



COURSE OUTLINE BRIEFS



SARGODHA UNIVERSITY

Pathway to Progress

FACULTY OF
PHARMACY



LIST OF DEPARTMENTS



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COLLEGE OF
PHARMACY



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PHARMACY**



OVERVIEW

The Faculty of Pharmacy was established in 2009. Previously, it was the Department of Pharmacy which was established in 2003. Currently, it offers degree programs in Pharm-D, M.Phil (Pharmaceutics and Pharmacology) PhD (Pharmaceutics and Pharmacology). We educate future pharmacists and scientists and provide professional development opportunities to practicing pharmacists and the pharmaceutical industry.

All of our programs are driven by our mission to enhance the quality of life for the people of Pakistan and the global community through improve health. The past decade has witnessed major advancements in the practice, drug discovery, pharmaceutical technology and regulatory affairs of pharmacy.

Faculty of Pharmacy has laid down its objectives very carefully to enhance the industrial production and improvements in manpower development. Our department is unique in Pakistan because we have our own Pharmaceutical industrial unit which is going to be functional in recent future. In addition we have a Model Pharmacy which provides quality medicines and services to the local Public and training of community pharmacy to the Pharmacy students. The past decade has witnessed major advances in the practice, drug discovery, pharmaceutical technology, and regulatory affairs of pharmacy. This has necessitated radical changes in pharmacy education globally and locally.

Pakistan pharmaceutical market is of about Rs. 45 billion. The pharmaceutical sector mainly depends upon imports while local pharmaceutical industry is engaged only in formulations. There are only a few basic manufacturing plants in the country. With the implementation of WTO regime, the situation is going to be more serious. We will not remain competitive due to our extensive dependence on import of raw materials. In order to remain viable, we must plan to move towards indigenous production. For an effective indigenization, we must focus on human resource development. Keeping in view these developments, the Faculty of Pharmacy has laid down its objectives very carefully to enhance the industrial production and improvements in faculty and manpower development.

Academic Programs Offered

1. Pharm-D
2. MPhil Pharmaceutics
3. MPhil Pharmacology
4. MPhil Pharmacy Practice
5. PhD Pharmaceutics
6. PhD Pharmacology

Pharm-D

Eligibility: At least 60% marks in FSc (Pre-Medical) or equivalent

Duration: 5 Years

Semesters: 10

Degree Requirements: Minimum 198 credit hours

Semester-1

Course Code	Course Title	Credit Hours
URCE-5101	English-I (Functional English [T])	2(2+0)
PHRM-5101	Pharmaceutics-I (Physical Pharmacy-I) [T]	3(3+0)
PHRM-5102	Pharmaceutics-I (Physical Pharmacy-I) [P]	1(0+1)
PHRM-5103	Pharmaceutical Chemistry-I (Organic-I) [T]	3(3+0)
PHRM-5104	Pharmaceutical Chemistry-I (Organic-I) [P]	1(0+1)
PHRM-5105	Pharmaceutical Chemistry-II A (Biochemistry-I) [T]	3(3+0)
PHRM-5106	Pharmaceutical Chemistry-II A (Biochemistry-I) [P]	1(0+1)
PHRM-5107	Physiology-A [T]	3(3+0)
PHRM-5108	Physiology-A [P]	1(0+1)
PHRM-5109	Anatomy & Histology [T]	3(3+0)
PHRM-5110	Anatomy & Histology [P]	1(0+1)

Semester-2

URCE-5102	English-II (Communication and Writing Skills [T])	4(4+0)
PHRM-5111	Pharmaceutics-I B (Physical Pharmacy-II) [T]	3(3+0)
PHRM-5112	Pharmaceutics-I B (Physical Pharmacy-II) [P]	1(0+1)
PHRM-5113	Pharmaceutical Chemistry-I B (Organic-II) [T]	3(3+0)
PHRM-5114	Pharmaceutical Chemistry-I B (Organic-II) [P]	1(0+1)
PHRM-5115	Pharmaceutical Chemistry-I B (Biochemistry-II) [T]	3(3+0)
PHRM-5116	Pharmaceutical Chemistry-I B (Biochemistry-II) [P]	1(0+1)
PHRM-5117	Physiology-B [T]	3(3+0)
PHRM-5118	Physiology-B [P]	1(0+1)

Semester-3

URCI-5105	Islamic Studies	3(3+0)
PHRM-5119	Pharmaceutics-II A (Dosage Form Science-I) [T]	3(3+0)

PHRM-5120	Pharmaceutics-II A (Dosage Form Science-I) [P]	1(0+1)
PHRM-5121	Pharmaceutics-III (Pharmaceutical Mic. & Immu.-I) [T]	3(3+0)
PHRM-5122	Pharmaceutics-II (Pharmaceutical Mic. & Immu.-I) [P]	1(0+1)
PHRM-5123	Pharmacology & Therapeutics-I A [T]	3(3+0)
PHRM-5124	Pharmacology & Therapeutics-I A [P]	1(0+1)
PHRM-5125	Pharmacognosy-I A (Basic-I) [T]	3(0-3)
PHRM-5126	Pharmacognosy-I A (Basic-I) [P]	1(0+1)
PHRM-5127	Pharmacy Practice-I A (Pharmaceutical Mathematics	3(3+0)

Semester-4

URCP-5106	Pakistan Studies [T]	2(2+0)
PHRM-5128	Pharmaceutics-II B (Dosage Form Science-II) [T]	3(3+0)
PHRM-5129	Pharmaceutics-II B (Dosage Form Science-II) [P]	1(0+1)
PHRM-5130	Pharmaceutics-III B (Pharma. Mic. & Immun.-II) [T]	3(3+0)
PHRM-5131	Pharmaceutics-III B (Pharma. Mic. & Immun.-II) [P]	1(0+1)
PHRM-5132	Pharmacology & Therapeutics-I B [T]	3(3+0)
PHRM-5133	Pharmacology & Therapeutics-I B [P]	1(0+1)
PHRM-5134	Pharmacognosy-I B (Basic-II) [T]	3(3+0)
PHRM-5135	Pharmacognosy-I B (Basic-II) [T]	1(0+1)
PHRM-5136	Pharmacy Practice-I B (Bio-Statics)	3(3+0)

Semester-5

PHRM-6137	Pharmacy Practice-II A (Dispensing Pharmacy) [T]	3(3+0)
PHRM-6138	Pharmacy Practice-II A (Dispensing Pharmacy) [P]	1(0+1)
PHRM-6139	Pharmaceutical Chemistry-III A (Pharma. Analysis-I) [T]	3(3+0)
PHRM-6140	Pharmaceutical Chemistry-III A (Pharma. Analysis-I) [P]	1(0+1)
PHRM-6141	Pharmacology and Therapeutics-II A [T]	3(3+0)
PHRM-6142	Pharmacology and Therapeutics-II A [P]	1(0+1)
PHRM-6143	Pharmacognosy-II A (Advanced-I) [T]	3(3+0)
PHRM-6144	Pharmacognosy-II A (Advanced-I) [P]	1(0+1)
PHRM-6145	Pathology [T]	3(3+0)
PHRM-6146	Pathology [P]	1(0+1)

Semester-6

PHRM-6147	Pharmacy Practice-II B (Community Social & Administrative Pharmacy [T])	3(3+0)
PHRM-6148	Pharmaceutical Chemistry-III B Pharmaceutical Analysis-II [T]	3(3+0)
PHRM-6149	Pharmaceutical Chemistry-III B Pharmaceutical Analysis-II [P]	1(0+1)
PHRM-6150	Pharmacology and Therapeutics-II B [T]	3(3+0)
PHRM-6151	Pharmacology and Therapeutics-II B [P]	1(0+1)
PHRM-6152	Pharmacognosy-II B(Advanced-II) [T]	3(3+0)
PHRM-6153	Pharmacognosy-II B(Advanced-II) [P]	1(0+1)
PHRM-6154	Pharmacy Practice-III	3(3+0)

	(Computer and its Applications in Pharmacy) [T]	
PHRM-6155	Pharmacy Practice-III (Computer and its Applications in Pharmacy) [P]	1(0+1)

Semester-7

PHRM-6156	Pharmacy Practice-IV A (Hospital Pharmacy-I) [T]	3(3+0)
PHRM-6157	Pharmacy Practice-V A (Clinical Pharmacy-I) [T]	3(3+0)
PHRM-6158	Pharmacy Practice-V A (Clinical Pharmacy-I) [P]	1(0+1)
PHRM-6159	Pharmaceutics-IV A (Industrial Pharmacy-I) [T]	3(3+0)
PHRM-6160	Pharmaceutics-IV A (Industrial Pharmacy-I) [P]	1(0+1)
PHRM-6161	Pharmaceutics-V A	3(3+0)
PHRM-6162	(BioPharmaceutics & Pharmacokinetics-I) [T]	1(0+1)
PHRM-6163	Pharmaceutics-V A	3(3+0)
PHRM-6164	(BioPharmaceutics & Pharmacokinetics-I) [P]	1(0+1)

Semester-8

PHRM-6165	Pharmacy Practice-IV B (Hospital Pharmacy-II) [T]	3(3+0)
PHRM-6166	Pharmacy Practice-V B (Clinical Pharmacy-II) [T]	3(3+0)
PHRM-6167	Pharmacy Practice-V B (Clinical Pharmacy-II) [P]	1(0+1)
PHRM-6168	Pharmaceutics-IV B (Industrial Pharmacy-II) [T]	3(3+0)
PHRM-6169	Pharmaceutics-IV B (Industrial Pharmacy-II) [P]	1(0+1)
PHRM-6170	Pharmaceutics-V B (Biopharmaceutics and Pharmacokinetics-II [T])	3(3+0)
PHRM-6171	Pharmaceutics-V B (Biopharmaceutics & Pharmacokinetics-II) [P]	1(0+1)
PHRM-6172	Pharmaceutics-V B (Pharmaceutical Quality Management-II) [T]	3(3+0)
PHRM-6173	Pharmaceutics-V B Pharmaceutical Quality Management-II) [T]	1(0+1)

Semester-9

PHRM-6174	Pharmaceutics-VII A (Pharmaceutical Technology-I) [T]	3(3+0)
PHRM-6175	Pharmaceutics-VII A (Pharmaceutical Technology-I) [P]	1(0+1)
PHRM-6176	Pharmacy Practice-VI A (Advanced Clinical Pharmacy-II) [T]	3(3+0)
PHRM-6177	Pharmacy Practice-VI A (Advanced Clinical Pharmacy-II) [P]	1(0+1)
PHRM-6178	Pharmacy Practice-VII A (Forensic Pharmacy) [T]	3(3+0)
PHRM-6179	Pharmacy Practice-VIII A (Pharmaceutical Management & Marketing [T])	3(3+0)
PHRM-6180	Pharmaceutical Chemistry-IV A (Medicinal Chemistry) [T]	3(3+0)
PHRM-6181	Pharmaceutical Chemistry-IV A (Medicinal Chemistry) [p]	1(0+1)

Semester-10

PHRM-6182	Pharmaceutics-VII B (Pharmaceutical Technology-II) [T]	3(3+0)
PHRM-6183	Pharmaceutics-VII B (Pharmaceutical Technology-II) [P]	1(0+1)
PHRM-6184	Pharmacy Practice-VI B (Advanced Clinical Pharmacy-II) [T]	3(3+0)

PHRM-6185	Pharmacy Practice-VI B (Advanced Clinical Pharmacy-II) [P]	1(0+1)
PHRM-6186	Pharmacy Practice-VII B (Forensic Pharmacy) [T]	3(3+0)
PHRM-6187	Pharmacy Practice-VIII B (Pharmaceutical Management & Marketing) [T]	3(3+0)
PHRM-6188	Pharmaceutical Chemistry-IV B (Medicinal Chemistry-II) [T]	3(3+0)
PHRM-6189	Pharmaceutical Chemistry-IV B (Medicinal Chemistry-II) [P]	1(0+1)

MPhil Pharmacology

Eligibility: Pharm-D or B-Pharm or equivalent 16 years of education with at least second division or CGPA 2.00 out of 4.00 + Departmental Test (at least 50% marks)

Duration: 2 Years

Semesters: 4

Degree Requirements: Minimum 30 credit hours

Semester-1

PHRM-7101	Advance General Pharmacology	3(3+0)
PHRM-7102	Advanced Chemotherapy	3(3+0)
PHRM-7103	Advanced Immunopharmacology	3(3+0)
PHRM-7104	Advance Pharmacology Lab-1	1(0+1)
PHRM-7105	Research Methodology	3(3+0)

Semester-2

PHRM-7107	Advanced Applied Pharmacology	3(3+0)
PHRM-7108	Advanced Biochemical & Immunological techniques	3(3+0)
PHRM-7109	Advanced Neuropharmacology	3(3+0)
PHRM-7110	Biostatistics	3(3+0)
PHRM-7107	Pharmacology Lab-IV	1(0+1)

Semester-3 to 4

PHRM-7111	Research & Thesis	
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MPhil Pharmaceutics

Eligibility: Pharm-D or B-Pharm or equivalent (16-yers of education) with at least second division or CGPA 2.00 out 4.00 + Departmental Test (at least 50% marks)

Duration: 2 Years

Semesters: 4

Degree Requirements: Minimum 30 credit hours

Semester-1

PHRM-7201	Advanced Pharmaceutics	3(3+0)
PHRM-7202	Pharmaceutics Lab	1(0+1)
PHRM-7203	Pharmaceutical Microbiology	3(3+0)
PHRM-7204	Clinical Pharmacy & Therapeutics-I	3(3+0)
PHRM-7205	Pharmaceutical Marketing	3(3+0)

Semester-2

PHRM-7206	Pharmaceutical Technology	4(4+0)
PHRM-7207	Pharm.Tech. Lab.	1(0+1)
PHRM-7208	Clinical Pharmacy & Therapeutics-II	3(3+0)
PHRM-7209	Bio-statistics	3(3+0)
PHRM-7210	Research Methodology	2(2+0)

Semester-3 to 4

PHRM-7211	Research & Thesis	
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MPhil Pharmacy Practice

Eligibility: Pharm-D or B-Pharm or equivalent 16 years of education with at least second division or CGPA 2.00 out of 4.00 + Departmental Test (at least 50% marks)

Duration: 2 Years

Semesters: 4

Degree Requirements: Minimum 30 credit hours

Semester-1

PHRM-7301	Pharmacy Practice I - Public Health Pharmacy	3(3+0)
PHRM-7302	Pharmacy Practice II Pharmacoepidemiology & Pharmacovigilance	3(3+0)
PHRM-7303	Pharmacy Practice III Social and Administrative Pharmacy	3(3+0)
PHRM-7304	Pharmacy Practice IV Clinical Pharmacy -I	3(3+0)

Semester-2

PHRM-7305	Pharmacy Practice V Clinical Pharmacokinetics	3(3+0)
PHRM-7306	Pharmacy Practice VI Clinical Pharmacy -II	3(3+0)
PHRM-7307	Research Methods & Project Planning in Pharmacy	3(3+0)
PHRM-7308	Biostatistics for Pharmacy	3(3+0)

Semester-3 to 4

PHRM-7309	Research & Thesis	
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PhD Pharmacology

Eligibility: Pharm-D or B-Pharm or equivalent 16 years of education with at least second division or CGPA 2.00 out of 4.00 + Departmental Test (at least 50% marks)

Duration: 3 Years

Semesters: 6

Degree Requirements: Minimum 24 credit hours

Semester-1

PHRM-8101	Research Methodology	3(3+0)
PHRM-8102	Battery of Pharmacological Test	3(3+0)
PHRM-8103	Toxicokinetic studies & Metabolic disorder	3(3+0)

Semester-2

PHRM-8104	Drugs Activity Evaluations	3(3+0)
PHRM-8105	Screening of Medicinal plants	3(3+0)
PHRM-8106	Ethnopharmacology and Systemic Anti-microbial agents	3(3+0)

Semester-3 to 6

PHRM-8107	Research & Thesis	
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PhD Pharmaceutics

Eligibility: MPhil in Pharmaceutics (18 years of education) or equivalent Degree CGPA 3.00 out of 4.00 + Departmental Test (at least 70% marks)

Duration: 3 Years

Semesters: 6

Degree Requirements: Minimum 24 credit hours

Semester-1

PHRM-8201	Pharmaceutical Statistics	3(3+0)
PHRM-8202	Advance Biopharmaceutics	3(3+0)
PHRM-8203	Advanced Pharmaceutical Technology	3(3+0)

Semester-2

PHRM-8204	Pharmaceutical Care	3(3+0)
PHRM-8205	Biopharmaceutics	3(3+0)
PHRM-8206	Rate Controlled Drug Delivery System	3(3+0)

Semester-3 to 6

PHRM-8207	Research & Thesis	
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Pharm-D

DOCTOR OF

PHARMACY



URCE-5101**ENGLISH-I (FUNCTIONAL ENGLISH)****2(2+0)**

The course introduces the students to the underlying rules to acquire and use language in academic context. The course aims at developing grammatical competence of the learners to use grammatical structures in context in order to make the experience of learning English more meaningful enabling the students to meet their real life communication needs. The objectives of the course are to, reinforce the basics of grammar, understand the basic meaningful units of language, and introduce the functional aspects of grammatical categories and to comprehend language use by practically working on the grammatical aspects of language in academic settings. After studying the course, students would be able to use the language efficiently in academic and real life situations and integrate the basic language skills in speaking and writing. The students would be able to work in a competitive environment at higher education level to cater with the long term learners' needs.

