group Discussion: Introduction, Communication skills in group discussion, Do's and Don'ts of group discussion

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(Tutorials)

The following learning modules may be conducted using Wordsworth® English language lab software.

Basic communication covering the following topics

Meeting People
Asking Questions
Making Friends
What did you do?
Do's and Don'ts

Pronunciations covering the following topics

Pronunciation (Consonant Sounds)
Pronunciation and Nouns
Pronunciation (Vowel Sounds)

Advanced Learning

Listening Comprehension / Direct and Indirect Speech

- Figures of Speech
- Effective Communication
- Writing Skills
- Effective Writing
- Interview Handling Skills
- E-Mail etiquette
- Presentation Skills

Recommended Books

1. Andreja. J. Ruther Ford, 'Basic Communication Skills for Technology', 2nd Edn., Pearson Education, **2011**.
2. Sanjay Kumar, Pushpalata, 'Communication Skills', 1stEdn., Oxford Press, **2011**.
3. Stephen P. Robbins, 'Organizational Behaviour', 1st Edn., Pearson, **2013**.
4. Gill Hasson, 'Brilliant-Communication Skills', 1st Edn., Pearson Life, **2011**.
5. Gopala Swamy Ramesh, 'The Ace of Soft Skills: Attitude, Communication and Etiquette for Success', 5th Edn., Pearson, **2013**.
6. Deborah Dalley, Lois Burton, Margaret, 'Developing your Influencing Skills', Green Hall, 1st Edn., Universe of Learning LTD, **2010**.
7. Konar nira, 'Communication Skills for Professionals', 2nd Edn., PHI, **2011**.
8. Barun K. Mitra, 'Personality Development and Soft Skills', 1st Edn., Oxford Press, **2011**.
9. 'Soft Skill for Everyone', Butter Field, 1st Edn., Cengage Learning India Pvt. Ltd., **2011**.
10. S.J. Francis Peters, 'Soft Skills and Professional Communication', 1st Edn., Mc Graw Hill Education, **2011**.
11. John Adair, 'Effective Communication', 4th Edn., Pan Mac Millan, **2009**.
12. Aubrey Daniels, 'Bringing out the Best in People', 2nd Edn., McGraw Hill, **1999**.

PHARMACOGNOSY-I

Subject Code: BPHA1-101

L T P C
2 1 0 3

Duration – 35Hrs

UNIT-I (9 Hrs)

Definition, history, scope and development of Pharmacognosy; Sources of drugs: Biological, marine, mineral and plant tissue culture.

Plant Cell, Histology and Morphology: Structure of plant cell and its non-living inclusions,

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different types of plant tissues and their functions. Morphology and histology of root, stem, bark, wood, leaf, flower, fruit and seed. Modifications of root and stem.

UNIT-II (7Hrs)

Classification of drugs: Alphabetical, morphological, taxonomical, chemical and pharmacological; Plant taxonomy: Study of the following families with special reference to medicinally important plants-Apocynaceae, Solanaceae and Rubiaceae.

Plant taxonomy: Study of the following families Umbelliferae, Leguminosae, Liliaceae, Labiatae, Cruciferae and Papaveraceae with special reference to medicinally important plants.

UNIT-III (10Hrs)

Cultivation, collection, processing and storage of crude drugs: Factors influencing cultivation of medicinal plants. Polyploidy, mutation and hybridization with reference to medicinal plants.

Quality control of crude drugs: Adulteration of crude drugs. Brief introduction to evaluation of crude drugs by organoleptic, microscopic, physical, chemical and biological methods.

UNIT-IV (9Hrs)

Introduction to crude drug monograph and its importance in registration of herbal products. Introduction to Chromatographic Techniques: Column, Paper, Thin Layer (TLC).

Introduction to Phytoconstituents of drugs: Definition, classification, properties and identification tests of carbohydrates, alkaloids, glycosides, terpenoids, steroids and flavonoids.

Recommended Books

1. G.E. Trease and W.C. Evans, 'Pharmacognosy', Elsevier, a Division of Reed Elsevier India Pvt. Ltd., New Delhi.
2. C.K. Kokate, A.P. Purohit and S.B. Gokhale, 'Pharmacognosy', Nirali Prakashan, Pune.
3. S.S. Handa and V.K. Kapoor, 'Textbook of Pharmacognosy', Vallabh Prashan, New Delhi.
4. T.E. Wallis, 'Textbook of Pharmacognosy', 5th Edn., CBS Publishers and Distributors, New Delhi.
5. V.C. Tyler, L.R. Brady and J.E. Robers, 'Pharmacognosy', Lea & Febiger, Philadelphia.
6. V.E. Tyler, Jr. and A.E. Schwarting, 'Experimental Pharmacognosy', Burgess Pub. Co., Hinneapoos, Minnesota.
7. K.R. Brain and T.D. Turner, 'The Practical Evaluation of Phytopharmaceuticals', Wright-Scientetchnica, Bristol.

PHARMACEUTICAL CHEMISTRY-I (INORGANIC PHARMACEUTICAL CHEMISTRY)

Subject Code: BPHA1-102

L T P C
3 1 0 4

Duration – 45Hrs

UNIT-I (21Hrs)

Impurities in Pharmaceutical Substances & their control sources and types of impurities, their limits, limit test for chlorides, sulphates, iron, lead, arsenic & heavy metals.

