**I Year II Semester**

**PHR16121 - HUMAN ANATOMY & PHYSIOLOGY – II (50 Hrs)**

**UNIT –I 08**

**Central Nervous System**: Anatomy and physiology of different parts of brain, spinal cord and cranial nerves.

*LO:* Brain involvement in sensory and motor functions including pain perception, sleep wake cycle, cognitive skills, memory, behavior and governance.

**UNIT – II 08**

Neuron, axon conduction, Neurochemical transmission, reflex action, Electroencephalogram, specialized functions of the brain, and their functions.

*LO:* Chemical Mediators like Acetyl choline, Serotinine, Dopamine, Noradrenaline, Glutamic acid, Gaba involvement in transmission of impulse and disorders due to their changes.

# UNIT – III 08

**Autonomic Nervous System**: Physiology and functions of sympathetic and parasympathetic nervous system. Mechanism of neurohumoral transmission in the A.N.S.

*LO:* Cholinergic system is Essential for life process while adrenergic system is needed to meet emergency by flight or fight. ANS works without rest through life without rest unlike CNS.

# UNIT – IV 08

**Endocrine System**: Basic anatomy and physiology of pituitary, thyroid, parathyroid, adrenals, testes, ovary and endocrine functions of hormones and functions.

*LO:* Growth, reproduction and metabolism depend on hormonal activity. Their imbalance leads to disorders and some of them cannot be rectified.

**UNIT-V 08**

**Reproductive System:** Male and female reproductive systems and the functions of their hormones. Physiology of menstruation, Spermatogenesis and Oogenesis.

*LO:* Concept of male & female hormones, Characters, sex cell maturity, reproductive period, copulation and pregnancy, parturition, concept of pregnancy, menopause and their care.

**UNIT-VI** **10**

**Sense organs:** basic anatomy and physiology of Eye, Ear, Nose, Tongue and skin.

*LO:* Sensations are the combined activities of sensory organs and specified areas of the brain.

**TEXT BOOKS**

1. Tortora, G.J and Anagnodokas, Principles of Anatomy and Physiology, N.P Harper & Row Publishers N.Y
2. Ross & Wilson – Anatomy & Physiology in health and illness – Anne Waugh, Allison Grant.
3. T.S. Ranganathan, A Text book of Human Anatomy.
4. Human Anatomy and Physiology. C.C Chatterjee.
5. Dr. Jayaveera K.N., Vrushabendra Swamy B.M., Human Anatomy Physiology and Health Education, S.Chand publ.

**REFERENCES**

1. Donald.C Rizzo, Fundamental of Anatomy and Physiology.
2. Subrhamanyam and Others, A textbook of Physiology
3. A.C.Guyton, Text Book of Medical PhysiologyKeele& Neil, Samson Wrights Applied Physiology
4. Best & Taylor, The Living Body-A Text Book on Human Physiology
5. M.N. Ghosh, Human Physiology Julia F. Gui, Learning Human Anatomy: A Laboratory Text
6. B.D. Chaurasia, Human Anatomy, Regional and Applied, Part-I,II and III, CBS Publishers and Distributors, New Delhi

**I Year II Semester**

**PHR16122 - PHARMACEUTICAL INORGANIC CHEMISTRY (50Hrs)**

**UNIT-I ` 08**

1. Classification of inorganic pharmaceuticals based on their applications and therapeutic uses.
2. Sources of impurities, quality control and test for purity. Limit tests for chlorides, sulphates, iron, arsenic, lead and heavy metals and their pharmacopoeial standards.

*LO:* Pharmaceutical orientation to inorganic chemistry, definitions, principles, procedures, limits of detection, keeping the impurities in pharmaceutical substances to the minimal level.

**UNIT-II 10**

1. **Sodium, potassium and calcium replenishers:** sodium chloride, compound sodium chloride solution (Ringer solution), potassium chloride, ORS.
2. **Calcium replenishers:** Calcium chloride, calcium gluconate, dibasic calcium phosphate.
3. **Acid-base regulators:** sodium bicarbonate, sodium lactate, sodium citrate/potassium citrate, sodium acetate and ammonium chloride.
4. **Antacids:** Aluminium hydroxide gel, dried aluminium hydroxide gel, magnesium oxide, magnesium hydroxide mixture, magnesium trisilicate and calcium carbonate.
5. **Expectorants:** Ammonium chloride, potassium iodide.
6. **Emetics:** Potassium antimony tartrate and copper sulfate.
7. **Antidotes:** Sodium thiosulphate and sodium nitrite.