Contents

- 1 Parts of speech
- 2 Noun and its types
- 3 Pronoun and its types
- 4 Adjective and its types
- 5 Verb and its types
- 6 Adverb and its types
- 7 Prepositions and its types
- 8 Conjunction and its types
- 9 Phrases and its different types
- 10 Clauses and its different types
- 11 Sentence, parts of sentence and types of sentence
- 12 Synthesis of sentence
- 13 Conditional sentences
- 14 Voices
- 15 Narration
- 16 Punctuation
- 17 Common grammatical errors and their corrections

Recommended Texts

- 1 Eastwood, J. (2011). *A basic English grammar*. Oxford: Oxford University Press.
- 2 Swan, M. (2018). *Practical English usage*. Oxford: Oxford University Press.

Suggested Readings

- 1 Thomson, A. J., & Martinet, A. V. (1986). *A practical English grammar*. Oxford University Press
- 2 Biber, D., Johansson, S., Leech, G., Conrad, S., Finegan, E., & Quirk, R. (1999). *Longman grammar of spoken and written English*. Harlow Essex: MIT Press.

- 3 Hunston, S., & Francis, G. (2000). *Pattern grammar: A corpus-driven approach to the lexicalgrammar of English*. Amsterdam: John Benjamins.

PHRM-5101

Pharmaceutics-1A (PHYSICAL PHARMACY-1)

3(3+0)

Pharmaceutics is the art and science of dosage form design. A dosage form also known as a drug delivery system is a carrier of therapeutically active moiety and thus formed from a combination of active drug and excipients. Physical pharmacy covers areas such as solubility, pharmacokinetics and drug delivery. It serves as principles that guide the pharmaceutical developments. It also serves as a basis for the understanding of drug absorptions, distributions, metabolism, and eliminations that happen during the course of drug treatment. The subject enables students to understand role of Pharmacist and scope of pharmacy in different sectors of health care profession. Physical Pharmacy aims at providing the basic physical and chemical principles and laws helpful in the formulation of a safe, stable, accurate and efficacious drug delivery system. The subject gives an insight regarding the nature and type of different dosage forms like suspension, emulsion and describes the ways and mechanisms of stabilizing these formulations. It also educate about the evolution pharmacy profession with an emphasis on the role of Muslim scientists in pharmacy profession. It provides understanding regarding role of various official books in formulation and quality testing of different pharmaceutical product.

Contents

1. Pharmacy Orientation
2. History and Literature of Pharmacy
3. An introduction of various official books.
4. Physico-chemical principles
5. Dispersions

Recommended Texts

1. Sinko, P. J., & Singh, Y. (2011). *Martin's physical pharmacy and pharmaceutical sciences: physical chemical and biopharmaceutical principles in the pharmaceutical sciences*. Netherlands: Walter Kluer.
2. Cooper J. W., Gunn C., & Carter SJ. (2004). *Cooper and Gunn's Tutorial Pharmacy*. New Delhi: New Delhi: CBS Publishers & Distributors.

Suggested Readings

1. Zinc G. Remington. (2005). *The Science and Practice of Pharmacy*. Philadelphia College of Pharmacy and Science; Ed 21. NY: Lippincott Williams & Wilkins.
2. Davis H. (1961) *Bentley's Text Book of Pharmaceutics*. London: Tindall and Cox Publishers.

Organic chemistry is one of the major sciences in general chemistry studies & one of the most important chemical sciences in pharmaceutical & medical studies, because organic chemistry deals directly with the medication nature & structure including our bodies also nature & structure, it is defined simply as the study . It deals with the structure, properties, composition, reactions, and preparation of carbon-containing compounds, which include not only hydrocarbons but also compounds with any number of other elements, including hydrogen (most compounds contain at least one carbon–hydrogen bond), nitrogen, oxygen. This course is designed to provide a fundamental overview of organic chemistry. Students will understand the relationship between structure and function of molecules, the major classes of reactions, reaction energetic, mechanisms and synthesis of organic compounds. Several themes are prevalent in each unit of study nomenclature, chemical and physical properties, structures, mechanisms, common molecules, and the diversity of organic compounds. An important aspect of organic chemistry class is laboratory experience.

Contents

1. Basic concepts of Organic Chemistry
2. Stereochemistry
3. General chemistry of functional groups and their analogues
4. Nucleophilic, electrophilic substitution reaction in aliphatic and aromatic systems
5. Orientation in electrophilic substitution reactions on benzene ring

Recommended Texts

1. Bansel RK. (1992). *Organic Reaction Mechanism*. Tata McGraw Hill.
2. Block JH. & Beale JM. (2010). *Wilson and Gisvold's textbook of organic medicinal and pharmaceutical chemistry*. (20th ed). Lippincott Williams & Wilkins.

Suggested Readings

1. Roberts, J. D., & Caserio, M. C. (1977). *Basic Principles of Organic Chemistry*. WA: Benjamin, Inc.
2. Sykes P. (2010). *Guide Book to Mechanism in Organic Chemistry*. NY: Prentice Hall.

PHRM-5105 PHARMACEUTICAL CHEMISTRY-IIA (BIOCHEMISTRY-I) 3(3+0)

Biochemistry is a laboratory based science that brings together biology and chemistry. By using chemical knowledge and techniques, biochemists can understand and solve biological problems. Biochemistry has broadened our understanding of how biochemical changes relate to physiological alteration in the body. It helps us understand the chemical aspects of biological processes such as digestion, hormonal action, and muscle contraction-relaxation. Because of its breadth, biochemistry is very important and advances in this field of science over the past 100 years have been staggering. It is also called as biological chemistry, is the study of chemical processes within and relating to living organisms. By controlling information flow through biochemical signaling and the flow of chemical energy through metabolism, biochemical processes give rise to the complexity of life. Over the last decades of the 20th century, biochemistry has become so successful at explaining living processes that now almost all areas of the life sciences from botany to medicine to genetics are engaged in biochemical research.

Contents

1. General introduction and basic biochemical principles.
2. Basic chemistry of biomolecules: (Nature, Classification etc.)
3. Carbohydrates
4. Lipids.
5. Proteins and Amino acids.
6. Nucleic Acids.
7. Vitamins: Chemistry, Classification (Fat-soluble and water-soluble vitamins), Biological and pharmaceutical importance of vitamins.
8. Hormones.
9. Enzymes.

Recommended Texts

1. Harvey, R. A., Ferrier, D. R., (2011). *Lippincott's illustrated reviews: Bioquímica*. New York: McGraw-Hill.
2. Ahmad, M. (2000). *Essentials of Medical Biochemistry*. Multan: Merit publishers, 98-174.

Suggested Readings

1. Murray, K., Rodwell, V., Bender, D., Botham, K. M., Weil, P. A., & Kennelly, P. J. (2009). *Harper's Illustrated Biochemistry*. New York: McGraw-Hill.
2. Dr. J. L. Jain, Sunjy Jain, Nitin Jain, (2010). *Fundamentals of Biochemistry*. New Delhi: S. Chand and Company Ltd.

Physiology is an experimental scientific discipline and is of central importance in medicine and related health sciences. It provides a thorough understanding of normal body function, enabling more effective treatment of abnormal or disease states. We use innovative teaching methods to enhance our teaching. Physiology is the basic medical subject and is mandatory to all health care professionals. It is the integral part of Pharmacy which involves the premium care of patients with respect to drug therapy. So, it is necessary for pharmacy students to understand how different organs and systems of human body functions; to relate the functions and anatomy/histology of each organ system; to understand and demonstrate interrelations of organ systems to each other and also to predict and explain integrated responses of organ systems of body to physiological and pathological stresses. The objective of this course is to prepare the pharmacy students to become the future clinical pharmacists ready to work in hospital wards and community pharmacies alongside doctors, nurses and other healthcare professionals for the uplift of patient's health.

Contents

1. Homeostasis
2. Cell
3. Transport through cell membrane
4. Signal transduction and receptor mechanisms
5. Blood
6. Membrane potential, Synapsis and synaptic transmission
7. Nervous system
8. Muscle system
9. Respiratory system
10. Digestive system

Recommended Texts

1. Hall, J. E. (2016). *Guyton and Hall Textbook of Medical Physiology*, Jordanian Edition E-Book. London: Elsevier.
2. Tortora, G. J., & Derrickson, B. H. (2018). *Principles of Anatomy and Physiology*. Hoboken: John Wiley & Sons.

Suggested Readings

1. Barret K.E., Barman S.M., Boitano S., Brooks H.L. Ganong's (2016). *Review of Medical Physiology*. NY: Mc Graw Hill Lange Publishers.
2. Sembulingam K, Sembulingam P. (2016). *Essentials of Medical Physiology*. London: Jaypee Publishers.

Anatomy is the branch of biology concerned with the study of the structure of organisms and their parts. It is a natural science which deals with the structural organization of living things, having its beginnings in prehistoric times. Anatomy knowledge of anatomical structure of the body is basic to understanding musculoskeletal function and how both structure and function are modified by exercise or disease. Ironically, at a time when knowledge of anatomy is increasingly important, exercise physiologists are facing a major crisis in anatomical education. Histology can help students gain a better understanding of cell behavior and reproduction, making cellular biology more understandable. Likewise, because tissues are the building blocks of virtually everything in the body, understanding histology enables students to predict and understand organ behavior and function. Anatomy course targets to understand the medical terminologies, structure of human body, locations and functions and conducts experiments in groups. While, medical histology combined with observation of the microscopic structure of a variety of human cells, tissues, organs, using the microscope; build the intellectual concepts for cells, tissues and organs composing the human body system.

Contents

1. Introduction: terminologies, definitions
2. Histology: tissues and its types
3. Integumentary System: skin and its appendages
4. Respiratory system: structure and function of parts
5. Cardiovascular System: heart and blood vessels
6. Alimentary System: organs of digestion and absorption
7. Urinary System: structure and function of nephron
8. Reproductive System: male and female organs
9. Endocrine System: hormones
10. Nervous System: brain and spinal cord
11. Autonomic nervous system: its nerves and function

Recommended Texts

1. Tortora GJ., Derrickson B. (2010). *Principles of Anatomy and Physiology*. Hoboken: Wiley.
2. Snell RS. (2011). *Clinical Anatomy*. Boston: Little Brown and Company.

Suggested Readings

1. Liaqat H. S. (2016). *General Anatomy*. Peshawar: Paramount books,
2. Elain N. (2012). *Anatomy and Physiology*. New York: Pearson

URCE-5102**English-II (Communication & Writing Skills)****4(4+0)**

The course aims at developing linguistic competence by focusing on basic language skills in integration to make the use of language in context. It also aims at developing students' skills in reading and reading comprehension of written texts in various contexts. The course also provides assistance in developing students' vocabulary building skills as well as their critical thinking skills regarding writing skills. The students require a grasp of English language to comprehend texts as organic whole, to interact with reasonable ease in structured situations, and to comprehend and construct academic discourse. The course objectives are to enhance students' language skill management capacity, to comprehend text(s) in context, to respond to language in context, and to write structured response(s). The course will also enhance the students' understanding of ethical considerations in writing academic assignments and research proposals.

Contents

1. Paragraph writing
2. CV and Job Application Letter
3. Translation skills
4. Study skills (skimming, scanning, extensive and intensive reading skills)
5. Academic writing skills (letter/memo writing, research proposal writing with focus on style and clarity)
6. Essay writing (descriptive, argumentative, discursive and narrative)
7. Technical report writing (pharmacy writing and oral communication)
8. Reading strategies, summarizing, sequencing, inferencing, comparing and contrasting
9. Presentation skills (focus on style, content, confidence and body gestures)

Recommended Texts

1. Mikulecky, B. S., & Jeffries, L. (2007). *Advanced reading power: Extensive reading, vocabulary building, comprehension skills, reading faster*. New York: Pearson.
2. Swales, J. M., & Feak, C. B. (2012). *Academic writing for graduate students: Essential tasks and skills*. Ann Arbor: The University of Michigan Press

Suggested Readings

1. Johnson-Sheehan, R. (2019). *Writing today*. Don Mills: Pearson.
2. Horowitz, R., & Samuels, S. J. (1987). *Comprehending oral and written language*. San Diego: Academic Press.

Physical Pharmacy concerns with establishing a safe, stable and effective dosage form, so it provides the fundamentals of rheological principles for inducing and predicting stability in a drug delivery system. The subject gives an insight regarding nature and type of different dosage forms but emphasize on the ways and mechanisms of stabilizing these formulations. It aims to providing knowledge about a number of various basic physico-chemical processes which not only directly or indirectly influence the features of an ideal dosage form but also helpful in the formulation of a safe, stable, accurate and efficacious drug delivery system. It makes students able to conduct drug stability studies and calculate the shelf life of a pharmaceutical product by examining the rate and order of degradation of drug. The subject enables students to understand role of Pharmacist and scope of pharmacy in different sectors of health care profession. Moreover it provides the basic physical and chemical principles and laws helpful in the formulation of a safe, stable, accurate and efficacious drug delivery system. The subject gives an insight regarding the nature and type of different dosage forms like suspension, emulsion and describes the ways and mechanisms of stabilizing these formulations. It also educate about the evolution of pharmacy profession with an emphasis on the role of Muslim scientists in pharmacy profession. It elaborates extraction techniques to extract out various types of active constituents (New drug) from different plant and animal sources for therapeutic purpose.

Contents

1. Rheology
2. Physicochemical Processes
3. Miscellaneous Processes
4. Efflorescence, deliquescence, lyophilization, elutrition, exiccation, sublimation, adsorption etc.
5. Extraction processes
6. Rate and Order of Reactions
7. Kinetic Principles and Stability Testing

Recommended Texts

1. Sinko PJ. (2010). *Martin's Physical Pharmacy and Pharmaceutical Sciences*. New York: Lippincott Williams & Wilkins.
2. Cooper JW, Gunn C, Carter SJ. (2004). *Cooper and Gunn's Tutorial Pharmacy*. New Delhi: New Delhi: CBS Publishers & Distributors.

Suggested Readings

1. Zinc G. Remington. (2005). *The Science and Practice of Pharmacy*. Philadelphia College of Pharmacy and Science; 2005. New York: Lippincott Williams & Wilkins.
2. Davis H. (1961). *Bentley's Text Book of Pharmaceutics*. London: Tindall and Cox Publishers.

Organic Chemistry deals with the structure, properties, composition, reactions, and preparation of carbon-containing compounds, which include not only hydrocarbons but also compounds with any number of other elements, including hydrogen (most compounds contain at least one carbon–hydrogen bond), nitrogen, oxygen. This course is designed to provide a fundamental overview of organic chemistry, students will understand the relationship between structure and function of molecules, the major classes of reactions, reaction energetic, mechanisms and synthesis of organic compounds. Students will understand the relationship between structure and function of molecules, the major classes of reactions, reaction energetic, mechanisms and synthesis of organic compounds. Several themes are prevalent in each unit of study nomenclature, chemical and physical properties, structures, mechanisms, common molecules, and the diversity of organic compounds. Several themes are prevalent in each unit of study: nomenclature, chemical and physical properties, structures, mechanisms, common molecules, and the diversity of organic compounds. An important aspect of organic chemistry class is laboratory experience.

Contents

1. Heterocyclic chemistry
2. Organic reaction mechanism
3. Chemistry of reactive intermediate and free radicals
4. Carbonium ion rearrangements
5. Condensation reaction

Recommended Texts

1. Bansel RK. (1992). *Organic Reaction Mechanism*. New Delhi: Tata McGraw Hill.
2. Wilson, C. O., Gisvold, O., Block, J. H., & Beale, J. M. (2004). *Wilson and Gisvold's textbook of Organic Medicinal and Pharmaceutical Chemistry/edited by John H. Block, John M. Beale Jr.* Philadelphia: Lippincott Williams & Wilkins,

Suggested Readings

1. Roberts, J. D., & Caserio, M. C. (1977). *Basic Principles of Organic Chemistry*. WA: Benjamin, Inc..
2. Sykes P. (2011). *Guide Book to Mechanism in Organic Chemistry*. London: Longman Co;
3. Wade LG. (2010). *Organic Chemistry*. NJ: Prentice Hall.

PHRM-5115 PHARMACEUTICAL CHEMISTRY-IIA (BIOCHEMISTRY) 3(3+0)

Biochemistry is a laboratory based science that brings together biology and chemistry. By using chemical knowledge and techniques, biochemists can understand and solve biological problems. Biochemistry has broadened our understanding of how biochemical changes relate to physiological alteration in the body. It helps us understand the chemical aspects of biological processes such as digestion, hormonal action, and muscle contraction-relaxation. Because of its breadth, biochemistry is very important and advances in this field of science over the past 100 years have been staggering. It is also called as biological chemistry, is the study of chemical processes within and relating to living organisms. By controlling information flow through biochemical signaling and the flow of chemical energy through metabolism, biochemical processes give rise to the complexity of life. Over the last decades of the 20th century, biochemistry has become so successful at explaining living processes that now almost all areas of the life sciences from botany to medicine to genetics are engaged in biochemical research.