Pharmaceutical Aids & Necessities (Antioxidants: Theory, the selection of Antioxidants, Official antioxidants (Hypophosphorus Acid, Sodium bisulphite, Sodium thiosulphate, Sodium nitrite)

Major Intra & Extracellular Electrolytes Major Physiological ions (Chloride, Phosphate, Bicarbonate, Sodium, Potassium, Calcium, Magnesium); Electrolytes used in replacement therapy (Sodium chloride), Potassium replacement (potassium chloride), Calcium replacement (Calcium chloride, Calcium gluconate) Parenteral magnesium administration (Magnesium sulphate), Physiological acid base balance, Electrolytes used in acid base therapy (Sodium acetate, Potassium acetate, Sodium bicarbonate, Sodium citrate, Potassium citrate, Sodium

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lactate, Ammonium chloride), Electrolyte combination therapy.}; **Essential and Trace Elements** {Iron, Copper, Zinc, Chromium, Manganese, Molybdenum, Selenium, Sulphur and Iodine. Official Iodine Products (Iodine, Potassium iodide, Sodium iodide.

UNIT-II (7Hrs)

Gastrointestinal Agents {**Acidifying agents, Antacids:** (Sodium bicarbonate, Aluminium hydroxide, Aluminium phosphate, Dihydroxy Aluminium, Sodium carbonate, Calcium carbonate, Tribasic Calcium phosphate, Magnesium carbonate, Magnesium hydroxide, Magnesium oxide, Magnesium phosphate, Magnesium trisilicate) Combination antacid preparations.; **Protectives and Adsorbents:** Introduction. Bismuth containing products, Bismuth subnitrate, Bismuth subcarbonate, Kaolin, Activated charcoal.}; {**Saline Cathartics:** Introduction, Sodium phosphate, Potassium sodium tartrate, Magnesium hydroxide, Magnesium citrate, Magnesium sulphate, Potassium phosphate, Potassium bitartrate, Calomel.}

UNIT-III (5Hrs)

Protective: Definition, Protective products, Talc, Insoluble Zinc compounds (Zinc oxide, Calamine, Zinc stearate), Titanium dioxide, Aluminium as a protective agent, Silicone polymer; **Antimicrobials and Astringents:** Antimicrobial terminology, mechanism of action, control of antimicrobial/ astringent action; **Oxidative Antimicrobial Agents:** Hydrogen peroxide, Zinc peroxide, Sodium carbonate, Potassium permanganate, Iodine preparation and compounds.

UNIT-IV(12Hrs)

Protein Precipitant Antimicrobial Agents: Silver nitrate, Mild Silver Protein Mercury compounds (Yellow Mercuric oxide, Mercuric chloride), Sulphur and Sulphur compounds (Sublimed sulphur and Precipitated sulphur) Boric acid and Sodium borate, Antimony potassium tartrate, Official compounds of Aluminium and Zinc; **Dental Products:** Anticaries agents: Fluorides, official products (Sodium fluoride, Stannous fluoride), Phosphates, Dentifrices: Dentifrices containing Fluorides, Official products (Pumice). Dentifrices containing desensitizing agents, Official products (Zinc chloride and Zinc-Eugenol cement). **Co-ordination Compounds and Complexation** Theoretical considerations and official products (Calcium disodium edentate, Disodium edetate, Dimercaprol & Penicillamine}; **Miscellaneous Inorganic Pharmaceutical Agents** Inhalants, respiratory stimulants, expectorants and emetics, antidotes, tableting aids and suspending agents.

Recommended Books

1. J.H. Block, E. Roche, T.O. Soine and C.O. Wilson, 'Inorganic Medicinal and Pharmaceutical Chemistry', Lea & Febiger, Philadelphia, P.A.
2. L.M. Artherden, Bentley and Drivers, 'Textbook of Pharmaceutical Chemistry', S& Ed., Oxford University Press, Delhi.
3. 'Pharmacopoeia of India', Govt. of India, Ministry of Health.
4. Block, Roche, Soine & Wilson, 'Inorganic Medicinal & Pharmaceutical Chemistry'. 1st Edn., Varghese Publishing House, Mumbai, 1986.
5. Chatwal, 'Pharmaceutical Chemistry Inorganic', 3rd Edn., Himalaya Publishing House, Mumbai, 2007.
6. Singh & Kapoor, Practical Pharmaceutical Chemistry, 4th Edn., Vallabh Prakashan, Delhi, 1998.

PHARMACEUTICAL ANALYSIS-I

Subject Code: BPHA1-103

L T P C
3 1 0 4

Duration – 45Hrs

UNIT-I (9Hrs)

Quantitative Analysis and Data Handling

Introduction to concept of Quality Control and Assurance in Pharmaceutical Industry and role of Statistics in pharmaceutical analysis. Significance of quantitative analysis in quality control, different techniques of analysis, preliminaries and definitions, significant figures. Rules for retaining significant figures, Types of errors (Determinate and Indeterminate). Minimization of errors, Propagation of errors in addition and subtraction, multiplication and division, exponents, logarithms, precision and accuracy, selection of sample.

Acid Base Titrations

Acid base concept, role of the solvent, Relative strengths of acids and bases; Law of mass action; common ion effect, ionic product of water, pH, Hydrolysis of salts, Handerson – Hasselbach equation; Buffer and buffer capacity: Acid base indicators, Theory of indicators, Choice of indicators; Neutralization curves (Strong acid and strong base, strong acid weak base, weak acid strong base and weak acid weak base).