*LO:* Properties, classification, preparation, assay of ammonium chloride, sodium thiosulfate and sodium nitrite, uses.

**UNIT-III 08**

1. **Adsorbents:** Light kaolin, heavy kaolin and activated charcoal.
2. **Astringents:** Zinc oxide and Bismuth subcarbonate.
3. **Protectants:** Calamine, zinc oxide, zinc stearate, talc and titanium dioxide
4. **Silicone polymers:** Activated Dimethicone
5. **Anti-infectives:** Hydrogen peroxide solution, potassium permanganate, silver nitrate (Silver protein), iodine (Solutions of iodine, povidone-iodine) boric acid and yellow mercuric chloride.

*LO:*Properties, preparation wherever applicable, assay of hydrogen peroxide, potassium permanganate, boric acid, zinc oxide and uses.

**UNIT-IV 08**

1. **Laxatives:** Magnesium sulphate and Sodium phosphate.
2. **Haematinics:** Ferrous sulphate, Ferrous fumarate, Ferrous gluconate, Ferric ammonium Citrate, Iron and Dextrose injection.
3. **Suspending agents:** Bentonite and Colloidal silica.
4. **Excipients:** Di and tricalcium phosphates, Magnesium stearate, talc and Calcium carbonate (precipitated chalk).
5. **Colorants:** Titanium oxide and Ferric oxide.

*LO:* Properties, preparations wherever applicable, uses.

**UNIT-V 08**

**Dental products:**

1. **Fluorides:** Sodium fluoride and Stannous fluoride.
2. **Oral antiseptics:** Hydrogen peroxide, Zinc peroxide and mouth washes.
3. **Dentifrices:** Dibasic calcium phosphate, Strontium chloride and Sodium metaphosphate.
4. **Cements and Fillers:** Zinc oxide.

*LO:* Properties, preparations wherever applicable, uses.

**UNIT-VI 08**

**Miscellaneous medicinal agents of inorganic nature:**

Cisplatin (Antineoplastic), lithium carbonate (Antipsychotic), Barium sulfate (diagnostic agent), Plaster of paris (surgical aid), Sodium auorthiomalate (antirheumatic), Sodium antimonygluconate (internal parasiticid) and Potassium perchlorate (antithyroid).

*LO:* Structures, properties and uses.

# TEXT BOOKS

* + - 1. A.H.Beckett and J.B.Stenlake, Practical pharmaceutical chemistry, Part-I. The Athtone press, University of London, London.
      2. Advanced Inorganic Chemistry by Satya prakash, G.D.Tuli
      3. Wal Ankita, Wal, Pranay, Rai, Awani Kumar, Inorganic Pharmaceutical Chemistry, New Age International Publishers.

**REFERENCES**

1. J.H Block, E.Roche, T.O Soine and C.O. Wilson, Inorganic Medical and pharmaceutical

Chemistry Lea & Febiger Philadelphia PA.

2. P. Gundu Rao, Inorganic pharmaceutical chemistry; Vallabh Prakashan, Delhi.

3. L.M. Atherden, Bentley and Driver’s Textbook of Pharmaceutical Chemistry Oxford

University Press, London.

* + - 1. G.R Chatwal, Pharmaceutical Chemistry Inorganic, Himalaya Publishers.
      2. K Somasekhar Rao, C Venkata Suresh, Pharmaceutical Inorganic Chemistry, Pharma Med Press.

**I Year II Semester**

**PHR16123 - PHARMACEUTICAL ORGANIC CHEMISTRY-II (50Hrs)**

**UNIT-I 10**

**Benzene:** Kekule’s structure, Aromaticity, Huckle’s rule, resonance energy, characteristic electrophilic substitution reactions: Nitration, Halogenations, Sulfonation, Friedel-Craft’s alkylation and acylation with limitations, orientation in mono substituted benzenes.

**Polynuclear aromatic hydrocarbons:** Nomenclature, methods of preparation of Naphthalene, Anthracene and Phenanthrene, their oxidation and reduction reactions, relative susceptibilities to oxidation as interpreted in terms of sacrifice of resonance energies, Electrophilic substitution reactions.

**Arylhalides:** Nomenclature, comparison of reactivity with respect to alkylhalides, mechanism of nucleophilic substitution (Benzyne concept).