Contents

1. Carbohydrates
2. Lipids
3. Proteins and Amino acids
4. Bioenergetics
5. Role of Vitamins
6. Receptor mediated regulation (Hormones): Mechanism of action of hormones, Physiological roles of various hormones, Site of synthesis and target sites of hormones.
7. Secondary Messengers
8. Gene Expression
9. Introduction and importance of the clinical chemistry. Laboratory tests in diagnosis of diseases including Uric acid, Cholesterol, Bilirubin and Creatinine

Recommended Texts

1. A Harvey, R. (2011). *Lippincott's Illustrated Reviews: Biochemistry*. Philadelphia: Lippincott Williams & Wilkins.
2. Ahmad, M. (2000). *Essentials of Medical Biochemistry. Vol. I*, 7th Ed. Multan: Merit publishers, 98-174.

Suggested Readings

1. Murray, K., Rodwell, V., Bender, D., Botham, K. M., Weil, P. A., & Kennelly, P. J. (2009). *Harper's Illustrated Biochemistry*. 28 (p. 588). New York: McGraw-Hill.
2. Jain. J. L., Sunjy J., Nitin J., (2010). *Fundamentals of Biochemistry*. New Delhi: S. Chand and Company Ltd.

Physiology is an experimental scientific discipline and is of central importance in medicine and related health sciences. It provides a thorough understanding of normal body function, enabling more effective treatment of abnormal or disease states. We use innovative teaching methods to enhance our teaching. Physiology is the basic medical subject and is mandatory to all health care professionals. It is the integral part of Pharmacy which involves the premium care of patients with respect to drug therapy. In Physiology B, pharmacy students to understand how different organs and systems of human body functions; to relate the functions and anatomy/histology of each organ system; to understand and demonstrate interrelations of organ systems to each other and also to predict and explain integrated responses of organ systems of body to physiological and pathological stresses. The objective of this course is to prepare the pharmacy students to become the future clinical pharmacists ready to work in hospital wards and community pharmacies alongside doctors, nurses and other healthcare professionals for the uplift of patient's health.

Contents

1. Renal System
2. Pain Physiology
3. Cardiovascular system
4. Endocrinology
5. Reproductive System

Recommended Texts

1. Hall J.E. (2015). *Guyton and Hall Textbook of Medical Physiology*. London: Elsevier Publishers
2. Tortora, G. J., & Derrickson, B. H. (2018). *Principles of anatomy and Physiology*. Hoboken: John Wiley & Sons.

Suggested Readings

1. Barrett, K. E., Barman, S. M., Brooks, H. L., & Yuan, J. X. J. (2019). *Ganong's Review of medical Physiology*. New York: McGraw-Hill Education.
2. Sembulingam, K., & Sembulingam, P. (2012). *Essentials of Medical Physiology*. JP Medical Ltd.

Islamic Studies engages in the study of Islam as a textual tradition inscribed in the fundamental sources of Islam; Qur'an and Hadith, history and particular cultural contexts. The area seeks to provide an introduction to and a specialization in Islam through a large variety of expressions (literary, poetic, social, and political) and through a variety of methods (literary criticism, hermeneutics, history, sociology, and anthropology). It offers opportunities to get fully introductory foundational bases of Islam in fields that include Qur'anic studies, Hadith and Seerah of Prophet Muhammad (PBUH), Islamic philosophy, and Islamic law, culture and theology through the textual study of Qur'an and Sunnah.. Islamic Studies is the academic study of Islam and Islamic culture. It majorly comprises of the importance of life and that after death. It is one of the best systems of education, which makes an ethical groomed person with the qualities which he/she should have as a human being. The basic sources of the Islamic Studies are the Holy Qur'an and Sunnah or Hadith of the Holy Prophet Muhammad ﷺ. The learning of the Qur'an and Sunnah guides the Muslims to live peacefully.

Contents

- 1 Study of the Qur'an (Introduction to the Qur'an, Selected verses from *Surah Al-Baqarah, Al-Furqan, Al-Ahzab, Al-Mu'minoon, Al-An'am, Al-Hujurat, Al-Saff*)
- 2 Study of the Hadith (Introduction to Hadith literature, Selected Ahadith (Text and Translation))
- 3 Introduction to Qur'anic Studies
- 4 Basic Concepts of Qur'an
- 5 History of Quran
- 6 Basic Concepts of Hadith
- 7 History of Hadith
- 8 Kinds of Hadith
- 9 Uloom –ul-Hadith
- 10 Sunnah & Hadith
- 11 Seerat ul-Nabi (PBUH), necessity and importance of Seerah, role of Seerah in the development of personality, Pact of Madinah, Khutbah Hajjat al-Wada' and ethical teachings of Prophet (PBUH).
- 12 Legal Position of Sunnah
- 13 Islamic Culture & Civilization
- 14 Characteristics of Islamic Culture & Civilization
- 15 Historical Development of Islamic Culture & Civilization
- 16 Comparative Religions and Contemporary Issues
- 17 Impact of Islamic civilization

Recommended Text

- 1 Hassan, A. (1990). *Principles of Islamic jurisprudence*. New Dehli: Adam Publishers.
- 2 Zia-ul-Haq, M. (2001). *Introduction to al-Sharia al-Islamia*. Lahore: Aziz Publication.

Suggested Readings

- 1 Hameedullah, M. (1957). *Introduction to Islam*. Lahore: Sh M Ashraf Publisher.
- 2 Hameedullah, M. (1980). *Emergence of Islam*. New Dehli: Adam Publishers.

3 Hameedullah, M. (1942). *Muslim conduct of state*. Lahore: Sh M Ashraf Publisher.

PHRM-5119 PHARMACEUTICS-II A (Dosage Form Science-I) 3(3+0)

Dosage forms are pharmaceutical drug products in the form in which they are marketed for use, with a specific mixture of active ingredients and inactive components, in a particular configuration, and apportioned into a particular dose. Dosage forms are important because they generally indicate the way a particular medication should be given. For example, injection, inhalation, oral, rectal, nasal, transdermal. This course is for graduate level to broaden the student's outlook to know about all pharmaceutical dosage forms and deepen his interest in everything that concerns general and specialized methods of preparation of dosage forms. In this course, the students will also be exposed briefly to certain specific areas of tablets, capsules, aerosols, suppositories, ointments. The lab of this course aims to provide students hands-on experience to prepare various dosage forms. This course is an instrument of satisfying the student's handling and ability to prepare various formulations. After studying this course, students will be able to understand the pharmaceutical drug products, excipients and methods used to formulate various dosage forms.

Contents

1. Pharmaceutical Calculations: Some Fundamentals of Measurements and Calculations
2. Introduction: Dosage form, Ingredient, Product formulation.
3. Galenical Preparations: Infusions, Decoctions, Extracts, Fluid extracts, Tinctures, Aromatic waters.
4. Solvents used in pharmaceutical preparations: Oral Solutions, Syrups, Elixirs and Spirits: Solutions.
5. Oral suspensions, emulsions, magma and gels: Preparations, examples and importance.
6. Topical and transdermal drug delivery systems:
7. Ophthalmic, Nasal and Otic preparations:

Recommended Texts

1. Ansel, H. C., Popovich, N. G., & Allen, L. V. (1995). *Pharmaceutical Dosage forms and drug Delivery Systems* (Vol. 6). Baltimore: Williams & Wilkins.
2. Howard, C. A. (2012). *Pharmaceutical Calculations*. London: Lippincott William and Wilkins.

Suggested Readings

1. Micheal E. Aulton (2016), *Aulton's Pharmaceutics*. Pennsylvania: Mack Publishing Company.
2. Gennaro, A.R., (2006). *Remington's Pharmaceutical Sciences*. Pennsylvania: Mack Publishing

The course pharmaceutical microbiology and immunology is designed to provide a fundamental background and opportunity to the students where they should be able to thoroughly understand and explain the microbiology and immunology of various microbes with the addition of pathological, diagnostic and industrial aspects of important microorganisms and pharmacological agents such as antibiotics, as well as vaccines and other agents which are used to control infectious microorganisms. The main objective is to summarize the working principles in the microbiology laboratory and distinguish main microbiological devices, general staining and chemical identification tests of microorganisms, use of microbial media/culture media, for laboratory culture of microorganisms, incubate the microorganisms where inoculated to medium, compare the morphological observation techniques of microorganisms, and to compare normal flora areas of human body and the microorganisms in there. Pharmaceutical microbiology course is designed for Pharm D students in two semesters. Pharmaceutical Microbiology and Immunology in 3rd semester is about basic knowledge about microorganisms, basic microbiological techniques and environmental microbiology. This course provides basic understanding of the normal and common pathogenic organisms associated with human infectious diseases to make appropriate and effective on the job professional decisions.

Contents

1. General Microbiology
2. Microorganisms
3. The normal flora

Recommended Texts

1. Pelczar MJ. (2007). *Microbiology*. New York: McGraw Hill Inc.
2. Pommerville JC. (2010). *Alcamo's Fundamentals of Microbiology*. Massachusetts: John Bartlett Publishers.

Suggested Readings

1. Willey J., Sherwood L., Woolverton C. (2010). *Prescott's Microbiology*. C. New York: Brown Publishers.
2. Gerard J. Tortora, Berdell R. Funke, Christine L (2004). *Case Pearson Microbiology an Introduction*. London: Pearson.
3. Collins CH., Lynes PM., Grange JM., Falkinham JO. (2018). *Collins & Lyne's Microbiological Methods*. Oxford: Vutterworth Heineman.

Pharmacology is branch of medical science that deals with the study of effects of chemical substances on function of living system. In general this subject explains what the drug does to the body and what the body does to the drug. Drug can be used to treat, prevent and cure of any disease. The main objectives of this course are to give an understanding of the fundamental principles of Pharmacodynamics (i.e. drug receptor interactions) and pharmacokinetics (i.e. absorption, distribution, metabolism, and elimination of drugs). This subject play a vital role to develop understanding of Pharmacy students in mechanism of action, Pharmacological actions, therapeutic and other uses, indication, contraindication, drug-drug interaction, drug food interaction and toxic effects of drugs. This knowledge of pharmacology will help pharmacy students to work in clinical pharmacy setup and to work in hospital wards and community pharmacies alongside other healthcare professionals for better health outcome of patients.

Contents

1. General Pharmacology
2. Pharmacokinetics
3. Pharmacodynamics
4. Drug metabolism
5. Cardiovascular Pharmacology
6. Antihypertensive drugs
7. Pharmacology of respiratory system
8. Antihyperlipidemic drugs
9. Diuretics
10. Anticoagulants anti platelets

Recommended Texts

1. Goodman Gillman (2016), *Pharmacological Basis of THERAPEUTICS*. New York: McGrawHill Book Company.
2. Lippincott (2011), *Pharmacology*. New York: Lippincot William & Willkin.

Suggested Readings

1. Tripathy J. D. (2000). *Essential of Medical Pharmacology*. New Delhi: Japees Brother.
2. Katzung B. G. (2012). *Basic and Clinical Pharmacology*. New York: McGraw-Hill Medical Publishers.

Pharmacognosy is the study of medicines or crude drugs produced from natural sources such as plants, microbes, and animals. It includes analysis of their biological, chemical, biochemical, and physical properties. Pharmacognosy gives a sound knowledge of the vegetable drugs under botany and animal drugs under zoology. It also includes plant taxonomy, plant breeding, plant pathology, and plant genetics and by this knowledge one can improve the cultivation methods for both medicinal and aromatic plants. This course is a graduate level course of Pharmacognosy for Pharm-D. Pharmacognosy is the science of natural drugs obtained from natural sources. The purpose of course is to provide basic knowledge of Pharmacognosy, crude drugs, their preparation, evaluation and adulteration. It will also include the pharmacognostic features of various medicinal plants belonging to different families. The students of this semester will be able to define drugs from natural origin and identify them from various methods. The students will also acquire the knowledge about crude drugs, their preparation, evaluation and adulteration.

Contents

1. General introduction: historical development and scope of Pharmacognosy. Traditional system of medicine /medicinal plants, classification of crude drugs with special emphasis to chemical and therapeutical system of classification. Terminology used in Pharmacognosy. Preparation of crude drugs for commercial market including methods of cultivation, drying, storage, preservation and packing. Adulteration of crude drugs and types of adulteration, inferiority, spoilage, admixture, sophistication and substitution of crude drugs. Evaluation of crude drugs i.e. Organoleptic, microscopic, physical, chemical and biological.
2. The study of the crude drugs belonging to various families of medicinal importance Families Crude Drugs

Recommended Texts

1. Varro E. Tyler, Lynn R. Brady, James E. Robbers (2001). *Pharmacognosy*. Philadelphia: Lea and Febiger.
2. William C. Evans, George E. Trease, Daphne E. (2009). *Trease and Evans' Pharmacognosy*. New York: Illustrated Elsevier Health Sciences Division Publisher.

Suggested Readings

1. T.E. Wellis (1986). *Pharmacognosy*. New Delhi: New Delhi: CBS Publishers & Distributors.
2. Ali M. (2012). *Introduction to Pharmacognosy*. New Delhi: New Delhi: CBS Publishers & Distributors.

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URCP-5106**Pakistan Studies****2(2+0)**

The course is designed to acquaint the students of BS Programs with the rationale of the creation of Pakistan. The students would be apprised of the emergence, growth and development of Muslim nationalism in South Asia and the struggle for freedom, which eventually led to the establishment of Pakistan. While highlighting the main objectives of national life, the course explains further the socio-economic, political and cultural aspects of Pakistan's endeavours to develop and progress in the contemporary world. For this purpose, the foreign policy objectives and Pakistan's foreign relations with neighbouring and other countries are also included. This curriculum has been developed to help students analyse the socio-political problems of Pakistan while highlighting various phases of its history before and after the partition and to develop a vision in them to become knowledgeable citizens of their homeland.

Contents

- 1 Contextualizing Pakistan Studies
- 2 Geography of Pakistan: Geo-Strategic Importance of Pakistan
- 3 Freedom Movement (1857-1947)
- 4 Pakistan Movement (1940-47)
- 5 Muslim Nationalism in South Asia
- 6 Two Nations Theory
- 7 Ideology of Pakistan
- 8 Initial Problems of Pakistan
- 9 Political and Constitutional Developments in Pakistan
- 10 Economy of Pakistan: Problems and Prospects
- 11 Society and Culture of Pakistan
- 12 Foreign Policy Objectives of Pakistan and Diplomatic Relations
- 13 Current and Contemporary Issues of Pakistan
- 14 Human Rights: Issues of Human Rights in Pakistan

Recommended Texts

- 1 Kazimi, M. R. (2007). *Pakistan studies*. Karachi: Oxford University Press.
- 2 Sheikh, J. A. (2004). *Pakistan's political economic and diplomatic dynamics*. Lahore: Kitabistan Paper Products.

Suggested Readings

- 1 Hayat, S. (2016). *Aspects of Pakistan movement*. Islamabad: National Institute of Historical and Cultural Research.
- 2 Kazimi, M. R (2009). *A concise history of Pakistan*. Karachi: Oxford University Press.
- 3 Talbot, I. (1998). *Pakistan: A modern history*. London: Hurst and Company.

This course is built upon the mathematical concepts, principles and techniques that are useful in almost all undergraduate programs. The main objectives of the course are to enhance student's competency in application of mathematical concepts in solving problems and to improve their level of quantitative approach. Upon the successful completion of this course students would be able to develop understanding: Mathematical functions, Building and solving linear and quadratic equations, Matrices and Determinants with application, sequences and series, and basic Financial Mathematics. To prepare the students, not majoring in mathematics, with the essential tools of financial, algebra and geometry to apply the concepts and the techniques in their respective disciplines.

Contents

- 1 Linear Equations and Quadratic Equations: Formation of Linear equation
- 2 Solving Linear equation involving one variable
- 3 Solution of Quadratic equation by factorization method
- 4 Solution of quadratic equation by square completion methods
- 5 Solution of quadratic equation by quadratic formula
- 6 Application of quadratic equation
- 7 Sequences and Series
- 8 Matrices and Determinants: Introduction of matrices
- 9 Types of matrices
- 10 Matrix operations
- 11 Inverse of matrix
- 12 The determinants and its properties
- 13 Solution of system of linear equations by determinants: Cramer's rule, Inverse Matrices Method
- 14 Mathematics of Finance: Simple interest
- 15 Compound interest
- 16 Annuities
- 17 Sets and Sets Operations
- 18 Permutation and combinations
- 19 Introduction to mathematical induction and binomial theorem
- 20 Basic Concepts of Trigonometry
- 21 Fundamental Identities of Trigonometry

Recommended Texts

- 1 Frank, S. B. (1993). *Applied mathematics for business, economics, and the social Sciences*). New York: McGraw-Hill publisher.
- 2 Nauman, K. (2019). *Basic mathematics-I: algebra and trigonometry*. Lahore: Al-Hassan Pub.

Suggested Readings

- 1 Kaufmann, J. E. (1994). *College algebra and trigonometry*. Boston: PWS-Kent Pub. Co.
- 2 Swokowski, E. W. (1993). *Fundamentals of algebra and trigonometry*. Boston: PWS-Kent Pub. Co.

URCP-5106

Pakistan Studies

2(2+0)

The course is designed to acquaint the students of BS Programs with the rationale of the creation of Pakistan. The students would be apprised of the emergence, growth and development of Muslim nationalism in South Asia and the struggle for freedom, which eventually led to the establishment of Pakistan. While highlighting the main objectives of national life, the course explains further the socio-economic, political and cultural aspects of Pakistan's endeavours to develop and progress in the contemporary world. For this purpose, the foreign policy objectives and Pakistan's foreign relations with neighbouring and other countries are also included. This curriculum has been developed to help students analyse the socio-political problems of Pakistan while highlighting various phases of its history before and after the partition and to develop a vision in them to become knowledgeable citizens of their homeland.