UNIT-II (13Hrs)

Acid Base Titrations

Polyprotic system, dissociation calculations for polyprotic acids, fractions and equilibrium concentrations of dissociating species at a given pH, salts of polyprotic acids, (Amphoteric salts and unprotonated salts), Buffer calculations for polyprotic acids, titrations of polyprotic acid, amino acid system and its titrations. Applications in assay of H_3BO_3 , HCl , NaOH and Na_2CO_3 .

Oxidation-Reduction Titrations

Concepts of oxidation and reduction, redox reactions, equivalent weights of oxidizing and reducing agents, electrochemical cells, reduction potential, standard reduction potential, Nernst equation, cell representations, measurement of electrode potential and its application in determining the equilibrium constant of a reaction.

UNIT-III (12Hrs)

Oxidation-Reduction Titrations

Concept of formal potential, oxidation reduction curves, redox indicators, potassium permanganate titrations, iodimetry and iodometry, ceric sulphate titrations, potassium iodate titrations, sodium 2, 6- dichlorophenol - indophenol titrations, pharmaceutical applications.

Precipitation Titrations

Precipitation reactions, solubility product, effects of common ion, acids, temperature and solvent upon the solubility of a precipitate, conditional solubility product, fractional precipitation.

UNIT-IV(11Hrs)

Precipitation Titrations

Argentometric titrations, ammonium or potassium thiocyanate titrations, mercuric nitrate titrations, indicators, Gay-Lussac method, Mohr's method, Volhard's method, Fajan's method, Pharmaceutical applications.

Gravimetric Analysis

Precipitation techniques, the colloidal state, gravimetric factor, super saturation, co-

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precipitation and its types, Post precipitation, digestion, washing of the precipitate, filtration, filter papers and crucibles, ignition, thermogravimetric curves of copper sulphate, specific examples like barium as barium sulphate, aluminium as aluminium oxide, calcium as calcium oxalate and magnesium as magnesium pyrophosphate, organic precipitants.

Recommended Books

1. Becket & Stenlake, 'Practical Pharmaceutical Chemistry', Vol. 1, 2, 4th Edn., CBS Publishers, New Delhi, 2005.
2. Jeffery, Bassett & Mendham, 'Vogel's Text Book of Quantitative Chemical Analysis', 5th Edn., Addison Wesley Longman Ltd., England, 1996.
3. K. Danzer, 'Analytical Chemistry', Springer, 2007.
4. R.M. Verma, 'Analytical Chemistry', 3rd Edn., CBS Publishers, New Delhi, 2007.
5. Alexeyev, 'Qualitative Analysis'. 2nd Edn., CBS Publishers, New Delhi, 2005.
6. L.M. Atherden, 'Bentley and Driver's Textbook of Pharmaceutical Chemistry', Oxford University Press, Delhi.

COMPUTER SCIENCE & APPLICATIONS

Subject Code: BCAP0-195

L T P C
2 1 0 3

Duration –35Hrs

Scope of the Subject: Subject deals with computer fundamentals and operating system. Computer applications are expected to offer various pharmaceutical services as drug information services, drug design and pharmacokinetic analysis.

Objectives of the Subject: Upon completion of the subject student shall be able

- To understand the basic MS-Word, MS- Excel and MS- Power point
- To know computer programming, data analysis, calculation and graphing using formulae and function.

UNIT-I (9 Hrs)

Computer Fundamentals Introduction to Computers:

Characteristics of computers, Historical perspectives of computers, Computer generations, types of computers and uses, Software, Hardware, Basic architecture and functions of CPU and its parts, Important I/O devices like Keyboard, Mouse, Printers, Video Monitors; **Number System:** Decimal, Binary, Basic Binary arithmetic (Conversion to and from decimal numbers, Binary addition and subtraction; **Memory Storage:** Memory Cells, Semiconductor and Magnetic core memory, ROM (its types), RAM, Cache and Virtual memory, Secondary storage devices and their organization (Hard disk, Floppy disk, CD, DVD).

Operating Systems

Definitions, Need, Organization, Functions, Types of Operating Systems, DOS, Windows, Handling Drives, Directories and files, Commands (Internal & External), Icons, Clipboard, Folders, Major differences between DOS & Windows.

UNIT-II (9Hrs)

Communication Networks

Hardware and software components, seven layers of OSI architecture, Network Topologies (Ring, Star, Fully Connected and Bus), LAN and WAN, Bounded and unbounded communication media, Internet, World Wide Web and I.T., Browsers, Important terminology regarding Internet applications, Electronic Mail, Potential uses and abuses of Internet.

Computer Programming

Programming languages, Classifications, Low level and high level languages, merits and demerits of languages, object oriented languages, Syntax and semantics, Basic steps involved

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in software development, Flow charts, Compilers and Interpreters.

UNIT-III (10Hrs)

Simple Programming Using

C Data types, Constants, Variables, Arithmetic and relational expressions, Symbolic constants, Input and output assignment statements, If-else, Switch statements, Loops (While, do-while and for), Transfer statements, Problem solving using “C” taking simple algorithms.

Computer Applications Word Processing

Techniques, File manipulation, Formatting, Printing setups Table handling, Mail merge, etc. using MS-Word; **SpreadsheetPackage:** Worksheets, formatting sheets, Calculations and graphing using formulae and functions, Import and export of data using MS-Excel.