*LO:* Understanding the properties of aromatic compounds, mechanisms of reactions and their usefulness in organic synthesis, electronic factors influencing orientation.

**UNIT-II 08**

**Carbonyl compounds:** Nomenclature, important methods of preparation, characteristic nucleophilic addition reactions (addition of bisulphate, Grignard reagent, hydrogen cyanide, hydrazine derivatives and alcohols); Aldol condensation, Cannizzaro reaction and Perkin reaction.

*LO:* General properties, relative reactivities towards nucleophilic addition, mechanisms and applications.

**UNIT-III 08**

**Carboxylic acids:** Nomenclature, important methods of preparation, characteristic reactions (acidity, relative acidities, reduction, H-V-Z reaction, conversion into acid chlorides, amides and esters); methods of preparation of important esters (Acetoacetic ester and Malonic ester) and their applications in organic synthesis.

*LO:*General properties, measurement of relative acidities, equations involving the reactions and mechanisms, applications in synthesis.

**UNIT-IV 08**

**Phenols:** Nomenclature, general methods of preparation, industrial synthesis of phenol by Dow process, characteristic reactions (acidity and its comparison to alcohols and carboxylic acids as interpreted by resonance, ether formation, ester formation, Kolbe reaction, Reimer-Tiemann Reaction, Bromination and nitration).

*LO:* Structures, equations, mechanisms, importance of these reactions in pharmaceutical organic synthesis.

**UNIT-V 08**

**Amines and Diazonium compounds:** Nomenclature, methods of preparation, characteristic reactions (basicity and relative basicities, alkylation and exhaustive alkylation, nitration and orientation), separation of all three classes of amines by Hinsberg’s method; formation of Diazonium compounds, characteristic reactions (replacement by hydrogen, Sandmeyer reaction, replacement by nitrile, and their applications in synthesis and coupling reactions).

*LO:* Properties, structures, equations, mechanisms, orientations and applications.

**UNIT-VI 08**

**Name reactions:** Beckmann rearrangement, Mannich reaction, Fries rearrangement, Michael addition, Schmidt reaction, Benzoin condensation.

*LO:*General reaction, structures and mechanism, applications in organic synthesis.

**TEXT BOOKS**

1. T.R. Morrison and R.N. Boyd, Organic chemistry, pentice hall of India private limited, New Delhi.
2. Arun Bahl & Bahl, Advanced Pharmaceutical Organic Chemistry.
3. C. N. Pillai, Text book of Organic Chemistry.
4. Bhupinder Mehta, Manju Mehta, Organic Chemistry.

**REFERENCES**

1. R.L Madan, *Organic Chemistry.*
2. Lloyd N. Ferguson, Text book of Organic Chemistry, 2nd edition,.
3. Raj K Bansal, A textbook of Organic Chemistry, 5th edition.

**I Year II Semester**

**PHR16124 - PHYSICAL PHARMACY – I (50 Hrs)**

**UNIT – I 10**

**Intermolecular forces and states of matter**: Binding forces between molecules, the states of matter, the gaseous state, the liquid state, solids and the crystalline state. Phase equilibria and the phase rule.

*LO***:** To learn intermolecular forces and states of matter,Phase equilibria and Phase rule

**UNIT – II 08**

**Thermodynamics**: The first law of thermodynamics, The second law of thermodynamics. The third law of thermodynamics, Free energy functions and applications. Thermochemistry

*LO***:** To understand laws of Thermodynamics and their Applications

**UNIT – III 08**

**Physical properties of Drug Molecules**: Dielectric constant induced polarization, Dipole moment, Refractive index and Molar refraction, Optical rotatory dispersion.

*LO***:** To understand the physical properties of drug molecules and their significance.

**UNIT – IV 12**

**Solutions of Non electrolytes:** Concentration expressions, Ideal and Real solutions, Colligative properties, molecular weight determinations.

*LO***:** To understand properties of Non electrolytes and their significance

**Solutions of Electrolytes:** Properties of solutions of electrolytes. The Arrhenius theory of electrolyte dissociation.The modern theory of strong electrolytes and other coefficients for expressing colligative properties.

*LO***:** To know theories of electrolytes and their dissolution and colligative properties

**UNIT - V 05**

**Buffers and buffered isotonic systems**: The buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions, methods of adjusting tonicity and pH (relevant numerical problems).

*LO***:** To know about buffers , buffer isotonic solutions, Methods of adjusting isotonicity and their

Significance.