Contents

- 1 Contextualizing Pakistan Studies
- 2 Geography of Pakistan: Geo-Strategic Importance of Pakistan
- 3 Freedom Movement (1857-1947)
- 4 Pakistan Movement (1940-47)
- 5 Muslim Nationalism in South Asia
- 6 Two Nations Theory
- 7 Ideology of Pakistan
- 8 Initial Problems of Pakistan
- 9 Political and Constitutional Developments in Pakistan
- 10 Economy of Pakistan: Problems and Prospects
- 11 Society and Culture of Pakistan
- 12 Foreign Policy Objectives of Pakistan and Diplomatic Relations
- 13 Current and Contemporary Issues of Pakistan
- 14 Human Rights: Issues of Human Rights in Pakistan

Recommended Texts

- 1 Kazimi, M. R. (2007). *Pakistan studies*. Karachi: Oxford University Press.
- 2 Sheikh, J. A. (2004). *Pakistan's political economic and diplomatic dynamics*. Lahore: Kitabistan Paper Products.

Suggested Readings

- 1 Hayat, S. (2016). *Aspects of Pakistan movement*. Islamabad: National Institute of Historical and Cultural Research.
- 2 Kazimi, M. R (2009). *A concise history of Pakistan*. Karachi: Oxford University Press.
- 3 Talbot, I. (1998). *Pakistan: A modern history*. London: Hurst and Company.

Dosage forms are pharmaceutical drug products in the form in which they are marketed for use, with a specific mixture of active ingredients and inactive components, in a particular configuration, and apportioned into a particular dose. Dosage forms are important because they generally indicate the way a particular medication should be given. For example, injection, inhalation, oral, rectal, nasal, transdermal. This course is for graduate level to broaden the student's outlook to know about all pharmaceutical dosage forms and deepen his interest in everything that concerns general and specialized methods of preparation of dosage forms. In this course, the students will also be exposed briefly to certain specific areas of tablets, capsules, aerosols, suppositories, ointments. The lab of this course aims to provide students hands-on experience to prepare various dosage forms. This course is an instrument of satisfying the student's handling and ability to prepare various formulations. After studying this course, students will be able to understand the pharmaceutical drug products, excipients and methods used to formulate various dosage forms. In this course, the students will also be exposed briefly to certain specific areas of tablets, capsules, aerosols, suppositories, ointments

Contents

1. Powders, Capsules, Tablet Dosage Forms:
2. Suppositories and Vaginal Suppositories: Semi-solid Preparations, Suppositories bases, preparation, packaging and storage, Solutions/Enemas.
3. Aerosols, Inhalations and Sprays: Aerosol:
4. Introduction to parenteral:
5. A Brief Introduction To Oral Hygiene Products

Recommended Texts

1. Allen, L.V., N.G. Popovich and H.C. Ansel, (2010). *Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems*. New York: LWW
2. Gennaro, A.R., (2006). *Remington's Pharmaceutical Sciences*. Pennsylvania: Mack Publishing Company.

Suggested Readings

1. Micheal E. Aulton, Aulton (2006). *Pharmaceutics: The Design and Manufacture of Medicines*. Netherlands: Elsevier
2. Micheal E. Aulton (2006). *Pharmaceutics: The Science of Dosage Form Design*. Netherlands: Elsevier
3. Gennaro, A.R., (2006). *Remington's Pharmaceutical Sciences*. Pennsylvania: Mack Publishing Company.

PHRM-5130

Pharmaceutical Microbiology & Immunology II

3(3+0)

Pharmaceutical microbiology and immunology is designed to provide a fundamental background and opportunity to the students where they should be able to thoroughly understand and explain the microbiology and immunology of various microbes with the addition of pathological, diagnostic and industrial aspects of important microorganisms and pharmacological agents such as antibiotics, as well as vaccines and other agents which are used to control infectious microorganisms. The main objective is to summarize the working principles in the microbiology laboratory and distinguish main microbiological devices, general staining and chemical identification tests of microorganisms, use of microbial media/culture media, for laboratory culture of microorganisms, incubate the microorganisms where inoculated to medium, compare the morphological observation techniques of microorganisms, and to compare normal flora areas of human body and the microorganisms in there. Pharmaceutical microbiology course is designed for Pharm D students in two semesters. Pharmaceutical Microbiology and Immunology in 4th semester covers the areas like Industrial microbiology, Immunology, Factory and Hospital Hygiene and introduction to some common infectious diseases. Students get acquainted with the industrial aspect of the field of Microbiology.

Contents

1. Industrial microbiology
2. Immunology
3. Factory & hospital hygiene including good manufacturing practices
4. Introduction to diseases Dengue fever, Bird flu, SARS, or other prevailing diseases of bacteria and Virus.

Recommended Texts

1. Hugo WB, Denyer SP, Hodges NA, Gorman SP (2004). *Hugo and Russell's pharmaceutical microbiology*. Hoboken: Wiley Blackwell.
2. Pommerville, J. C., & Pommerville, J. C. (2004). *Alcamo's fundamentals of microbiology*. Massachusetts: Jones & Bartlett Learning.

Suggested Readings

1. Fraise A, Lambert PA, Maillard JY. Russell, Hugo & Ayliffe's (2004). *Principles and Practice of Disinfection, Preservation & Sterilization*. Hoboken: Wiley Blackwell.
2. Willey J, Sherwood L, Woolverton C (2010). *Prescott's Microbiology*. C. New York: Brown Publishers.

Pharmacology is branch of medical science that deals with the study of effects of chemical substances on function of living system. In general this subject explains what the drug does to the body and what the body does to the drug. Drug can be used to treat, prevent and cure of any disease. The main objectives of this course are to give an understanding of the fundamental principles of Pharmacodynamics (i.e. drug receptor interactions) and pharmacokinetics (i.e. absorption, distribution, metabolism, and elimination of drugs). This subject play a vital role to develop understanding of Pharmacy students in mechanism of action, Pharmacological actions, therapeutic and other uses, indication, contraindication, drug-drug interaction, drug food interaction and toxic effects of drugs. This knowledge of pharmacology will help pharmacy students to work in clinical pharmacy setup and to work in hospital wards and community pharmacies alongside other healthcare professionals for better health outcome of patients.

Contents

1. Pharmacology of gastrointestinal Pharmacology
2. Anti-ulcer drugs
3. Anti emetic drugs
4. Pharmacology of respiratory system
5. Bronchodilators
6. Autacoids
7. Antihistaminic drugs
8. antidiabetics

Recommended Texts

1. Goodman, L. S. (1996). *Goodman and Gilman's the pharmacological basis of therapeutics* (Vol. 1549). New York: McGraw-Hill.
2. Lippincott (2001), *Pharmacolog.*, New York: Lippincot William & Willkin

Suggested Readings

1. Lippincott (2001), *Pharmacology*. New York: Lippincot William & Willkin
2. J D Tripathy (2000), *Essential of Medical Pharmacology*. New Delhi: Japees Brother.
3. Katzung B G (2001), *Basic and Clinical Pharmacology*. New York: McGraw-Hill Medical Publishers.

Pharmacognosy is the study of medicines or crude drugs produced from natural sources such as plants, microbes, and animals. It includes analysis of their biological, chemical, biochemical, and physical properties. Pharmacognosy gives a sound knowledge of the vegetable drugs. This course is a graduate level course of Pharmacognosy for Pharm-D. Pharmacognosy is the science of natural drugs obtained from natural sources. The purpose of course is to provide basic knowledge of mechanism of allergic reaction, various tests for diagnosis and treatment of allergy and different types of allergens causing allergy. The students of this semester will learn about preparation and therapeutic applications of enzymes obtained from various plant and animal sources. The detailed study of poisonous plants of Pakistan and various types of pesticides will also be provided. The effect of various plant growth regulators on the growth of secondary metabolites of plants and drugs of animal origin will be discussed. A brief introduction of various biologicals including vaccines and various surgical dressings will also be the part of this semester.

Contents

1. Allergens and allergenic preparations:
2. Enzymes.
3. Growth regulators: general account with special reference to plant hormones;;
4. Pesticides:
5. Drugs of animal origin:
6. Biologics:
7. Surgical dressings:

Recommended Texts

1. Pharmacognosy, Varro E. Tyler, Lynn R. Brady, James E. Robbers (2001). *Lea and Febiger*, Philadelphia.
2. Evans, W. C. (2009). *Trease and Evans Pharmacognosy, International Edition E-Book*. Elsevier Health Sciences.

Suggested Readings

1. T.E. Wellis (1986). *Pharmacognosy*, CBS Publishers & Distributors, New Dehli.
2. Ali M. (2012). *Introduction to Pharmacognosy*. CBS Publishers & Distributors, New Dehli.

This is the general Statistics course designed for under graduate programs of arts and social sciences. Statistics is an integral part of arts and social science research. We live in a world where there is no shortage of numerical data and there is increasing demand for people who know how to make sense of it independent of the field of work. The goal of this course is to turn the students into one of such category. In this course, students will learn the basics of descriptive and inferential statistics and the most commonly used statistical techniques found in arts and social science research. The course is designed to give the students an in depth understanding of how these statistical techniques work but minimizing the mathematical burden on the student. While more focus will be given on the statistical analysis with the help of some statistical softwares SPSS, Excel etc. Moreover, the teacher will also focus on interpretation of statistical data results which are obtained from the statistical softwares. So these activities will improve the analytical and research activities of arts and social science students.

Contents

- 1 Introduction to Statistics: Descriptive and Inferential Statistics, Limitations of Statistics, Scope of Statistics, Variable, Data, Types of Variable and Data, Scales of Measurements.
- 2 Display of Data: Tabulation of Data, Graphical Display, Histogram, Bar Charts, Pie Chart, Stem and Leaf Plots.
- 3 Measures of Central Tendency: Mean Median, Mode, Box Plot, and Application in Real Life.
- 4 Measures of Dispersion: Range, Quartile Deviation, Mean Deviation, Variance and Standard Deviation, Coefficient of Variation, Z-score and their Application.
- 5 Normal Distribution: Normal Distribution and its Application,
- 6 Sampling and Sampling Distribution.
- 7 Hypothesis Testing: z test, t-test, Chi-square test
- 8 Regression Analysis: Simple Linear Regression, Multiple Regression.
- 9 Correlation Analysis: Simple correlation, multiple correlation, partial correlation, partial correlation.
- 10 Test of independence between qualitative variables
- 11 All the observational analysis will be carried out using MS Excel and SPSS.

Recommended Texts

- 1 Weiss, N. A. (2017). *Introductory statistics*. England: Pearson Education.
- 2 Mann, P.S. (2016). *Introductory statistics*. New York: John Wiley & Sons.

Suggested Readings

- 1 Ross, S. M. (2010). *Introductory statistic*. New York: Academic Press.
- 2 Dunn, D.S. (2001). *Statistics and data analysis for the behavioral sciences*. New York: McGraw Hill
- 3 Chaudhry, S. M. & Kamal, S. (2010). *Introduction to statistical theory part I &II*. Pakistan: Ilmi Kitab Khana.

Dispensing refers to the process of preparing and giving medicine to a named person on the basis of a prescription. It involves the correct interpretation of the wishes of the prescriber and the accurate preparation and labeling of medicine for use by the patient. Programs to improve rational use have often been concentrated on ensuring rational prescribing habits, overlooking dispensing and the patient's use of medicines. Pharmacists contribute the safe and effective use of pharmaceuticals at times when drugs are dispensed. They also play a significant role in promoting rational use of drugs, e.g. providing drug information to patient, and carrying out drug utilization studies. This course is designed with emphasis placed on the role of the pharmacist in medication dispensing and patient care. The course will provide students with information and skills in the areas of compounding and extemporaneous preparations to meet specific patient needs. Moreover pharmacists with the practice of pharmaceutical care as well as the skills required to deliver patient care safely and effectively. It focuses on the fundamental operations in compounding and dispensing.

Contents

1. Fundamental operations in compounding, containers and closures for dispensed products
2. Prescription-handling (Parts of Prescription, Filling, Interpretation, Pricing) and labelling of dispensed medication
3. Solutions, Suspensions, Emulsions, Creams
4. Ointments, Pastes and gels
5. Suppositories and Pessaries
6. Powders and granules and Oral unit dosage form
7. Pharmaceutical Incompatibilities: Types of Incompatibilities, Manifestations, Correction and Prevention with reference to typical examples.

Recommended Texts

1. Armstrong, N. A., & James, K. C. (1990). *Understanding experimental design and interpretation in pharmaceutics*. New York: Taylor & Francis.
2. Remington, J. P. (2006). *Remington: The science and practice of pharmacy* (Vol. 1). New York: Lippincott Williams & Wilkins.

Suggested Readings:

1. Cooper JW. Gunn C. & Carter SJ. (2008). *Cooper and Gunn's Dispensing for Pharmaceutical Students*. New Delhi: CBS Publishers & Distributors.
2. Lund W. (2009). *The Pharmaceutical Codex: Principles and Practice of Pharmaceutics*. New Delhi: CBS Publishers & Distributors.
3. Mehta DK (2007). *British National Formulary (BNF)*. London: Pharmaceutical Press.

Pharmaceutical analysis is a branch of practical chemistry that involves a series of process for identification, determination, quantification and purification of a substance, separation of the components of a solution or mixture, or determination of structure of chemical compounds. The contents of this course have been meticulously designed to provide fundamentals of various disciplines embodying pharmaceutical drug analysis specifically for the under-graduate students. It will also be useful to the graduate students studying modern methods of pharmaceutical analysis to a great extent. It will also cater to scientists and investigators, working in other fields of pharmaceutical sciences who wish to update their personal wealth of knowledge and understanding of the intricacies of modern methods of Pharmaceutical Drug Analysis. It is also valuable for the students to provide the knowledge of methods described in Pharmacopoeia application of the mentioned methods in the analysis of pharmaceutical formulations and biological fluids, efficiency of packaging material for pharmaceutical products (protection from air, light, humidity) and contamination of the products by the packaging materials are also aims of this course.

Contents

1. Theory, Instrumentation and Pharmaceutical Applications of the following Spectroscopic Methods
2. Chromatographic Methods
3. Electro Chemical Methods
4. Thermal Analysis
5. Titrimetric Analysis
6. Occurrence, Properties Preparation and Application Of Official Inorganic Compounds:

Recommended Texts

1. Ahuja, S., & Scypinski, S. (Eds.). (2001). *Handbook of modern Pharmaceutical Analysis* (Vol. 3). Massachusetts: Academic press.
2. Armstrong, N. A., & James, K. C. (1990). *Understanding Experimental Design and interpretation in pharmaceutics*. New York: Taylor & Francis.

Suggested Readings

1. Snyder LR. Kirkland JJ. Dolan JW. (2011). *Introduction to Modern Liquid Chromatography*. Hoboken: John Wiley & Sons Inc.
2. Beckett AH. Stennlake JB. (2011). *Practical Pharmaceutical Chemistry*. New York: The Aulton Pres.

Pharmacology is a multidisciplinary science that deals with all aspects of drugs and their interactions with living organisms. Thus, pharmacologists study the physical and chemical properties of drugs, their biochemical and physiological effects, mechanisms of action, pharmacokinetics, and therapeutic and other uses. It is based on the properties of drugs from which are deduced their clinical uses and contraindications, whereas the therapeutics is based on the patient and the disease to be treated and looks for the best means for reaching that point: drugs. This course is a graduate-level course of Pharmacology and Therapeutics-II A. This course focuses on neuropharmacology. The aim of neuropharmacology in general is to understand the basic functioning of impulses and signals within the brain in order to determine the drug response to treat neurological disorders and drug dependence. The primary objective of this course is to build up the students understanding to treat various diseases of central nervous system (CNS) such as epilepsy, depression and neurodegenerative diseases.

Contents

1. Sedatives & Hypnotic
2. Anxiolytics, antidepressants and anti-manic drugs
3. Antiepileptics
4. Antiparkinsonism and drug used in other neurodegenerative diseases
5. Antipsychotics
6. Opioid analgesics
7. Therapeutic gases (Oxygen, Carbon-dioxide, Nitric oxide and Helium
8. Cerebral Stimulants, Medullary stimulants, Spinal Cord Stimulants.
9. Anesthetics: General and local
10. Non-steroidal anti-inflammatory drugs
11. Disease modifying anti-rhumatic drugs
12. non-opioid analgesics
13. drugs used in the treatment of gout

Recommended Texts

1. Katzung and Trevor (2017), *Basic and Clinical Pharmacology*. Philadelphia: Williams and Wilkins,
2. Lippincott's Illustrated Reviews. *Pharmacology*, Harvey and Champ. 2009. Baltimore: Lippincott Williams and Wilkins.