UNIT- IV(7Hrs)

Computer Applications Graphics

Objectives and types of graphics, Presentation packages, Slides designing, Diagrams and graphs, Import & Export data using MS-Power Point; **Data Security against Viruses:** Definition of computer viruses, Detection, prevention and cure against viruses using anti-virus software packages.

Pharmaceutical Applications

Basics of computer use in various pharmaceutical and clinical applications like drug information services, hospital and community pharmacy, drug design, pharmacokinetics and data analysis.

Recommended Books

1. Rajaraman, ‘Fundamentals of Computers’, Prentice Hall of India.
2. N.K. Tiwari, ‘Computer Fundamental with Pharmacy Applications’, 1st Edn., Pharm. Med Press, 2008.
3. Stultz, ‘Learn MS-Office 2000’, BPB Publications.
4. Ivens, ‘Using Microsoft Windows’, Prentice Hall of India, 1998.
5. Stultz, ‘Learn DOS in a day’, BPB Publications.

INTRODUCTION TO DOSAGE FORM

Subject Code: BPHA1-104

L T P C
2 1 0 3

Duration –35Hrs

UNIT-I (2 Hrs)

Pharmacy Profession

History of Pharmacy, Pharmacy as a career, Pharmaceutical education in India and abroad, Pharmacopoeia of India and other Pharmacopoeias, Other official books.

UNIT-II (13 Hrs)

Introduction to different dosage forms, their classification with examples (Official formulation), their relative application; Definitions, general formulation, manufacturing procedures and official products of solutions, aromatic waters, syrups, spirits, elixirs, glycerides, lotions, liniments, gargles, mouth washes, suspension, emulsion, douches, draught preparation.

UNIT-III (10Hrs)

Additive of dosage forms Introduction, classification and uses of following additives in formulation of different dosage forms: preservatives, antioxidants, surfactants, hydrocolloids, emulsify agent, suspending agent, Diluents, binders, lubricants, organoleptic additives.

UNIT-IV(10Hrs)

Crude Extracts: Infusion, decoction, tincture, and extracts, methods of preparation of dry, soft

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and liquid extracts of IP.

Allergenic Extracts: Types of allergens, preparation of extracts testing and standardization of extracts.

Important Terms of Pharmaceutics Definition and examples of expectorant, pharmaceutical aid, additives.

Recommended Books

1. 'Remington's Pharmaceutical Sciences'.
2. 'Pharmacopoeia of India', Govt. of India, Ministry of Health.
3. Ansel, 'Introduction to Pharmaceutical Dosage Forms'.

PHARMACOGNOSY-ILAB

Subject Code: BPHA1-105

L T P C

0 0 4 2

1. To study different features of a dicot stem (Sunflower)
2. To study different feature of a dicot root
3. To study various pharmacognostic characteristics of a monocot stem
4. To study various pharmacognostic characteristics of a monocot root (Maize)
5. To study various pharmacognostic characteristics of a monocot leaf
6. To study various pharmacognostic characteristics of a dicot leaf
7. To determine the veinlet and veinlet termination number.
8. To study diagnostic features of *Vinca rosea* (Apocynaceae)
9. To study diagnostic features of *Datura stramonium/metel* (Solanaceae)
10. To study diagnostic features of *Ocimum basilicum* (Labiatae)
11. To study diagnostic features of *Brassica campestris* (Cruciferae)
12. To study diagnostic features of *Fennel* (Umbelliferae)
13. To study diagnostic features of *Cassia fistula* (Leguminosae)
14. To identify accacia gum by performing various tests
15. To identify tragacanth by performing various tests
16. To identify honey by performing various tests
17. To perform tests for identification of castor oil
18. To perform tests for identification of sesame oil
19. To determine the stomatal number and stomatal index of senna leaf
20. To determine the palisade ratio of Indian senna
21. To determine the average diameter of starch grains (Cinnamon powder)
22. To measure the average width of fiber in Cinnamon powder
23. Preparations of minimum of 50 herbarium sheets (one each for every student) of selected medicinal plants

Recommended Books

1. G.E. Trease and W.C. Evans, 'Pharmacognosy', Elsevier, a Division of Reed Elsevier India Pvt. Ltd., New Delhi.
2. V.E. Tyler, Jr. and A.E. Schwarting, 'Experimental Pharmacognosy', Burgess Pub. Co, Hinneapois, Minnesota.
3. K.R. Brain and T.D. Turner, 'The Practical Evaluation of Phytopharmaceuticals', Wright-Scientetchnica, Bristol.
4. T.E. Wallis, 'Practical Pharmacognosy', 4th Edn, PharmaMed Press, Hyderabad, India, 2011.

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5. C.K. Kokate, 'Practical Pharmacognosy', 4th Edn., Published by M.K Jain for Vallabh Prakashan, Delhi, India, 1994.

PHARMACEUTICAL CHEMISTRY-I (INORGANIC PHARMACEUTICAL CHEMISTRY) LAB

Subject Code: BPHA1-106

L T P C

0 0 4 2

1. To analyse the presence of acid radicals (anions) in the given mixture.
2. To analyse the presence of six radicals (three anions and three cations) in the given mixture by semi-micro method.
3. To perform detection of group I and group II radicals.
4. To perform determination of melting point and boiling points.
5. To perform identification tests for Magnesium Sulphate
6. To perform identification tests for Calcium chloride.
7. To perform identification tests for barium sulphate.
8. To perform identification tests for Hydrochloric acid and qualitatively analyse the chloride ions.
9. To perform identification tests for ferrous sulphate.
10. To perform identification tests for hydrogen peroxide.
11. To perform identification tests for Boric acid.
12. To perform identification tests for Potassium permanganate and qualitatively analyse for potassium ions.
13. To perform identification tests for ammonium chloride and qualitatively analyse for ammonium as cation and chloride as anion.
14. To perform limit tests for chloride in Magnesium sulphate.
15. To perform limit tests for sulphate.
16. To perform limit tests for iron.
17. To perform limit tests for heavy metals.
18. To perform limit tests for Arsenic.