**UNIT - VI 07**

**Solubility and Distribution Phenomena:** Solvent-solute interaction, solubility of gases in liquids, liquids in liquids, solids in liquids, distribution of solutes in immiscible solvents.

**Introduction to phenomena of diffusion:** Ficks first law and second law.

*LO*: To understand the solubility and distribution phenomenon and laws of diffusion.

# TEXT BOOKS

1. Patrick J. Sinko, Martin's Physical Pharmacy and Pharmaceutical Sciences Fifth Edition.
2. C.V.S.Subramanyam, Essentials of Physical Pharmacy, Vallabh Prakashan.
3. C.V.S.Subramanyam, Physical Pharmacy, Vallabh Prakashan.
4. E. Shotton and K. Ridgaway, Physical Pharmaceutics, Oxford University Press, London.
5. Bentley’s Text Book of Pharmaceutics by E.A. Rawlins.
6. Manavalan & Ramasamy, Physical Pharmaceutics, Vignesh Publishers

**REFERENCES**

1. Pharmacopoeia, (I.P., B.P., U.S.P. and European.)
2. B.S Bahl, ArunBahl and G.D Tuli, Essentials of Physical Chemistry.
3. Martindale, the Extra Pharmacopoeia; Latest Edition the Royal Pharmaceutical Society
4. Lippincott Williams and Wilkins, Remington Pharmaceutical Sciences
5. Robin J. Haiwan, Hand Book of Pharmacy and Health Care Edition, ThePharma Press, U.K.
6. S. J Carter, Cooper and Gunn’s Tutorial pharmacy.

**I Year II Semester**

**PHR16125 - COMPUTER APPLICATIONS AND BIOSTATISTICS (50Hrs)**

**Unit-I 22**

**Overview of computer with general applications:** components of computers, computer languages, usage of computers, introduction of operative system.

**Introduction to MS-Office:** MS**-** word: Basics, working with files, working with text, formatting paragraphs, styles, lists, tables, graphics, spelling and grammar, page formatting macros and table of contents.

MS-Excel: Basics, spreadsheets, data types, formulas, formatting charts and graphs.

MS-Power Point: Basics, views, slide controls, applied design, page setup, templates, background control, colour screens, traditions and animations, working with texts and working with graphics.

MS-Access: Data base concepts, screens layouts, creating tables, data sheet record, table relationships, shorting and filtering, query forms, form controls, sub forms, reports, importing, exporting and linking.

*LO***:** The student should be familiar with overview of the computers and MS-office

**Unit-II 06**

**Information Technology Today:** Internet and World Wide Web (www), structure and organization of www, browsers, information searching in www, search engines, pharmaceutical resources in www types of indexing tools and search strategies, Hyper Text Manuscripts Languages (HTML) and e-mail.

*LO***:** Familiarity with internet, WWW, browsing, HTML & e-mails.

**Unit-III 06**

**Database Management:** Concepts and objectives of Database Management systems, advantages of database management systems and examples of DBMS packs (like DBASE III).

*LO***:** Familiarity with Database management

**Unit-IV 08**

**Data collection and treatment:** Significant digits and rounding of numbers, data collection, random and non-random sampling methods, sample size, data organization, diagrammatic representation of data, bar, pie, 2-D and 3-D diagrams.

**Measures of central tendency and variations:** Mean, median, mode, properties and applications, range, standard deviations and standard error of means, coefficient of variation, kurtosis, skewness and confidance (fiducial) limits for mean and proportions.

*LO***:** Fundamentals of date / Sample collection and diagrammatic presentation. Measures of central tendency and dispersion.

**Unit-V 04**

**Correlation and Regression:** Correlation and regression analysis, method of least squares and non-linear regression.

*LO***:** Correlation and regression in pharmacy.

**Unit-VI 04**

**Statistical inference:** t-test, chi square test and their applications in pharmacy.

*LO***:** Application of t-test, Chi square test and approve in the testing the significance of difference or similarity.

**TEXTBOOKS**

1. Computer Fundamentals, Anita Goel, Pearson.
2. Information Technology Workshop, 3e, G Praveen Babu, M V Narayana BS Publications.
3. Khan & Khan, *“Fundamentals of Biostatistics”.*
4. Pranab Kumar Banerjee, *“Introduction to Biostatistics”.*

**REFERENCE BOOK:**

1. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N.B. Venkateswarlu
2. Biostatistics for medical, nursing and pharmacy students by A. Indrayan, L Satyanarayana.
3. Introduction to Information Technology, ITL Education Solutions Ltd.,2nd Ed, PEARSON
4. Comdex Information Technology, Vikas Gupta, dreamtech.