Suggested Readings

1. Goodman and Gilman's (2011). *Pharmacological Basis of Therapeutics*, Brunton, Lazo and parker. New York : New York: McGraw Hill.
2. Tripathi, K. D. (2009). Local Anaesthetics. *Tripathi KD. Essentials of Medical Pharmacology*, 7th ed. New Delhi: Jaypee Brothers Medical Publishers (p) Ltd, 361.
3. Trevor, Katzung & Masters (2008). *Katzung and Trevor's Pharmacology Examination and Board Reviews*. Boston: McGraw Hill

Pharmacognosy is the study of medicines or crude drugs produced from natural sources such as plants, microbes, and animals. It includes analysis of their biological, chemical, biochemical, and physical properties. Pharmacognosy gives a sound knowledge of the vegetable drugs. This course is a graduate level course of Pharmacognosy for Pharm-D. Pharmacognosy is the science of natural drugs obtained from natural sources. The purpose of course is to provide basic knowledge of mechanism of allergic reaction, various tests for diagnosis and treatment of allergy and different types of allergens causing allergy. This course is a graduate level course of Pharmacognosy Advanced. The course aims to elaborate the phytochemical analysis of natural drugs, for instance different instrumental techniques that could be used for the extraction and chemical evaluation of drugs. In addition, different classes of drugs such as carbohydrates, alkaloids, glycosides, steroids and lipids based drugs will also be deeply taught with reference to their source, biosynthetic pathways, preparation and medicinal uses. By studying this course, students will be in a better position to analyze crude drugs on the basis of chemical evaluation that will also strengthen the foundations of their research potential as well.

Contents

1. Separation and isolation of plant constituents
2. Carbohydrates and related compounds
3. Alkaloids
4. Glycosides
5. Plant steroids
6. Lipids

Recommended Texts

1. Varro E. Tyler, Lynn R (2009). Brady, and James E. Robbers., *Pharmacognosy*. Philadelphia: Lea & Febiger.
2. Evans, W.C., G.E. (2009). Trease and D. Evans., *Trease and Evans' Pharmacognosy*. Toronto: W.B. Saunders.

Suggested Readings

1. Heinrich, M., J. Barnes, S. Gibbons and E.M. Williamson (2012). *Fundamentals of Pharmacognosy and Phytotherapy*. Netherlands: Elsevier Health Sciences.
2. Cseke, L.J., A. Kirakosyan, P.B. Kaufman, S. Warber and J.A. Duke (2012). *Natural Products from Plants*. Florida: CRC Press.

Pathology is a branch of medical science primarily concerning the cause, origin and nature of disease. It involves the examination of tissues, organs, bodily fluids and autopsies in order to study and diagnose disease. As a field of general inquiry and research, pathology addresses four components of disease: cause, mechanisms of development (pathogenesis), structural alterations of cells (morphologic changes), and the consequences of changes (clinical manifestations). General pathology is mostly concerned with analyzing known clinical abnormalities that are markers or precursors for both infectious and non-infectious disease and is conducted by experts in one of two major specialties, anatomical pathology and clinical pathology. Course is designed to present students with essential concepts of pathological processes and altered health states. The course looks in depth at a wide variety of common pathological conditions. General topics covered include the nature and causes of cell injury and death; adaptive cellular changes; inflammation, healing and repair, thrombosis, infarction and neoplasia. In addition to lectures, provide an opportunity for students to examine microscopic specimens illustrating the pathology covered in lectures.

Contents

1. Scope of pathology & concept of diseases, Atrophy, Hypertrophy
2. Acute and Chronic inflammation
3. Hyperplasia, Metaplasia
4. Necrosis, Infarction
5. Aplasia, Anaplasia
6. Ulcer (Peptic, Duodenal)
7. Allergy and Hyper Sensitivity
8. Hypertension
9. Leukemia or Blood Cancer
10. Types of cancer (Malignant Carcinoma, Sarcoma & Lymphomas)
11. Fate, survival and prognosis with tumors
12. Diagnosis and treatment of Cancer

Recommended Texts

1. Kumar, V., Abbas, A. K., & Aster, J. C. (2017). *Robbins basic Pathology e-book*. Netherlands: Elsevier Health Sciences.
2. Slauson, D.O. and B.J. Cooper (2003). *Mechanism of Disease*. A textbook of Comparative General Pathology. London: Elsevier Health Science Div'

Suggested Readings

1. Suvarna, S.K., C. Layton and J.D. Bancroft, (2012). *Theory and Practice of Histological Techniques*. London: Churchill Livingstone Publishers.
2. Rubin R. Strayer DS. Rubin E. (2008). *Rubin's Pathology: Clinicopathologic Foundations of Medicine*. New York: Philadelphia: Lippincott Williams & Wilkins.
3. Siegenthaler W. Aeschlimann A. (2007). *Differential Diagnosis in Internal Medicine: from symptom to diagnosis*. New York: Stuttgart Thieme.

A community pharmacy is a pharmacy that deals directly with people in the local area. It has responsibilities including compounding, counseling, checking and dispensing of prescription drugs to the patients with care, accuracy, and legality. While Social pharmacy is the discipline dealing with the role of medicines from the social, scientific and humanistic perspectives. It draws on theories of the social and behavioral sciences, and includes health psychology. This is an undergraduate level course. The healthcare community, including the patients will benefit from the advanced knowledge and skills of these practicing pharmacists. The pharmacists will gain an in-depth understanding of techniques for evaluating and managing the risk associated with prescribing, supplying and administering medicines to ensure patient safety. It focuses on specific disease states. After completion of this course, pharmacists can promote the safe use of medications and improve clinical outcomes. Americans rely on prescriptions to manage their health issues. The pharmacist often interacts with patients more often than the prescribing medical professional.

Contents

1. Definitions and background:
2. Public Health and Community Pharmacy:
3. Medical complication of drug taking
4. Patient education and counselling
5. Control of drug abuse and misuse
6. Role of Pharmacist
7. Health System Research
8. Pharmacoconomics
9. Alternative Therapies
10. Pharmacy Layout Design

Recommended Texts

1. Armstrong NA, James KC. (1990). *Understanding experimental design and interpretation in pharmaceutics*. Abingdon: New York: Taylor & Francis Publishers.
2. Gennaro AR. (2011). Remington: *The Science and Practice of Pharmacy*. New York: Lippincott Williams & Wilkins.

Suggested Readings:

1. Cooper JW, Gunn C, Carter SJ (2008). *Cooper and Gun's Dispensing for Pharmaceutical Students*. New Delhi: New Delhi: CBS Publishers & Distributors.
2. Lund W (2009). *The Pharmaceutical Codex: Principles and Practice of Pharmaceutics*. New Delhi: CBS Publishers.
3. Mehta DK (2007). *British National Formulary (BNF)*. London: London: Pharmaceutical Press.

PHRM-6148 Pharmaceutical Chemistry-III B (Pharmaceutical Analysis-II)**3(3+0)**

Pharmaceutical analysis is a branch of practical chemistry that involves a series of process for identification, determination, quantification and purification of a substance, separation of the components of a solution or mixture, or determination of structure of chemical compounds. The contents of this course have been meticulously designed to provide fundamentals of various disciplines embodying pharmaceutical drug analysis specifically for the under-graduate students. It will also be useful to the graduate students studying modern methods of pharmaceutical analysis to a great extent. It will also cater to scientists and investigators, working in other fields of pharmaceutical sciences who wish to update their personal wealth of knowledge and understanding of the intricacies of modern methods of Pharmaceutical Drug Analysis. The contents of this course have been meticulously designed to provide fundamentals of various disciplines embodying pharmaceutical drug analysis specifically for the under-graduate students. It will also be useful to the graduate students studying modern methods of pharmaceutical analysis to a great extent. It will also cater to scientists and investigators, working in other fields of pharmaceutical sciences who wish to update their personal wealth of knowledge and understanding of the intricacies of modern methods of Pharmaceutical Drug Analysis.

Contents

1. Electro Chemical Methods:
2. Thermal Analysis:
3. Titrimetric Analysis:
4. Occurrence, Properties Preparation and Application of Official Inorganic Compounds:

Recommended Texts

1. Moffat AC(2011), Osselton DM, Widdop B. *Clarke's Analysis of Drugs and Poisons*. London: Pharmaceutical Press.
2. Pryde A. (1979). Gilbert MJ. *Applications of High Performance Liquid Chromatography*. London: Chapman & Hall.

Suggested Readings

1. Knevel AM. (1977). Digangi FE. *Jenkin's quantitative Pharmaceutical Chemistry*. New York: McGraw Hill.
2. Lough WJ. Wainer WI. (1989). *High Performance Liquid Chromatography*. London: Blackie Academic Press.
3. Moffat AC. Osselton DM. Widdop B. (2011). *Clarke's Analysis of Drugs and Poisons*. London: Pharmaceutical Press.

Pharmacology and Therapeutics is a multidisciplinary science that deals with all aspects of drugs and their interactions with living organisms. Thus, pharmacologists study the physical and chemical properties of drugs, their biochemical and physiological effects, mechanisms of action, pharmacokinetics, and therapeutic and other uses. It is based on the properties of drugs from which are deduced their clinical uses and contraindications, whereas the therapeutics is based on the patient and the disease to be treated and looks for the best means for reaching that point: drugs. This course is a graduate-level course of Pharmacology and Therapeutics-II B. This course focuses on chemotherapy, immune-pharmacology and toxicology. The aim of subject in general is to build up the students understanding to treat various infectious diseases such as amebic dysentery, malaria, cancer, tuberculosis, typhoid fever, meningitis and viral diseases. This subject also enables students to apply pharmacodynamics principles (theoretical aspects) to treat infectious disease practically in clinical setup.

Contents

1. Basic principles of chemotherapy
2. Antibacterial
3. Anti-fungals
4. Anti-virals
5. Anti-protozoals: (anti-malaria, anti-amebiasis, anthelmintics and anti-leishmaniasis)
6. Anti-neoplastic drug
7. Pharmacology of immuno-suppressants and stimulants
8. Pollution and its types (water, air, food)
9. Poison and principle of treatment of poisoning.
10. Poisoning (Sign & symptom and treatment)

Recommended Texts

1. Katzung and Trevor (2009). *Basic and Clinical Pharmacology*. New York: McGraw-Hill Medical Publishing division.
2. Harvey and Champ. (2009). *Lippincott's Illustrated Reviews. Pharmacology*. Baltimore: Lippincott Williams and Wilkins.

Suggested Readings

1. Goodman and Gilman's (2008). *Pharmacological Basis of Therapeutics*. New York: McGraw Hill.
2. Tripathi (2009). *KD Essentials of Medical Pharmacology*. New Delhi: Jayee Brothers.

Pharmacognosy is the study of medicines or crude drugs produced from natural sources such as plants, microbes, and animals. It includes analysis of their biological, chemical, biochemical, and physical properties. Pharmacognosy is the science of natural drugs obtained from natural sources. The purpose of course is to provide basic knowledge of mechanism of allergic reaction, various tests for diagnosis and treatment of allergy and different types of allergens causing allergy. This course is a graduate level course of Pharmacognosy Advanced. This course is a graduate level course of Pharmacognosy Advanced. This course is a graduate level course of Pharmacognosy for Pharm-D, aims to elaborate the introduction of toxicants from natural source regarding how they produce clinical toxicology and how the respective clinical condition may be managed. In addition, different classes of drugs such as volatile oils, resins, tannins and herbs based drugs will be deeply taught with reference to their source, biosynthetic pathways, preparation and medicinal uses. Also a part of clinical pharmacognosy and cosmeceuticals, nutraceuticals-the main trend of today's research will be taught. By studying this course, students will be in a better position to manage the poisoned patients and also will be well familiar with the clinical use of various herbs and herbal medicines in different disease conditions.

Contents

1. Volatile oils (Essential oils)
2. Resins and oleoresins
3. Tannins
4. Natural toxicants
5. An introduction to nutraceuticals and cosmeceuticals
6. Tumor inhibitors from plants
7. Introduction to clinical Pharmacognosy
8. Clinical use of herbs & herbal medicine

Recommended Texts

1. Varro E. Tyler, Lynn R. Brady, and James E. Robbers. (2009). *Pharmacognosy*. Philadelphia: Lea & Febiger.
2. Evans, W.C., G.E. Trease and D. Evans. (2009). *Trease and Evans' Pharmacognosy*. Toronto: W.B. Saunders.

Suggested Readings

1. Heinrich, M., J. Barnes, S. Gibbons and E.M. Williamson. (2012). *Fundamentals of Pharmacognosy and Phytotherapy*. London: Elsevier Health Sciences.
2. Cseke, L.J., A. Kirakosyan, P.B. Kaufman, S. Warber and J.A. Duke (2010). *Natural Products from Plants*. New York: CRC Press.

In recent years, information technologies have strong impact on people life. All industries are using computer because of the benefits of automated information processing. Computer has become the integral part of drug/medicine store, clinical/hospital pharmacy and pharmaceutical research including health care industry. Computer incorporate and overcome the routine, repetitive and tedious office tasks. Computer is helpful in pharmaceutical industry, hospital management, data storage, education, budget maintenance. Computer is also useful for patient profile management checking, prescription checking, database administration and procurement management. Computer is mandatory in every field of life like manufacturing, communication, transportation, medical science and pharmacy as well. The subject Pharmacy Practice-III (Computer & Its Applications in Pharmacy) is a part of computer science and play important role in Pharmacy profession. This course can be beneficial for the Pharmacy student's and will provide ability to perform repetitive easily with the use of Information Technology. After studying this course, students will be able to understand the basic of computer system and how to use the computer system.

Contents

1. Fundamentals of computers
2. Research methodologies
3. System analysis and design
4. Computer Data processing
5. Application of computers in hospital pharmacy
6. Application of computers Community pharmacy
7. Application of computers drug information retrieval & storage

Suggested Texts:

1. Dennis N (2010). *Programmer's Guide to MS-DOS*. Brady Games.
2. Peter Norton, Scott Clark, Scott H. Clark (2002). *Peter Norton's New Inside the PC*. Indianapolis: Sams Publishers.

Suggested Reading:

1. Alan D, Barbara W, Roberta M. (2018). *System Analysis and design*. Hoboken: John Wiley & Sons.
2. Norton P, Clark S, (1994). *Peter Norton's Complete Guide to DOS*. Indianapolis: Sams Publishers.

Hospital pharmacy provides a base through which a pharmacist must be able to perform medicines management tasks in order to assure and maintain medicines availability by designing and monitoring a high standard multifunctional pharmacy in hospital. The subject enables students to learn regarding the role of pharmacist in research activities and how to cooperate and coordinate with other health professionals to assist these activities. It provides understanding about different types of hospitals with their specific actions and mode of treatment, the organizational pattern of a hospital, organogram and mode of functioning of hospital. Students will have a clear idea about the critical role of pharmacist in functioning of poison control and drug information centers. A hospital pharmacist being a part of hospital pharmacy and therapeutic committee plays a vital role in designing of hospital formulary according to the needs of patients and health care professionals. The subject provides understanding regarding monitoring, reporting and management of safe use of medicines by estimating and overcoming all of the possible causes of medication errors. The students will also have an insight of various dispensing techniques for the inpatients, ambulatory patients and dispensing during off hours.

Contents

1. Introduction of hospital pharmacy
2. Hospital and its organization
3. Pharmacy, its organization and personnel
4. Pharmacy and therapeutic committee
5. The hospital formulary
6. Dispensing to inpatients
7. Dispensing to ambulatory patients:
8. Distribution of control substances:
9. Dispensing during off-hours:
10. Safe use of medication in the hospital

Recommended Texts

1. Martin S. (2003). *Hospital Pharmacy*. London: Pharmaceutical Press.
2. Hassan W. (1986). *Hospital Pharmacy*. Philadelphia: Lee & Febiger.

Suggested Readings

1. Gennaro AR. Remington (2011). *The Science and Practice of Pharmacy*. New York: Lippincott Williams & Wilkins.
2. Winfield AJ. Rees J. Smith I. (2009). *Pharmaceutical Practice*. London: Churchill Livingstone.
3. Bukhari NI. (2001). *Hospital Pharmacy*. Lahore: Aziz Book Depot.

PHRM-6157

Pharmacy Practice-VA (Clinical Pharmacy-I)

3(3+0)

Clinical pharmacy inculcates skills to review prescriptions from doctors to ensure accuracy of dose and dosage form, to ascertain the needed ingredients, to evaluate their suitability for the patient and to counsel patients on dosage, possible side effects and risks associated with each medicine. It provides understanding regarding monitoring, reporting and management of various types of adverse drug reactions with factors affecting them. It plays a critical role in understanding of different drug interactions like drug-drug, drug-food, drug-lab, and drug – disease interactions and to manage and maintain patient's medication profiles. The students will also have an insight of drug development process from identification of the drug from its source passing through pre-clinical trials, clinical trials and ultimately reaching the market and post marketing surveillance, and data management in different clinical settings. The subject provides practical skills of taking patient's history, dose calculation for pediatric patients and establish drug information resources.

Contents

1. General Introduction to Clinical Pharmacy
2. Patient profile & patient counseling
3. Clinical trials of drug substances
4. Emergency Treatment
5. Drug interactions
6. Pharmacovigilance
7. Adverse drug reactions and side effects

Recommended Texts

1. Walker R. (2003). *Clinical Pharmacy & Therapeutics*. Churchill Levingstone.
2. DiPiro JT. (2002). *Encyclopedia of Clinical Pharmacy*. Informa Healthcare.

Suggested Readings

1. Gennaro AR. Remington (2001). *The Science and Practice of Pharmacy*. Lippincott Williams & Wilkins.
2. Zinc G. (2005). *Comprehensive Pharmacy Review Philadelphia College of Pharmacy and Science*. New York 1157.
3. Gourley H. (1992). *Clinical Pharmacy & Therapeutics*. William& Willkins.