Recommended Books

1. Nirmal Sharma, Yogeshwar Sharma, K.K. Thakur, Pratibha Nand, G.C. Sharma, 'Practical Inorganic Pharmaceutical Chemistry and Viva- voce', 1st Edn., Birla Publications Pvt. Ltd., 2007.
2. Singh & Kapoor, 'Practical Pharmaceutical Chemistry', 4th Edn., Vallabh Prakashan, Delhi, 1998.
3. G. Devala Rao, 'Practical Pharmaceutical Inorganic Chemistry', 3rd Edn., Birla Pub. (20101-2011).
4. Anees Ahmed Siddiqui, Mohammed Ali, 'Practical Pharmaceutical Chemistry', 1st Edn., CBS Publishers, 1997.

PHARMACEUTICAL ANALYSIS-I LAB

Subject Code: BPHA1-107

L T P C

0 0 4 2

1. To study the typical analytical balance, the requirements of a good balance, weights, care and use of balance, methods of weighing and errors in weighing.
2. To perform calibration of volumetric apparatus and weights including fractional weight

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-
- using digital weighing balance of sensitivity 01 mg.
3. To carry out the standardization of 0.1 N HCl using standard solution of sodium carbonate.
 4. To carry out the standardization of 0.1 N H₂SO₄ using standard solution of sodium carbonate.
 5. To standardize the given of 0.1 N NaOH using standard solution of oxalic acid.
 6. To perform the assay of given sample of sodium bicarbonate.
 7. To perform the assay of given sample of boric acid.
 8. To perform the assay of given sample borax using standard solution of HCl.
 9. To standardise the given solution of 0.1N KMnO₄ using standard solution of oxalic acid.
 10. To perform the assay of given sample of ferrous sulphate using standard solution of KMnO₄.
 11. To perform the assay of the given sample of copper sulphate.
 12. To perform the assay of the given sample of sodium chloride.
 13. To perform the assay of the given sample of KCl.
 14. To prepare and standardize 0.1 N iodine solution.
 15. To prepare and standardise 0.1 N sodium thiosulphate solution.
 16. To estimate the amount of barium present in the given solution

Recommended Books

1. Jeffery, Bassett & Mendham, 'Vogel Text Book of Quantitative Chemical Analysis', 5th Edn., Addison Wesley Longman Ltd England, 1996.
2. R.M. Verma, 'Analytical Chemistry', 3rd Edn., CBS Publishers, New Delhi. Becket & Stenlake, 2007.
3. 'Practical Pharmaceutical Chemistry', Vol.1 & 2, 4th Edn., CBS publishers, New Delhi, 2005.
4. Alexeyev, 'Quantative Analysis', 2nd Edn., CBS publishers, New Delhi, 2005.
5. L.M. Atherden, 'Bentley and Driver's Textbook of Pharmaceutical Chemistry', Oxford University Press, Delhi.

COMPUTER SCIENCE & APPLICATIONS LAB

Subject Code: BCAP0-196

L T P C

0 0 4 2

1. Give the various components, their functions and identification of various parts of a computer and peripherals. Perform installation of a computer and loading system software and application software.
2. Installation of DOS and simple exercises on TYPE, REN, DEL, CD, MD, COPY, TREE, BACKUP commands.
3. Exercises on entering text and data (Typing Practice) Features of Windows as an operating system.
4. File Management using Ms Word, Page set up using Ms Word Editing a document using Ms Word.
5. Formatting a document using Ms Word Tables and Borders using Ms Word Working with more than one window in MS Word.
6. Perform application of MS Excel.
7. Application of Menu commands, Work books and Creating a chart.
8. Customize MS-Excel.

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9. Introduction to MS-Power Point and use of Wizards and Templates Preparing Presentations.
10. Prepare and submit a scientific power point presentation using various effects and application of power point.
11. Prepare a program in C language to find sum of any two numbers.
12. Prepare a program in C language to find gross salary.
13. Prepare a program in C language to find table (mathematical) of any number.
14. Prepare a program in C language to find greatest in 3 numbers.
15. Prepare a program in C language to show the use of conditional operator.
16. Program to find that entered year is leap year or not.
17. Prepare a program in C language to find whether given no is even or odd
18. Display the kind of output on screen (in the left of the screen)
 - a. 1
 - b. 22
 - c. 333
 - d. 4444
19. Write a C program to find the sum of first 100 natural numbers.
20. Prepare a program in C language to find the sum of first 100 odd or even numbers.
21. Write a C program to display first 25 Fibonacci number.
22. Write a C program to display first 100 prime numbers.
23. Write a C program to find factorial numbers and to print the accepted no and its reverse number.

HUMAN ANATOMY AND PHYSIOLOGY-I

Subject Code – BPHA1-208

L T P C
3 1 0 4

Duration – 45 Hrs

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

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

UNIT-I (11 Hrs)

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 signaling pathway

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activation by extracellular signal molecule, Forms of intracellular signaling: 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.