**I Year II Semester**

**PHR16126 - HUMAN ANATOMY PHYSIOLOGY LAB**

1. Study of compound microscope and precautions to be taken while handling it.
2. Microscopic study of structure of cell and different tissues.
3. To understand and learn Blood withdrawal techniques.
4. Determination of bleeding time, clotting time, blood grouping and Estimation of Hemoglobin in blood.
5. Study of Haemocytometry.
6. Estimation of W.B.C count.
7. Estimation of R.B.C. count.
8. Estimation of D.L.C.
9. Study of human skeleton.
10. Study of different systems with the help of charts and models.
11. Recording of body temperature, pulse rate and blood pressure.
12. Determination of vital capacity, experiments on Spirometer.
13. Various devices used in family planning like Copper T, Lippe’s loop, diaphragm, condom and oral pills.

**I Year II Semester**

**PHR16127 - PHYSICAL PHARMACY – I LAB**

1. Determination of density of a liquid.
2. Determination of specific rotation of optically active substance by using polarimeter.
3. Determination of concentration of sugar solution by using Polarimeter.
4. Determination of refractive index of a liquid by using Refractometer.
5. Determination of Percent composition of a binary liquid mixture by using Refractometer.
6. Determination of Molecular weight of a given substance by using Landsberger method.
7. Determination of Molecular weight of a given substance by using Rast camphor method.
8. Calibration of pH Meter and determination of pH of a solution.
9. Estimation of pKa by Half Neutralization Method.
10. Determination of Upper Consolute Temperature by using Phenol water system.
11. Determination of heat of neutralization of strong acid by strong base.
12. Determination of effect of impurities on phase diagram of water – phenol system.
13. Preparation of Buffers.
14. Determination of Buffer capacity.
15. Determination of partition coefficient.
16. Effect of temperature on solubility of solid in liquid.
17. Effect of addition of salt / pH / cosolvent of the solubility.

**I Year II Semester**

**PHR16128 - COMPUTER APPLICATIONS LAB**

**Identification of the peripherals of a computer.**

To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices

A practice on disassemble the components of a PC and assembling them to working condition.

Examples of Operating systems-Dos, Windows,Installation of MS windows on a PC.

Introduction to Memory and Storage Devices , I/O Port, Device Drivers, Assemblers, Compilers, Interpreters , Linkers, Loaders.

**Internet & World Wide Web :**Importance of Networking, Transmission Media, Networking Devices- Gateway, Routers, Hub, Bridge, NIC ,Bluetooth Technology, Wireless Technology, Modem, DSL, Dialup Connection.

**Orientation & Connectivity Boot Camp and surfing the Web using Web Browsers:** Students should get connected to their Local Area Network and access the Internet. In the process they should configure the TCP/IP setting and demonstrate how to access the websites and email. Students customize their web browsers using bookmarks, search toolbars and pop up blockers.

**Search Engines & Netiquette:** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google.

**MS Office**

**Word Orientation:** Word as word Processors.

Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting ,Drop Cap , Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option

**Creating project :** Abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check , Track Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

**MS Excel**

**Excel Orientation:** The mentor needs to tell the importance of MS Excel as a Spreadsheet tool, give the details of the tasks and features that would be covered in each.

Using Excel Accessing, overview of toolbars, saving excel files, Using help and resources

**Creating a Scheduler -** Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

**Performance Analysis** - Features to be covered: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

**Power Point**

Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in PowerPoint*.*

Concentrating on the in and out of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

**MS Access:**

Students have to work on creating data bases, tables, storing and organizing data in the data base, querying, Creating Forms and Reports (take appropriate examples.)

**TEXT BOOK:**

1. Computer Fundamentals, Anita Goel, Pearson.
2. Information Technology Workshop,3e, G Praveen Babu, M V Narayana BS Publications.
3. Introduction to Information Technology, ITL Education Solutions Ltd., 2nd & 3rd Eds., PEARSON.
4. Comdex Information Technology, Vikas Gupta, Dreamtech.

**REFERENCE BOOK:**

1. Williams, Using Information Technology: Practical Introduction, TMH.
2. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr. N.B. Venkateswarlu.