Industrial pharmacy is the process which includes manufacturing, development, marketing and distribution of drug products including quality assurance of the developed drug. Industrial pharmacy is a complex, multi-factorial environment, with the overall aim of manufacturing, developing and marketing safe and efficacious medicines including quality assurance of these activities. This course is a graduate level course which is designed to broaden the student's outlook to know about all processes and procedures adopted for the large scale preparations of pharmaceuticals in industry and deepen their interest in everything that concerns general and specialized methods of preparation of medicines in pharmaceutical industry. In this course, the students will also be exposed briefly to certain specific areas of tablets, capsules, aerosols, suppositories, ointments, Syrups. This course is an instrument of satisfying the student's handling and ability to prepare various formulations. After studying this course, students will be able to understand the pharmaceutical drug products, excipients and methods used to formulate in Pharmaceutical Industry.

Contents

1. Mass transfer
2. Heat transfer
3. Theories of drying, Drying of Solids, Classification of dryers, General Methods, Fluidized Bed systems, Pneumatic systems, Spray dryer, Freeze drying
4. Communion, Reasons for size reduction, Factors affecting size reduction, size analysis, Sieving, Energy Mills (Ball Mill, Endrumer, Edge Rumer, Disintegrate, Colloid Mill, Hammer Mill, Cutter Mill and Fluid Energy Mill etc.)
5. Mixing, Fundamentals, Mechanisms, Mixing Equipment used in Liquid/Liquid, Liquid/Solid and Solid/Solid mixing.
6. Clarification and Filtration, Theory, Filter Media, Filter aids, Filter selection and Equipment (Leaf filter, Filter press, Melta filters and Rotary filters)
7. Evaporation, General principles of Evaporation, Evaporators and Evaporation under reduced pressure
8. Compression and compaction, The solid-air Interface, Angle of Repose, Flow rates, Mass volume relationship, Density, Heckel Plots, Consolidation, Granulation, Friability, Compression, Physics of Tableting, tableting machines and other equipment required, problems involved in tableting, tablet coating. Capsulation, Hard and soft gelatin capsules

Recommended Texts

1. Lachman. L. (2013). Lieberman, H. A. *The Theory and Practice of Industrial Pharmacy* New Delhi: CBS Publishers & Distributors.
2. Carter, S. J. (2005). *Cooper and Gunn's Tutorial Pharmacy*. New Delhi: CBS Publishers & Distributors.

Suggested Readings

1. Gennaro, A. R. *Remington (2001). The Science and Practice of Pharmacy* Philadelphia: Lippincott Williams & Wilkins.
2. Allen L. V., Popovich N. G. (2005). *Ansel's Pharmaceutical Dosage Forms and Drug delivery systems* (Lippincott Williams & Wilkins).
3. Aulton M. E. (2007). *Aulton's Pharmaceutics: The Design and Manufacture of Medicines* (Churchill Livingstone).

PHRM-6161 Pharmaceutics-V A (Biopharmaceutics & Pharmacokinetics-I) 3(3+0)

This course is a undergraduate-level of Biopharmaceutics & Pharmacokinetics-I. This course aims to study physical and chemical properties of a drug, and its dosage form, as related to the onset, duration, and intensity of drug action, including constituents and mode of manufacture. Drugs are given in a variety of dosage forms or *drug products* such as solids (tablets, capsules), semisolids (ointments, creams), liquids, suspensions, emulsions, etc, for systemic or local therapeutic activity. Drug products can be considered to be drug delivery systems that release and deliver drug to the site of action such that they produce the desired therapeutic effect and are also designed specifically to meet the patient's needs including palatability, convenience, and safety. *Biopharmaceutics* examines the interrelationship of the physical/chemical properties of the drug, the dosage form (drug product) in which the drug is given, and the route of administration on the rate and extent of systemic drug absorption.

Contents

1. Definitions and terminology:
2. Gastro-Intestinal Absorption:
3. Biological half-life and volume of distribution:
4. Drug Clearance:
5. Pharmacokinetics:
6. Multiple dosage regimens:
7. Concept of compartment(s) models:

Recommended Texts

1. Shargel L., S. Wu-Pong and A.B.C. Yu. (2012). *Applied Biopharmaceutics and Pharmacokinetics*. McGraw-Hill, Medical Pub. Division, New Delhi, India.
2. Schoenwald, R.D. (2002). *Pharmacokinetics in Drug Discovery and Development*, CRC Pres, LLC, USA.

Suggested Readings

1. Li. A.P., (2004). *In Vitro Approaches for Evaluation of Drug Efficiency and Toxicity*. CRC Press, LLC, USA.
2. Niazi S., (2009). *Handbook of Pharmaceutical Manufacturing Formulations: Compressed Solid Products*. New York: Informa Health Care.

Pharmaceutical quality management is integral to an effective pharmaceutical quality system. It can provide a proactive approach to identifying, scientifically evaluating, and controlling potential risks to quality. It facilitates continual improvement of process performance and product quality throughout the product lifecycle. Quality management system in pharmaceuticals helps to improve the product quality and minimize the risk of product recall. Quality Management System takes into account all applicable guidelines and regulations that are designed to maintain its robustness. This graduate level course aims to elaborate the principles of pharmaceutical quality management and also elicit how to select the suitable method for analysis of drug substances in different dosage forms like solid dosage form, sterile products and liquid dosage forms. Also apply pharmacopeial methods to analyze and interpret criteria for quality pharmaceutical product. After completion of this course students will learn how to develop effective quality management in the pharmaceutical industry along with it that develop an effective monitoring control based on the performance as well as product quality.

Contents

1. Introduction
2. Quality control of solid dosage
3. Quality control of syrups, elixirs, and disperse system
4. Quality control of suppositories
5. Quality control of sterile products (Parenteral)
6. Standardization of pharmaceuticals

Recommended Texts

1. British Pharmacopoeia. British Pharmacopeial Commission.
2. The United States Pharmacopeia and the National Formulary (USP–NF). British Pharmacopoeial Secretariat.

Suggested Readings

1. Ahuja, S. Scypinski S. (2010). *Handbook of Modern Pharmaceutical Analysis*. Academic Press.
2. Lund, W. (2009). *The Pharmaceutical Codex: Principles and Practice of Pharmaceutics*. CBS Publishers.
3. Mehta DK (2016). *British National Formulary (BNF)*. London: Pharmaceutical Press.

Pharmacists working in hospitals are valued members of multidisciplinary teams working with other health care professionals to improve patient outcomes. The Role of Hospital Pharmacist has been expanded from conventional role of drug procurement, distribution and dispensing to specialist clinical roles reflecting the increased complexity of modern medicines treatments. This involves advising clinicians and providing information on the pharmaceutical and therapeutic aspects of drug use and many pharmacists specialize in areas including radiopharmaceuticals; chemotherapy; and manufacturing of TPN and sterile formulations and research. Objectives of this course are to educate students about the role and responsibilities of Hospital Pharmacist. To understand policies regarding drug procurement, inventory control, distribution and dispensing. To provide them education regarding some special services offered by hospital pharmacist. This course will help the students to be the future pharmacists that empower patients by helping them tackle illness and boosting their confidence, along with the impart of knowledge, they motivate, they help patients to help themselves. Active member of healthcare team in a health crisis, and sometimes even saves lives giving care beyond prescriptions and medicine.

Contents

1. Manufacturing bulk and sterile:
2. The pharmacy; central sterile supply room:
3. Aseptic dispensing:..
4. Role of pharmacist in small hospitals, nursing homes etc.
5. Purchasing, distribution and control of hospital medicines, medical & surgical supplies:..
6. Nuclear pharmacy:
7. The physical plant and its equipment:
8. Investigational use of drugs:
9. Health accessories:
10. Surgical supplies:
11. Inspection of wards with reference to drug storage and administration:
12. Management of accident & emergency pharmacy (a & e)

Recommended Texts

1. Martin, S. (2003). *Hospital Pharmacy*. London: Pharmaceutical Press.
2. Hassan, W. (1986). *Hospital Pharmacy*. Lee & Febiger.

Suggested Readings

1. Zinc G (2005). *Comprehensive Pharmacy Review Philadelphia College of Pharmacy and Science:*
New York 1157.
2. Gennaro AR (2011). *The science and practice of pharmacy*. Lippincott Williams & Wilkins.

Clinical pharmacy is the branch of pharmacy in which clinical pharmacists provide direct patient care that optimizes the use of medication and promotes health, wellness, and disease prevention. It provides a platform to perform activities through which pharmacist cooperates and coordinates with other health care professionals in designing, implementing and monitoring a therapeutic care plan for providing better care to patients by evaluating and reviewing drug utilization process. It helps students to learn about participative, rational decision making on the basis of scientific reasoning and evidence for better therapeutic outcomes. The subject enables students to find and manage drug induced diseases and gives an insight regarding role of computers in e-prescription, online pharmaceutical care, data management in different clinical settings. It helps students to gain a competency regarding how to design and how to write a clinical research study plan and that will increase students ‘proficiency in skillful evaluation of drug literatures. The course augments the practical skills of students regarding taking patient’s history, dose calculation for pediatric patients and establishing drug information resources.

Contents

1. Pharmacotherapy Plan
2. Pharmacotherapy decision-making
3. Drug induced diseases
4. Utilization of Clinical Drug Literature
5. On line pharmaceutical care services and globalization
6. Computers in clinical pharmacy
7. Provision of pharmaceutical care in multiple environments
7. Disease management

Recommended Book

1. Gourley H (1992). *Clinical Pharmacy & Therapeutics*. William& Willkins;
2. Koda-Kimble MA., Young L.Y., Kradjan WA., Guglielmo BJ. ,Alldredge BK. & Corelli RL. (2005).

Applied therapeutics:the clinical use of drugs. Lippincott Williams & Wilkins Baltimore;

Suggested Readings

1. DiPiro JT. (2002). *Encyclopedia of Clinical Pharmacy*. Informa Healthcare.
2. Gennaro AR. Remington (2011). *The Science and Practice of Pharmacy*. Lippincott Williams & Wilkins.
3. Walker R. (2003). *Clinical Pharmacy & Therapeutics*. Churchill Levingstone.

Industrial pharmacy is the process which includes manufacturing, development, marketing and distribution of drug products including quality assurance of the developed drug. Industrial pharmacy is a complex, multi-factorial environment, with the overall aim of manufacturing, developing and marketing safe and efficacious medicines including quality assurance of these activities. This course is a graduate level course which is designed to broaden the student's outlook to know about all processes and procedures adopted for the large scale preparations of pharmaceuticals in industry and deepen their interest in everything that concerns general and specialized methods of preparation of medicines in pharmaceutical industry. In this course, the students will also be exposed briefly to certain specific areas of tablets, capsules, aerosols, suppositories, ointments, Syrups. The lab of this course aims to provide student's hands-on experience to various industrial equipment's to enhance their skills. This course is an instrument of satisfying the student's handling and ability to prepare various formulations. After studying this course, students will be able to understand the pharmaceutical drug products, excipients and methods used to formulate in Pharmaceutical Industry.

Contents

1. Emulsions.
2. Suspensions.
3. Semisolids.
4. Sterile Products.
5. Packing & Packaging.
6. Safety methods in pharmaceutical industry.

Recommended Texts

1. Lachman, L., Lieberman, H. A. (2013). *The Theory and Practice of Industrial Pharmacy* (New Delhi: CBS Publishers & Distributors).
2. Carter, S. J., (2005). *Cooper and Gunn's Tutorial Pharmacy* (New Delhi: CBS Publishers & Distributors).

Suggested Readings

1. Gennaro, A. R. (2011). *Remington: The Science and Practice of Pharmacy* (Philadelphia: Lippincott Williams & Wilkins).
2. Allen, L. V., Popovich, N. G. (2005). *Ansel's pharmaceutical dosage forms and drug delivery systems*. Philadelphia: Lippincott Williams & Wilkins.
3. Aulton, M. E. (2007). *Aulton's Pharmaceutics: the Design and Manufacture of Medicines* Churchill Livingstone.

PHRM-6170 Pharmaceutics-V B (Biopharmaceutics & Pharmacokinetics-II) 3(3+0)

Biopharmaceutics & Pharmacokinetics is a combination which refers to a branch in pharmaceutical sciences which relates between the physicochemical properties of a drug in dosage form and the pharmacology, toxicology, or clinical response observed after its administration. Drug efficacy and safety are dependent on the dosing regimen. On the other end pharmacokinetics refers to the study of the time course of a drug within the body extent and duration of systemic exposure to the drug and also incorporates the process about the drug's absorption, distribution, metabolism, and excretion (ADME) pattern. This course aims to study physical and chemical properties of a drug, and its dosage form, as related to the onset, duration, and intensity of drug action, including constituents and mode of manufacture. Drugs are substances intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease. Drugs are given in a variety of dosage forms or drug products such as solids (tablets, capsules), semisolids (ointments, creams), liquids, suspensions, emulsions, etc., for systemic or local therapeutic activity. Drug products can be considered to be drug delivery systems that release and deliver drug to the site of action such that they produce the desired therapeutic effect and are also designed specifically to meet the patient's needs including palatability, convenience, and safety.

Contents

1. Elimination of drugs.
 - a) Hepatic Elimination.
 - b) Renal Excretion of Drugs.
 - c) Elimination of Drugs through other organs.
2. Protein Binding.
3. Pharmacokinetics variations in disease states.
4. Pharmacokinetics of intravenous infusions.
5. Biopharmaceutical aspects in developing a dosage form.
6. Bioavailability and bioequivalence.
7. In-Vitro-In-Vivo Correlation (IVIVC).

Recommended Texts

1. Shargel, L., S. Wu-Pong and A.B.C. Yu, (2012). *Applied Biopharmaceutics and Pharmacokinetics*. New Delhi: McGraw-Hill, Medical Pub. Division..
2. Schoenwald, R.D., (2002). *Pharmacokinetics in Drug Discovery and Development*. New York: CRC Pres, LLC.

Suggested Readings

1. Li, A.P., (2004). *In Vitro Approaches for Evaluation of Drug Efficiency and Toxicity*. New York: CRC Press, LLC
2. Niazi, S., (2009). *Handbook of Pharmaceutical Manufacturing Formulations: Compressed Solid Products* (2nd ed.). London: Informa Health Care.

PHRM-6172**Pharmaceutical Quality Management-II****3(3+0)**

Pharmaceutical quality management is integral to an effective pharmaceutical quality system. It can provide a proactive approach to identifying, scientifically evaluating, and controlling potential risks to quality. It facilitates continual improvement of process performance and product quality throughout the product lifecycle. Quality management system in pharmaceuticals helps to improve the product quality and minimize the risk of product recall. Quality Management System takes into account all applicable guidelines and regulations that are designed to maintain its robustness. This graduate level course aims to elaborate the principles of pharmaceutical quality management and also elicit how to select the suitable method for analysis of drug substances in different dosage forms like solid dosage form, sterile products and liquid dosage forms. Also apply pharmacopeial methods to analyze and interpret criteria for quality pharmaceutical product. This graduate level course aims to elaborate the principles of bioassay and bioassay techniques and describe and explain the pharmacopeial methods of moisture contents and ash contents determination and also interpret the possible interactions or interferences of some compounds with the selected method of analysis of certain compounds.

Contents

1. Biological assays
2. Alcohol determination
3. Alkaloidal drug assay
4. Quality assurance of vaccines
5. Miscellaneous determinations and tests
6. Statistical interpretation of quality control charts during manufacturing processes

Recommended Texts

1. British Pharmacopoeia
2. The United States Pharmacopeia and the National Formulary (USP–NF)

Suggested Readings

1. Armstrong NA, James KC (1990). *Understanding Experimental Design and Interpretation in Pharmaceutics* (1st Ed.). New York: Taylor & Francis Publishers.
2. Baertschi SW, Alsante KM, Reed RA (2011). *Pharmaceutical Stress Testing: Predicting drug Degradation*. London: Informa Healthcare.

Pharmaceutical technology is a collective term for technologies to develop candidate compounds that have either been discovered or created into commercial pharmaceutical products. It combines scientific aspects that are critical in the development and manufacture of new drugs, handling of medicines and medical devices. This course is designed to broaden the student's outlook to know about all Processes and procedures to formulate the novel DDS by transforming chemical compounds with useful effects on the human body into high-quality dosage forms that can appropriately exhibit effects against disease. Pharmaceutical technology course has been broadly categorized into the following three functions. Process technology for researching synthetic methods to be used to manufacture candidate compounds efficiently and consistently in large amounts. Formulation technology for investigating dosage forms, formulations, and packages based on absorption stability, and usability in consideration of the characteristics of candidate compounds. Analytical and quality evaluation technology for establishing a variety of analytical and quality evaluation systems.

Contents

1. Principles of pharmaceutical formulation and dosage form design:
2. Advanced granulation technology (design & practice):
3. Polymers used in drug delivery systems:
4. Novel Drug Delivery System (DDS):

Recommended Texts

1. Hellery, A.M., (2002). *Drug Delivery and Targeting*. London: Taylor & Francis.
2. Banker, G.S. and T.C.T. Rhodes, (2002). *Modern Pharmaceutics*. London: Informa Health Care.

Suggested Readings

1. Allen, L.V., N.G. Popovich and H.C. Ansel, (2010). *Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems*. New York: Lippincott Williams & Wilkins.
2. Liu, D., (2008). *Water Insoluble Drug Formulations*. New Delhi: CRC Press.
3. Ahuja, S. and S. Scypinski, (2010). *Handbook of Modern Pharmaceutical Analysis*. New York: Academic Press.