UNIT-II (11 Hrs)

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

UNIT-III (12 Hrs)

Body fluids and blood

- Body fluids, composition and functions of blood, hemopoiesis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system.

Lymphatic system

- Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system

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.

UNIT-IV (11 Hrs)

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
- Disorders of heart.

Recommended Books

1. K. Sembulingam and P. Sembulingam, 'Essentials of Medical Physiology', Jaypee Brothers Medical Publishers, New Delhi.
2. Kathleen J.W. Wilson, 'Anatomy and Physiology in Health and Illness', Churchill Livingstone, New York.
3. Best and Taylor, 'Physiological Basis of Medical Practice', Williams & Wilkins Co, Riverview, MI USA.
4. C. Arthur, Guyton and John. E. Hall, 'Text book of Medical Physiology', Miamisburg, OH U.S.A.
5. Tortora Grabowski, 'Principles of Anatomy and Physiology', Palmetto, GA, U.S.A.

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6. Inderbir Singh, 'Textbook of Human Histology', Jaypee Brother's Medical Publishers, New Delhi.
7. C.L. Ghai, 'Textbook of Practical Physiology', Jaypee Brother's Medical Publishers, New Delhi.
8. K. Srinageswari and Rajeev Sharma, 'Practical Workbook of Human Physiology', Jaypee Brother's Medical Publishers, New Delhi.
9. Best and Taylor, 'Physiological Basis of Medical Practice', Williams & Wilkins Co, Riverview, MI USA.
10. Arthur C. Guyton and John. E. Hall, 'Text book of Medical Physiology', Miamisburg, OH, U.S.A.
11. C.C. Chatterje, 'Human Physiology (vol. 1, 2)', Academic Publishers Kolkata.

PHARMACEUTICAL ORGANIC CHEMISTRY -I

Subject Code – BPHA1-209

L T P C

Duration – 45 Hrs

3 1 0 4

Scope:

- This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.

Objectives:

Upon completion of the course the student shall be able to

- Write the structure, name and the type of isomerism of the organic compound
- Write the reaction, name the reaction and orientation of reactions
- Account for reactivity/stability of compounds,
- Identify/confirm the identification of organic compound

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

UNIT-I (10 Hrs)

Classification, nomenclature and isomerism

- Classification of Organic Compounds
- Common and IUPAC systems of nomenclature of organic compounds (up to 10 Carbons open chain and carbocyclic compounds)
- Structural isomerism in organic compounds

UNIT-II (12 Hrs)

Alkanes*, Alkenes* and Conjugated dienes*

- SP₃ hybridization in alkanes, Halogenation of alkanes, uses of paraffin. Stabilities of alkenes, SP₂ hybridization in alkenes
- E₁ and E₂ reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E₁ verses E₂ reactions, Factors affecting E₁ and E₂ reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.

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- Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement

UNIT-III (12 Hrs)

Alkyl halides*

- SN1 and SN2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations.
- SN1 versus SN2 reactions, Factors affecting SN1 and SN2 reactions
- Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform.

Alcohols*-

- Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol

UNIT-IV (11 Hrs)

Carbonyl Compounds* (Aldehydes and Ketones)

- Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.

Carboxylic acids*

- Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester
- Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid
- Aliphatic amines* - Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine.

Recommended Books

1. Morrison and Boyd, 'Organic Chemistry'.
2. I.L. Finar, 'Organic Chemistry;' Volume-I.
3. B.S. Bahl & Arun Bahl, 'Textbook of Organic Chemistry'.
4. P.L. Soni, 'Organic Chemistry'.
5. Mann and Saunders, 'Practical Organic Chemistry'.
6. 'Vogel's Text Book of Practical Organic Chemistry'.
7. N.K. Vishnoi, 'Advanced Practical Organic Chemistry'.
8. Pavia, Lampman and Kriz, 'Introduction to Organic Laboratory Techniques'.

BIOCHEMISTRY

Subject Code – BPHA1-210

L T P C

Duration – 45 Hrs

3 1 0 4

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 be able to

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

UNIT-I (11 Hrs)

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 (11 Hrs)

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 (12 Hrs)

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 (11 Hrs)

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

Enzymes

- Introduction, properties, nomenclature and IUB classification of enzymes Enzyme kinetics (Michaelis plot, Line Weaver Burke plot)
- Enzyme inhibitors with examples
- Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation
- Therapeutic and diagnostic applications of enzymes and isoenzymes Coenzymes – Structure and biochemical functions

Recommended Books

1. Lehninger, 'Principles of Biochemistry'.
2. Robert K. Murry, Daryl K. Granner and Victor W. Rodwell, 'Biochemistry', Harper
3. Stryer, 'Biochemistry'.
4. D. Satyanarayan and U. Chakrapani, 'Biochemistry'.
5. Rama Rao, 'Textbook of Biochemistry'.
6. R.C. Gupta and S. Bhargavan, 'Practical Biochemistry'.
7. David T. Plummer, 'Introduction of Practical Biochemistry', 3rd Edn.
8. Rajagopal and Ramakrishna, 'Practical Biochemistry for Medical Students'.
9. Harold Varley, 'Practical Biochemistry'.

PHYSICAL PHARMACEUTICS-I

Subject Code – BPHA1-211

L T P C
3 1 0 4

Duration – 45 Hrs

Scope:

- The course deals with the various physical and physicochemical properties, and the 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:

Upon the completion of the course student shall be able to

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

UNIT-I (11 Hrs)

- 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 (11 Hrs)

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.

Physicochemical properties of drug molecules:

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

UNIT-III (11 Hrs)

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.

UNIT-IV (12 Hrs)

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.

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.

Recommended Books

1. Alfred Martin, 'Physical Pharmacy'.
2. Eugene, Parott, 'Experimental Pharmaceutics'.
3. Cooper and Gunn, 'Tutorial Pharmacy'.
4. H.A. Liberman, C. Lachman, 'Pharmaceutical Dosage Forms, Tablets', Volume-1 to 3, Marcel Dekkar Inc.
5. H.A. Liberman, C. Lachman, 'Pharmaceutical Dosage Forms, Disperse Systems', volume 1, 2, 3. Marcel Dekkar Inc.
6. C. Ramasamy and R. Manavalan, 'Physical Pharmaceutics'.
7. C.V.S. Subramanyam, J. Thimma Settee, 'Laboratory Manual of Physical Pharmaceutics'.
8. C.V.S. Subramanyam, 'Physical Pharmaceutics'.
9. Gaurav Jain & Roop K. Khar, 'Text Book of Physical Pharmacy'.

REMEDIAL BIOLOGY

Subject Code – BPHA1-212

L T P C

Duration – 25 Hrs

2 0 0 2

Scope:

- To learn and understand the components of living world, structure and functional system of plant and animal kingdom.

Objectives:

Upon completion of the course, the student shall be able to

- Know the classification and salient features of five kingdoms of life
- Understand the basic components of anatomy & physiology of plant
- Know understand the basic components of anatomy & physiology animal with special reference to human

UNIT-I (6 Hrs)

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,

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 & Dicotyledons.

UNIT-II (7 Hrs)

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

Digestion and Absorption

- Human alimentary canal and digestive glands
- Role of digestive enzymes
- Digestion, absorption and assimilation of digested food

Breathing and Respiration

- Human respiratory system
- Mechanism of breathing and its regulation
- Exchange of gases, transport of gases and regulation of respiration
- Respiratory volumes

UNIT-III (6 Hrs)

Excretory Products and their Elimination

- Modes of excretion
- Human excretory system- structure and function

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- Urine formation
- Rennin angiotensin system

Neural Control and Coordination

- Definition and classification of nervous system
- Structure of a neuron
- Generation and conduction of nerve impulse
- Structure of brain and 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

UNIT-IV (6 Hrs)

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.

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.

Recommended Books

1. S.B. Gokhale, 'Text book of Biology'.
2. Thulajappa and Seetaram, 'A Text Book of Biology'.
3. Naidu and Murthy, 'A Text Book of Biology'.
4. A.C. Dutta, 'Botany for Degree Students'.
5. M. Ekambaranatha Ayyer and T.N. Ananthakrishnan, 'Outlines of Zoology'.
6. S.B. Gokhale and C.K. Kokate, 'A Manual for Pharmaceutical Biology Practical'.

REMEDIAL MATHEMATICS

Subject Code – BPHA1-213

L T P C

Duration – 25 Hrs

3 0 0 3

Scope:

- This is an introductory course in mathematics. This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform.

Objectives:

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

- Know the theory and their application in Pharmacy
- Solve the different types of problems by applying theory
- Appreciate the important application of mathematics in Pharmacy

UNIT – I (6 Hrs)

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

Logarithms

- Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.

Function:

- Real Valued function, Classification of real valued functions,
- **Limits and continuity :**

Introduction , Limit of a function, Definition of limit of a function ($\epsilon - \delta$

definition) , $\lim_{x \rightarrow a} \frac{x_n - a_n}{x - a} = na_{n-1}$, $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$,

UNIT-II (6 Hrs)

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.

UNIT-II (6 Hrs)

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

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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

UNIT – IV (7 Hrs)

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

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

Recommended Books

1. Shanthinarayan, 'Differential Calculus'.
2. Panchaksharappa Gowda D.H., 'Pharmaceutical Mathematics with Application to Pharmacy'.
3. Shanthinarayan, 'Integral Calculus'.
4. B.S. Grewal, 'Higher Engineering Mathematics'.

ENVIRONMENTAL SCIENCES

Subject Code – BPHA1-214

L T P C

Duration – 45 Hrs

3 0 0 3

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:

- Create the awareness about environmental problems among learners.
- Impart basic knowledge about the environment and its allied problems.
- Develop an attitude of concern for the environment.
- Motivate learner to participate in environment protection and environment improvement.
- Acquire skills to help the concerned individuals in identifying and solving environmental problems.

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- Strive to attain harmony with Nature.

UNIT-I (11 Hrs)

- The Multidisciplinary nature of environmental studies
- Natural Resources
- Renewable and non-renewable resources:
- Natural resources and associated problems

UNIT-II (11 Hrs)

- 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.

UNIT-III (12 Hrs)

- 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)

UNIT- IV (11 Hrs)

- Environmental Pollution: Air pollution; Water pollution; Soil pollution

Recommended Books

1. Y.K. Sing, 'Environmental Science', New Age International Pvt, Publishers, Bangalore.
2. K.C. Agarwal, 'Environmental Biology', Nidi Publ. Ltd. Bikaner, 2001.
3. Bharucha Erach, 'The Biodiversity of India,' Mapin Publishing Pvt. Ltd.
4. R.C. Brunner, 'Hazardous Waste Incineration', McGraw Hill Inc.
5. R.S. Clark, 'Marine Pollution', Clanderson Press Oxford.
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 'Environmental Encyclopedia', Jaico Publ. House, Mumbai, 1196p, 2001.
7. A.K. De, 'Environmental Chemistry', Wiley Eastern Ltd.
8. 'Down of Earth', Centre for Science and Environment.