Advance Clinical Pharmacy provides a flexible study pathway that is designed to develop the therapeutic knowledge and clinical skills of pharmacists to an advanced level. The course is an amalgamation of our previous clinical pharmacy and community pharmacy courses and is open to pharmacists in all employment sectors. This course is an undergraduate-level of Advanced Clinical Pharmacy-I. This course aims to study the applications of Clinical pharmacy which is the branch of pharmacy in which pharmacists provide patient care that optimizes the use of medication and promote health, wellness, and disease prevention. The objective is promotion of human health through safe, efficacious and affordable pharmaceutical interventions. To provide pharmacy students with knowledge as well as technical and scientific skills for appropriate use of therapeutic substances. The end of this course the students will be able to describe the terminologies of various Disease, interpret the relationships between clinical pharmacy, pharmaceutical care and good pharmacy practice, recognize the importance of pharmacist in patient education and counseling about compliance, explain the role of pharmacist in treatment of poisoning and general management of poisoning & over dosage.

Contents

1. Rational use of drugs:
2. Introduction to essential drugs:
3. Disease management:
4. Drug utilization evaluation & drug utilization review (DUE/DUR):
5. Clinical pharmacokinetics:

Recommended Texts

1. Hansten P, Horn J (2010). *Drug interactions Analysis and Management*. Philadelphia: Lippincott Williams & Wilkins.
2. Koda-Kimble *et al*(2005). *Applied Therapeutics: the Clinical use of Drugs*. Baltimore: Lippincott Williams & Wilkins.

Suggested Readings

1. Gennaro AR (2011). Remington: *The Science and Practice of Pharmacy*. Philadelphia: Lippincott Williams & Wilkins.
2. Gourley H (1992). *Clinical Pharmacy & Therapeutics*. New York: William & Willkins.
3. Greene RJ, Harris ND (2008). *Pathology and Therapeutics for Pharmacists*. London: Pharmaceutical Press.

PHRM-6178

Pharmacy Practice-VII A (Forensic Pharmacy)

3(3+0)

This course is an undergraduate-level of Biopharmaceutics & Pharmacokinetics-I. This course aims to study the applications of scientific knowledge to legal problems and legal proceedings. The word "forensic" comes from the Latin word "forensis" pertaining to a forum. In ancient Rome the forum was a market place where people gathered, not just to buy things, but also to conduct all kinds of business, including that of public affairs. The meaning of "forensic" later came to be restricted to refer to the courts of law. Forensic pharmacy is the application of the sciences of drugs to legal issues. Forensic pharmacists engage in work relating to litigation, the regulatory process, and the criminal justice system. Forensic pharmacy overlaps with many other forensic fields. It helps systems for detecting drug abuse, or consult with a police department to teach officers how to better detect drug abuse in suspects. A forensic pharmacist might also offer his services to college sports teams, helping to detect drug use in players.

Contents

1. General introduction:
2. Role of forensic pharmacist:
3. Pharmaceutical ethics:
4. Study of drug Laws:
 - a. The Drugs Act 1976 and rules framed there under.
 - b. Provincial Drug Rules (Respective Drug Rules will be taught in the relevant province).
 - c. Advertisement rules.
 - d. Other Related rules and Legal aspects.

Recommended Texts

1. Hussain, R.Z., (2012). *The Manual of Drug Laws in Pakistan*. Lahore: Irfan Law Book House.
2. Government of Pakistan (1997) *Control of Narcotics Substances Act*. Islamabad: National Assembly

Suggested Readings

1. Government of Pakistan (1969). *Shop and Establishment Ordinance*. Islamabad: National Assembly
2. Government of Pakistan (1976). *The Pharmacy Act*. Islamabad: National Assembly

Pharmaceutical management and marketing course combines the study of basic and pharmaceutical sciences with marketing and management studies and that prepares individuals for careers in pharmaceutical sales, marketing, management, and related fields within the health care industry. Pharmacy Management and Business Methods takes foundational management theories and concepts and translates them to the specific challenges faced by today's pharmacy managers, regardless of the setting. This course will take an integrated didactic and active learning approach to tackle management issues faced by pharmacists such as personal resource management, personnel management, general operations management, special management skills, implementation of value-added services and management applications in various practice settings. This course is a graduate level course of Pharmaceutical management and marketing. This course will enable students how to manage different tasks, planning of objectives, how to manage long term and short term targets in pharmaceutical industry, marketing and retail setups, strategies to accomplish different goals and management of different tasks within a specific period of time.

Contents

1. Introduction of management and marketing
2. Principle of Management
3. Strategic Planning
4. Business Planning,
5. Organizational behavior
6. Human Resource management and Pharmacy

Recommended Texts

1. Desselle, S.P., P.D. Zgarrick & D.Se (2001). *Pharmacy Management: Essentials for all Practices settings*. New Delhi: McGraw Hills Professional.
2. McConnell, C.R., Brue, S.L., and Flynn, S.M (2009). *Economics: Principles, Problems and Policies*. New York: McGraw Hill, Inc.

Suggested Readings

1. Baye, M (2010). *Managerial Economics and Business Strategy*. Boston: McGraw Hill Inc.
2. Dogramatzis, D(2001). *Pharmaceutical Marketing: A Practical Guide*. New York: Informa Health Care.

PHRM-6180

Pharmaceutical Chemistry-IV A (Medicinal Chemistry)

3(3+0)

Medicinal chemistry is a discipline involved in the development, synthesis, and analysis of drugs and other bio-active agents. Medicinal chemistry draws from organic chemistry, biochemistry, pharmacology, and medicine. This course is a graduate level course of Medicinal Chemistry. Medicinal chemistry deals with the discovery, design, development and both pharmacological and analytical characterization of drug substances. Medicinal chemists are indispensable in the preclinical stages of drug development, and again as pharmaceutical chemists in drug quality control. Particular emphasis will be laid on the pharmaceutical substances that are specially found in the Official Compendia. It will also be involved to demonstrate an understanding of concepts such as drug metabolism, bioavailability and pharmacokinetics and the role of medicinal chemistry in improving these parameters. It will be helpful in relating the structure and physical properties of drugs to their pharmacological activity as well as describe the current challenges and opportunities in medicinal chemistry in light of contemporary developments in the field of drug discovery.

Contents

1. Introduction to medicinal chemistry:
2. Drug targets and drug designing
3. General properties, chemistry, biological action, structure activity relationship and the therapeutic applications

Recommended Texts

1. Burger A. *Medicinal Chemistry*. Hoboken: John Willey & Sons.
2. Block GH, Roche EB, Soine To, Wilson (1986). *Inorganic and Medicinal Pharmaceutical Chemistry*. Mumbai: Verghese Publishing House.

Suggested Readings

1. Block JH, Beale JM (2010). *Wilson and Gisvold's textbook of organic medicinal and Pharmaceutical Chemistry*. Philadelphia: Lippincott Williams & Wilkins.
2. Burger A (2003). *Medicinal Chemistry*. Hoboken: John Willey & Sons.
3. Foye WO (2008). *Principles of Medicinal Chemistry*. Mumbai: Verghese Publishing House.

Pharmaceutical technology is a collective term for technologies to develop candidate compounds that have either been discovered or created into commercial pharmaceutical products. It combines scientific aspects that are critical in the development and manufacture of new drugs, handling of medicines and medical devices. This course is designed to broaden the student's outlook to know about all processes and procedures to formulate the novel DDS by transforming chemical compounds with useful effects on the human body into high-quality dosage forms that can appropriately exhibit effects against disease. Pharmaceutical technology course has been broadly categorized into the following three functions. Process technology for researching synthetic methods to be used to manufacture candidate compounds efficiently and consistently in large amounts. Formulation technology for investigating dosage forms, formulations, and packages based on absorption stability, and usability in consideration of the characteristics of candidate compounds. Analytical and quality evaluation technology for establishing a variety of analytical and quality evaluation systems.

Contents

1. Novel GIT Drug Delivery System:
2. Drug Carrier System: Liposomes and Niosomes
3. Targeted Drug Delivery System: Active and Passive Drug Delivery System
4. Pharmaceutical Biotechnology:

Recommended Texts

1. Hellery, A.M., (2002). *Drug Delivery and Targeting*. London: Taylor & Francis.
2. Banker, G.S. and T.C.T. Rhodes, (2002). *Modern Pharmaceutics*. New York: Informa Health.

Suggested Readings

1. Allen, L.V., N.G. Popovich and H.C. Ansel, (2010). *Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems*. Philadelphia: Lippincott Williams & Wilkins.
2. Liu, D., (2008). *Water Insoluble Drug Formulations*. New York: CRC Press.
3. Ahuja, S. and S. Scypinski, (2010). *Handbook of Modern Pharmaceutical Analysis*. New York: Academic Press.

Advance Clinical Pharmacy provides a flexible study pathway that is designed to develop the therapeutic knowledge and clinical skills of pharmacists to an advanced level. The course is an amalgamation of our previous clinical pharmacy and community pharmacy courses and is open to pharmacists in all employment sectors. This course is an undergraduate-level of Advanced Clinical Pharmacy-II. This course aims to study the applications of Clinical pharmacy which is the branch of pharmacy in which pharmacists provide patient care that optimizes the use of medication and promote health, wellness, and disease prevention. The objective is promotion of human health through safe, efficacious and affordable pharmaceutical interventions. To provide pharmacy students with knowledge as well as technical and scientific skills for appropriate use of therapeutic substances. The end of this course the students will be able to describe the terminologies of various Disease, interpret the relationships between clinical pharmacy, pharmaceutical care and good pharmacy practice, recognize the importance of pharmacist in patient education and counseling about compliance, explain the role of pharmacist in treatment of poisoning and general management of poisoning & over dosage.

Contents

1. Pharmaceutical care, its scope, management and applications.
2. Clinical therapeutics: General Strategy:
3. Disease management: Unit VIII:
4. Clinical toxicology: 5. Safe intravenous therapy & hazards of i.v. therapy:
5. Non-Compliance:..

Recommended Texts

1. Hansten P, Horn J (2010). *Drug interactions Analysis and Management*. Philadelphia: Lippincott Williams & Wilkins.
2. Koda-Kimble *et al* (2005). *Applied Therapeutics: the Clinical use of Drugs*. Baltimore: Lippincott Williams & Wilkins.

Suggested Readings

1. Gennaro AR. Remington (2011). *The Science and Practice of Pharmacy*. Philadelphia: Lippincott Williams & Wilkins.
2. Gourley H (1992). *Clinical Pharmacy & Therapeutics*. Baltimore: William & Wilkins.
3. Greene RJ, Harris ND (2008). *Pathology and Therapeutics for Pharmacists*. London: Pharmaceutical Press.

This course is an undergraduate-level of Biopharmaceutics & Pharmacokinetics-I. This course aims to study the applications of scientific knowledge to legal problems and legal proceedings. The word "forensic" comes from the Latin word "forensis" pertaining to a forum. In ancient Rome the forum was a market place where people gathered, not just to buy things, but also to conduct all kinds of business, including that of public affairs. The meaning of "forensic" later came to be restricted to refer to the courts of law. Forensic pharmacy is the application of the sciences of drugs to legal issues. Forensic pharmacists engage in work relating to litigation, the regulatory process, and the criminal justice system. Forensic pharmacy overlaps with many other forensic fields. It helps systems for detecting drug abuse, or consult with a police department to teach officers how to better detect drug abuse in suspects. A forensic pharmacist might also offer his services to college sports teams, helping to detect drug use in players.

Contents

1. The Pharmacy Act 1967:
2. Control of Narcotics Substances Act 1997:
Laws relating to Narcotic drugs and psychotropic substances.
3. The Poisons Act 1919:
4. The Factories Act 1934:
5. Shops and Establishments Ordinance 1969 with Rules:
6. DRAP Act 2012:

Recommended Texts

1. Hussain, R.Z., (2012). *The Manual of Drug Laws in Pakistan*. Lahore: Irfan Law Book House.
2. Government of Pakistan (1997) *Control of Narcotics Substances Act*. Islamabad: National Assembly

Suggested Readings

1. Government of Pakistan (1969). *Shop and Establishment Ordinance*. Islamabad: National Assembly
2. Government of Pakistan (1976). *The Pharmacy Act*. Islamabad: National Assembly

Pharmaceutical management and marketing course combines the study of basic and pharmaceutical sciences with marketing and management studies and that prepares individuals for careers in pharmaceutical sales, marketing, management, and related fields within the health care industry. Pharmacy Management and Business Methods takes foundational management theories and concepts and translates them to the specific challenges faced by today's pharmacy managers, regardless of the setting. This course will take an integrated didactic and active learning approach to tackle management issues faced by pharmacists such as personal resource management, personnel management, general operations management, special management skills, implementation of value-added services and management applications in various practice settings. This course is a graduate level course of Pharmaceutical management and marketing. This course will enable students how to manage different tasks, planning of objectives, how to manage long term and short term targets in pharmaceutical industry, marketing and retail setups, strategies to accomplish different goals and management of different tasks within a specific period of time. The management of community pharmacy, retail pharmacy and risk management associated with all pharmacy business.

Contents

1. Introduction to marketing management
2. Marketing channels and Marketing mix strategy
3. Sales management
4. Organization of community pharmacy
5. Managing value added services
6. Managing risks in Pharmacy practice.
7. Preventing and managing medication errors: The pharmacist Role
8. Risks management technique
9. Emergency Risks in modern Pharmacy practice

Recommended Texts

1. Desselle, S.P., P.D. Zgarrick & D.Se (2001). *Pharmacy Management: Essentials for all Practices settings*. New Delhi: McGraw Hills Professional
2. McConnell, C.R., Brue, S.L., and Flynn, S.M (2009). *Economics: Principles, Problems and Policies* New York: McGraw Hill, Inc.

Suggested Readings

1. Baye, M (2010). *Managerial Economics and Business STRATEGY*. Boston: McGraw Hill Inc.
2. Dogramatzis, D (2001). *Pharmaceutical Marketing: A Practical Guide*. New York: Informa Health Care.

Medicinal chemistry is a discipline involved in the development, synthesis, and analysis of drugs and other bio-active agents. Medicinal chemistry draws from organic chemistry, biochemistry, pharmacology, and medicine. This course is a graduate level course of Medicinal Chemistry. Medicinal chemistry deals with the discovery, design, development and both pharmacological and analytical characterization of drug substances. Medicinal chemists are indispensable in the preclinical stages of drug development, and again as pharmaceutical chemists in drug quality control. Particular emphasis will be laid on the pharmaceutical substances that are specially found in the Official Compendia. It will also be involved to demonstrate an understanding of concepts such as drug metabolism, bioavailability and pharmacokinetics and the role of medicinal chemistry in improving these parameters. It will be helpful in relating the structure and physical properties of drugs to their pharmacological activity as well as describe the current challenges and opportunities in medicinal chemistry in light of contemporary developments in the field of drug discovery.

Contents

- 1- General Properties,
- 2- Chemistry,
- 3- Biological Action,
- 4- Structure Activity Relationship and therapeutic applications
- 5- Sulphonamides:
- 6- Antimalarials:

Recommended Texts

1. Burger A (2003). *Medicinal Chemistry*. Jhon Willey & Sons.
2. Block GH, Roche EB, Soine TO, Wilson (1986). *Inorganic and Medicinal Pharmaceutical Chemistry*. Verghese Publishing House.

Suggested Readings

1. Block JH, Beale JM (2010). *Wilson and Gisvold's textbook of organic medicinal and Pharmaceutical Chemistry*. Lippincott Williams & Wilkins.
2. Burger A (2003). *Medicinal Chemistry*. Jhon Willey & Sons.
3. Foye WO (2008). *Principles of Medicinal Chemistry*. Verghese Publishing House.



MPhil

PHARMACOLOGY



Advance General Pharmacology is a advance version of basic pharmacology which deals with the study of effects of chemical substances on function of living system. In general this subject explains what the drug does to the body and what the body does to the drug. Drug can be used to treat, prevent and cure of any disease. This course is designed to advance the student's knowledge of pharmacokinetics, pharmacodynamics, pharmacogenomics, and pharmacotherapeutics in the management of health and disease states. Major categories of pharmacological agents are examined in the context of the life span, culture, and health and disease states. This will give an understanding of the fundamental principles of Pharmacodynamics (i.e. drug receptor interactions) and pharmacokinetics (i.e. absorption, distribution, metabolism, and elimination of drugs). The major objective of Pharmacological sciences is the molecular understanding of signal transduction and signal transmission events that regulate and interfere with specific cell functions. M.Phil. Pharmacology introduces students to understand research skills and specialist knowledge and gives good basic training in laboratory work and animal handling. This course particularly provide necessary knowledge of basic principles of pharmacology.

Contents

1. General Pharmacology
2. General principals of pharmacology
3. Pharmacokinetics
4. Absorption
5. Distribution
6. Metabolism
7. excretion
8. Pharmacodynamics
9. Mechanism of action

Recommended Texts

1. Goodman Gillman (1996). *Pharmacological basis of Therapeutics*. New York: McGraw Hill Book Company.
2. Lippincott (2001). *Pharmacology*. New York: Lippincot William & Willkin.

Suggested Readings

1. J D Tripathy (2002). *Essential of Medical Pharmacology*. New Delhi: Japees Brother.
2. Katzung B.G. (2001). *Basic and Clinical Pharmacology* New York: McGraw-Hill Medical Publishers.