HUMAN ANATOMY AND PHYSIOLOGY- LAB

Subject Code – BPHA1-215

L T P C

0 0 4 2

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals 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.

1. Study of compound microscope.
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

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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.
15. Recording of blood pressure.

Recommended Books

1. K. Sembulingam and P. Sembulingam, 'Essentials of Medical Physiology' Jaypee Brothers Medical Publishers, New Delhi.
2. Kathleen J.W. Wilson, 'Anatomy and Physiology in Health and Illness', Churchill Livingstone, New York.
3. Best and Taylor, 'Physiological Basis of Medical Practice', Williams & Wilkins Co, Riverview, MI USA.
4. C. Arthur, Guyton and John. E. Hall, 'Text Book of Medical Physiology', Miamisburg, OH, U.S.A.
5. Tortora Grabowski, 'Principles of Anatomy and Physiology', Palmetto, GA, U.S.A.
6. Inderbir Singh, 'Textbook of Human Histology', Jaypee Brother's Medical Publishers, New Delhi.
7. C.L. Ghai, 'Textbook of Practical Physiology', Jaypee Brother's Medical Publishers, New Delhi.
8. K. Srinageswari and Rajeev Sharma, 'Practical Workbook of Human Physiology', Jaypee Brothers Medical Publishers, New Delhi.

PHARMACEUTICAL ORGANIC CHEMISTRY-I LAB

Subject Code – BPHA1-216

L T P C

0 0 4 2

- A. Systematic qualitative analysis of unknown organic compounds like
 - a) Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and
 - b) unsaturation, etc.
 - c) Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test
 - d) Solubility test
 - e) Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
 - f) Melting point/Boiling point of organic compounds
 - g) Identification of the unknown compound from the literature using melting point/ boiling point.
 - h) Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.
 - i) Minimum 5 unknown organic compounds to be analyzed systematically.
- B. Preparation of suitable solid derivatives from organic compounds
- C. Construction of molecular models

Recommended Books

1. Morrison and Boyd, 'Organic Chemistry'.
2. I.L. Finar, 'Organic Chemistry', Volume-I.
3. B.S. Bahl & Arun Bahl, 'Textbook of Organic Chemistry'.
4. P.L. Soni, 'Organic Chemistry'.
5. Mann and Saunders, 'Practical Organic Chemistry'.
6. 'Vogel's Text Book of Practical Organic Chemistry'.
7. N.K. Vishnoi, 'Advanced Practical Organic Chemistry'.
8. Pavia, Lampman and Kriz, 'Introduction to Organic Laboratory Techniques'.
9. Ahluwalia, Chatwal, 'Reaction and Reaction Mechanism'.

BIOCHEMISTRY- LAB

Subject Code – BPHA1-217

L T P C

0 0 4 2

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.

Recommended Books

1. Lehninger, 'Principles of Biochemistry'.
2. Robert K. Murry, Daryl K. Granner and Victor W. Rodwell, 'Biochemistry', Harper.
3. Stryer, 'Biochemistry'
4. D. Satyanarayan and U. Chakrapani, 'Biochemistry'.
5. Rama Rao, 'Textbook of Biochemistry'.
6. R.C. Gupta and S. Bhargavan, 'Practical Biochemistry'.
7. David T. Plummer, 'Introduction of Practical Biochemistry', 3rd Edn.
8. Rajagopal and Ramakrishna, 'Practical Biochemistry for Medical Students'.
9. Harold Varley, 'Practical Biochemistry'.

PHYSICAL PHARMACEUTICS-I LAB

Subject Code – BPHA1-218

T L P C

0 0 4 2

1. Determination the solubility of drug at room temperature
2. Determination of pK_a 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

Recommended Books

1. Alfred Martin, 'Physical Pharmacy'.
2. Eugene, Parott, 'Experimental Pharmaceutics'.
3. Cooper and Gunn, 'Tutorial Pharmacy'.
4. H.A. Liberman, C. Lachman, 'Pharmaceutical Dosage Forms, Tablets', Volume-1 to 3, Marcel Dekkar Inc.
5. H.A. Liberman, C. Lachman, 'Pharmaceutical Dosage Forms, Disperse Systems', Volume 1, 2, 3, Marcel Dekkar Inc.
6. C. Ramasamy and R. Manavalan, 'Physical Pharmaceutics'.
7. C.V.S. Subramanyam, J. Thimma Settee, 'Laboratory Manual of Physical Pharmaceutics'.
8. C.V.S. Subramanyam, 'Physical Pharmaceutics'.
9. Gaurav Jain & Roop K. Khar, 'Text Book of Physical Pharmacy'.

REMEDIAL BIOLOGY- LAB

Subject Code – BPHA1-219

T L P C

0 0 2 1

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

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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

Recommended Books

1. S.R. Kale and R.R. Kale, 'Practical Human Anatomy and Physiology'.
2. S.B. Gokhale, C.K. Kokate and S.P. Shriwastava, 'A Manual of Pharmaceutical Biology Practical'.
3. M.J.H. Shafi, 'Biology Practical Manual according to National Core Curriculum', Biology Forum of Karnataka.