Chemotherapy works by stopping or slowing the growth of cancer cells, which grow and divide quickly. It can also harm healthy cells that divide quickly, such as those that line your mouth and intestines or cause your hair to grow. Advanced Chemotherapy course helps the students to study the effects of chemical substances on function of living system. In general this course will illustrate and explains what the drug does to the body and what the body does to the drug. The main objectives of this course are to give an understanding of the fundamental principles of Pharmacodynamics (i.e. drug receptor interactions) and pharmacokinetics (i.e. absorption, distribution, metabolism, and elimination of drugs). The major objective of advanced chemotherapy is to understand molecular effects of anti-microbial agents. It provides a comprehensive understanding of drugs which acts either to suppress growth of microbes or kill them. After completing this course students will be able to involved with the care of cancer patients at all phases of their treatment; from assessment and diagnosis, to treatment decisions, medication management, symptom management and supportive care, and finally with survivorship programs at the completion of their treatment.

Contents

1. Chemotherapeutic agents
2. Antibiotics
3. Mechanism of bacterial resistance
4. Anti-parasitic agents
5. Anti-cancer agents
6. Anti-mycobacterial drugs
7. Bacterial resistance
8. Miss use of anti-biotics

Recommended Texts

1. Goodman Gillman (1996). *Pharmacological basis of Therapeutics*. New York: McGraw-Hill Book Company.
2. Lippincott (2001). *Pharmacology*. New York: Lippincot William & Willkin

Suggested Readings

1. J D Tripathy (2000). *Essential of Medical Pharmacology*, New Delhi: Japees Brother.
2. Katzung B G (2001). *Basic and Clinical Pharmacology*. New York: McGraw-Hill Medical Publishers.

Immunopharmacology is defined as that part of pharmacology that deals with drugs acting on the immune system and, in addition, with the pharmacological actions of substances derived from the immune system. Drug can be used to treat, prevent and cure of any disease. Moreover this course will give an understanding of the fundamental principles of Pharmacodynamics (i.e. drug receptor interactions) and pharmacokinetics (i.e. absorption, distribution, metabolism, and elimination of drugs). The major objective of advanced immunopharmacology is to develop understanding of M.Phil. Pharmacology students in drug action of immune system. It provides a comprehensive understanding of how drugs alter immune system and immune related disease. This course further aims to produce to enable the students to design new lead molecules to treat immunological diseases. After completing this course our pharmacist will be able to involved with the care patients at all phases of their treatment; from assessment and diagnosis, to treatment decisions, medication management, symptom management and supportive care, and finally with survivorship programs at the completion of their treatment.

Contents

1. Transcription and translation of gene
2. Autacoids
3. Pharmacology of rheumatoid disease
4. Toxicology
5. Immunosuppressant's
6. Anti-viral drugs
7. Anti-fungal drugs

Recommended Texts

1. Goodman Gillman (1996). *Pharmacological Basis of Therapeutics*. New York: New York: McGrawHill Book Company.
2. Lippincott (2001). *Pharmacology*, New York: Lippincot William & Willkin.

Suggested Readings

1. Lippincott (2001), *Pharmacology*. USA: Lippincot William & Willkin.
2. J D Tripathy (2000), *Essential of Medical Pharmacology*. New Delhi: Japees Brother.
3. Katzung B G. (2008), *Basic and Clinical Pharmacology*. New York: McGraw-Hill.

PHRM-7105**Research methodology****3(3+0)**

Research methodology is the specific procedures or techniques used to identify, select, process, and analyze information about a topic. In a research paper, the methodology section allows the reader to critically evaluate a study's overall validity and reliability. The major objective of Research Methodology in Pharmacological is to understand a number of research methods useful for academic and professional investigations in experimental design. Research methods in pharmacology mainly focused on pharmacokinetics and pharmacodynamics which deals with the absorption, distribution, biotransformation and excretion of the drugs and its metabolites from the body, along with the biochemical and physiological effect of the drug as well as its mechanism of action respectively. This course will aims to focus on both areas and will enable the students to design new experiments after clear understanding of previous data to find lead molecules in pharmacology. This course offers an overview of the different approaches, considerations and challenges involved in experimental research in Pharmacology. In addition to reviewing core human research methods such a interview, ethnographies, surveys and experiments. This course particularly provide necessary knowledge for students who are key personals of drug development.

Contents

1. Source of literature
2. Literature survey
3. Writing techniques
4. Data analysis using statistical techniques
5. Understand research articles
6. Peer review journals

Recommended Texts

1. Goodman Gillman (1996). *Pharmacological Basis of Therapeutics*. New York: McGrawHill Book Company.
2. Lippincott (2001). *Pharmacology*, New York: Lippincot William & Willkin..

Suggested Readings

1. Lippincott (2001), *Pharmacology*, New York: Lippincot William & Willkin..
2. J D Tripathy (2004), *Essential of Medical Pharmacology*, New Delhi: Japees Brother.
3. Katzung B G (2001), *Basic and Clinical Pharmacology*, New York: McGraw-Hill Medical Publishers.

Pharmacology is branch of medical science that deals with the study of effects of chemical substances on function of living system. In general this subject explains what the drug does to the body and what the body does to the drug. Drug can be used to treat, prevent and cure of any disease. The main objectives of this course are to give an understanding of the fundamental principles of Pharmacodynamics (i.e. drug receptor interactions) and pharmacokinetics (i.e. absorption, distribution, metabolism, and elimination of drugs). Applied Pharmacology provides the essential details that are required for a solid understanding of pharmacology: how the drugs work, why side effects occur, and how the drugs are used clinically. The major objective of Advanced applied pharmacology is to develop understanding in application of pharmacology particularly molecular mechanism of drugs acting on autonomic nervous system. It provides a comprehensive understanding of techniques and a thorough knowledge in development of drugs to treat nervous and other systems of body. This course further aims to enable the students to design new lead molecules to treat cardiovascular and nervous system.

Contents

1. Autonomic nervous system
2. Cholinergic and anti-cholinergic effects of drugs
3. Adrenergic and anti-adrenergic effects
4. Anti-anginal drugs
5. Anti-arrhythmic drugs
6. Diuretics

Recommended Texts

1. Goodman Gillman (1996). *Pharmacological Basis of Therapeutics*. New York: McGraw-Hill Book Company.
2. Lippincott (2001). *Pharmacology*, New York: Lippincot William & Willkin..

Suggested Readings

1. J D Tripathy (2004), *Essential of Medical Pharmacology*, New Delhi: Japees Brother.
2. Katzung B G (2001), *Basic and Clinical Pharmacology*, New York: McGraw-Hill Medical Publishers.

Advanced Biochemical & immunological is a very important branch of the medical and biological sciences. The immune system protects us from infection through various lines of defense. If the immune system is not functioning as it should, it can result in disease, such as autoimmunity, allergy and cancer. Moreover focusing how cells work at molecular level. Biochemistry, and the related field of molecular biology are important in understanding the molecular basis of life and its role in the disease process. Immunology is the study of how the body defends itself against disease. Immunological disorders are diseases or conditions caused by a dysfunction of the immune system and include allergy, asthma, autoimmune diseases, auto inflammatory syndromes and immunological deficiency syndromes will also be the part of the course. The major objective of Advanced Biochemical & immunological techniques in Pharmacological sciences is to develop understanding of students to various immunological and biochemical techniques. It provides a comprehensive understanding of techniques like PCR, Elisa and other impotent techniques for diagnosis of various diseases.

Contents

1. Bioassay of drugs
2. Separation purification and characterization of proteins
3. Study of drug metabolism and related enzymes
4. Determination of blood sugar lipid profile
5. Anti-ulcer genic evaluation
6. Anti-microbial assays

Recommended Texts

1. Goodman Gillman (1996). *Pharmacological Basis of Therapeutics*. New York: McGraw-Hill Book Company.
2. Lippincott (2001). *Pharmacology*, New York: Lippincot William & Willkin.

Suggested Readings

1. Lippincott (2001). *Pharmacology*, New York: Lippincot William & Willkin.
2. J D Tripathy (2000). *Essential of Medical Pharmacology*, New Delhi: Japees Brother.
3. Katzung B G (2001). *Basic and Clinical Pharmacology*, New York: McGraw-Hill Medical Publishers.

Neuropharmacology is the study of how drugs affect cellular function in the nervous system, and the neural mechanisms through which they influence behavior. There are two main branches of neuropharmacology: behavioral and molecular. Moreover it also focus on neurons and their neurochemical interactions, with the overall goal of developing drugs that have beneficial effects on neurological function. Both of these fields are closely connected, since both are concerned with the interactions of neurotransmitters, neuropeptides, neuro hormones, neuromodulators, enzymes, second messengers, co-transporters, ion channels, and receptor proteins in the central and peripheral nervous systems. Studying these interactions, researchers are developing drugs to treat many different neurological disorders, including pain, neurodegenerative diseases such as Parkinson's disease and Alzheimer's disease, psychological disorders, addiction. The major objective of advanced neuropharmacology in Pharmacological sciences is the molecular understanding of signal transduction and signal transmission events that regulate and interfere with specific cell and neuronal functions. It provides a comprehensive understanding of techniques used to identify drugs acting on nervous system. This course further aims to produce to enable the students to design new lead molecules to treat nervous diseases. Students will learn how drugs affect the brain and nervous system through experiments and clinical trials. They may find how to prevent and/or treat dysfunctions, and standardize dosing for mass distribution. They frequently guide teams of technicians or students.

Contents

1. Drugs acting on CNS
2. Anxiolytics
3. Anti-depressants
4. Anti-psychotics
5. Pharmacology of opioids
6. Drugs acting on Parkinson's diseases
7. Local anesthetics
8. Analgesics drugs

Recommended Texts

1. Goodman Gillman (1996). *Pharmacological Basis of Therapeutics*. New York: McGrawHill Book Company.
2. Lippincott (2001). *Pharmacology*. New York: Lippincot William & Willkin..

Suggested Readings

1. Lippincott (2001). *Pharmacology*, New York: Lippincot William & Willkin..
2. J D Tripathy (2007). *Essential of Medical Pharmacology*, New Delhi: Japees Brother.
3. Katzung B G (2001), *Basic and Clinical Pharmacology*, New York: McGraw-Hill Medical Publishers.

Biostatistics a branch of science that deal with statistical processes and methods applied to the collection, analysis, and interpretation of biological data and especially data relating to human biology, health, and medicine. In essence, the goal of biostatistics is to disentangle the data received and make valid inferences that can be used to solve problems in public health. Biostatistics uses the application of statistical methods to conduct research in the areas of biology, public health, and medicine. It encompasses the design of biological experiments, the collection and analysis of data from those experiments and the interpretation of the results. The major objective to teach biostatics in Pharmacological sciences is developing basic understanding on how to apply statistical methods on different experimental results. It provides a comprehensive understanding of techniques use to apply different statistical methods in designing of experiments. After completion of course students encompasses the methodology and theory of statistics as applied to problems in the life and health sciences. They will be trained in the skilled application of statistical methods to the solution of problems encountered in public health and medicine..

.Contents

1. Definition of biostatistics
2. Application of statistics
3. Presentation and tabulation of data
4. Basic principles of experimental design
5. Types of design
6. Student t test
7. ANOVA test
8. Chi square test

Recommended Texts

1. Danfel W.W (1983). *Biostatics Foundation for Analysis in Health.*
2. Nilton J.S & Tsoko J. (1983). *Statistical Methods In Biological And Health Science*

Suggested Readings

1. Danfel W.W (1983). *Biostatics Foundation for Nalysis In Health*
2. Nilton J.S & Tsoko J. (1983). *Statistical Methods In Biological And Health Science*



MPhil

PHARMACEUTICS



Advanced Pharmaceutics is focus on the basic principles and developmental aspects of drug formulation to deliver the active pharmaceutical ingredient through biological membranes to exert the therapeutic effect at site of action. Understanding of active pharmaceutical ingredient and additive or excipients physico-chemical properties at the molecular and macroscopic assembly level are manifest in dosage form properties and performance. The objective of this course is to introduce the students to the discovery, development and production of pharmaceutical dosage forms. It includes fundamentals of preparing dosage forms and demonstrates the application of engineering fundamentals to large scale production of dosage forms. It elaborates principles of drug absorption, drug stabilities issues, principles of sterilization and good manufacturing practices. It also introduce the students to noval drug delivery system which is target specific. The aim of advanced pharmaceutical course is to develop complete professional technologists for active pharmaceutical ingredients (API) and excipients. It provides basic knowledge of pharmaceutical formulations and their different quality control testing and ultimate effects on target. Students will integrate these principles to understand issues in the rational choice of dosage forms and drug delivery systems as well as their role in drug product development.

Contents

1. Surfactants and their application in pharmaceutical dosage forms.
2. Specialized pharmaceutical emulsions.
3. Noval drug delivery system: Liposomes and Niosomes as drug carriers.
4. Micro encapsulation/Methods of particles coating and analysis.
5. Cosmetics and their quality control.
6. Transdermal drug delivery system
7. Stabilities studies of pharmaceuticals.

Recommended Texts

1. Pharmaceutics (2007). *The science of dosage form design*. New York: M.E. Aulton editor.
2. Remington (2005). *The science and practice of pharmacy*.

Suggested Readings

1. Allen, L.V., N.G. Popovich and H.C. Ansel, (2010). *Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems*. New York: Lippincott Williams & Wilkins.
2. Liu, D., (2008). *Water Insoluble Drug Formulations*. New York: CRC Press.
3. Ahuja, S. and S. Scypinski, (2010). *Handbook of Modern Pharmaceutical Analysis*. New York: Academic Press.

Pharmaceutical Microbiology can be defined as the study of microorganisms that are pertinent to the production of antibiotics, enzymes, vitamins, vaccines, and other pharmaceutical products, it also incorporates the study of microorganisms that cause pharmaceutical contaminations, and degradation, deterioration and spoil of pharmaceutical raw. The most important contribution of microbiology to the pharmaceutical industry is the development of antibiotics. The production of vaccines against bacterial diseases usually requires the growth of large amounts of bacteria. Moreover vaccines are also a very important contribution of microbiology towards development of drugs. The production of vaccines against bacterial diseases usually requires the growth of large amounts of bacteria. This post graduate level course provides knowledge and understanding with regards to the significance of the presence of bacteria, yeasts, moulds, viruses and toxins in pharmaceutical raw materials, intermediates, products and advanced techniques for biotechnological products. After completing this course our students work synergistically with microbiologists to ensure that drug therapies target the opportunistic microbes without harming its human host. Microbiology plays a significant role in medical devices, such as fluorescent fusion, which are used for fast and precise detection of pathogens in tissue samples.

Contents

1. Microbial Enzymes: Classification and Mechanism of Action, Commercial Production of microbial enzymes and their application, Immobilized Enzymes.
2. General Principles and Methods of Microbiological assays.
3. Microbial spoilage and preservation of pharmaceutical products.
4. Fundamentals of Genetic Engineering and its application in Medicine.
5. Principles, synthesis and applications of Monoclonal antibodies.

Recommended Texts

1. Hugo & A D Russell (2004). *Pharmaceutical Microbiology*. London: Black Well Science Ltd.
2. Alcamo (2004). *Introduction to Microbiology*. London: John Bartlett Publishers.

Suggested Readings

1. Jawetiz, (1988) *Medical Microbiology and Immunology*. London: Churchill Livingstone.
2. Collin and Lynes, (1995). *Microbiological Methods*. Oxford: Vutterworth Heineman.
3. M Mekallee (2007), *Microbiology Essentials and Application* New York: McGraw-Hill Inc..

Clinical pharmacy provides the knowledge of direct patient care that optimizes the use of medication and promotes health, wellness and disease prevention. The clinical pharmacist plays a crucial role in different health care setups by evaluating and revising the medicines, medication history, dispensing errors, administration errors, analyzing drug interactions, pointing out the adverse drug reactions, exhorting individualization of dosage regimen. Clinical pharmacists are primary source of scientifically valid information and advice regarding safe, appropriate and cost effective use of medications. It provides the knowledge of different diseases, their mechanisms and their therapeutics treatments. This subject is helpful to understand or identify drug interactions, dose individualization according to different patient oriented parameters. It provides monitoring of different body disorders and their dose calculations. It also evaluate the appropriateness and effectiveness of patient's medications and also recognizes untreated health problems that could be improved or resolved with appropriate medication therapy. Our students work within the health care system as experts in the therapeutic use of medications. They will routinely provide medication therapy evaluations and recommendations to patients and other health care professionals.

Contents

1. General
 - Drug interactions, Adverse drug reactions and adverse drug reactions reporting.
 - Pharmacokinetics and pharmacokinetics variabilities.
 - Individualization and optimization of drug dosage regimen.
2. Therapeutic and monitoring
 - Hepatic disorder, Renal disorders, Respiratory disorders, Thoracic disorders, Narcotic control, Chemical hazards, Industrial pollution, Pesticides /insecticides, Family welfare
3. Clinical records:
 - Documentation and development of SOPs (case studies with reference to clinical work)
4. Clinical trials of drug substances:
 - Designing of clinical trial, types of trails, choice of patients etc.

Recommended Texts

1. Roger Walker 2016). *Clinical Pharmacy and Therapeutics*. London: Elsevier.
2. Dr. A. V. Yadav (2009). *Hand Book of Clinical Pharmacy*. Pune: Nirali Prakashan

Suggested Readings

1. Gennaro AR. Remington (2011). *The Science and Practice of Pharmacy*. Philadelphia: Lippincott Williams & Wilkins.
2. Gourley H (1992). *Clinical Pharmacy & Therapeutics*. William& Willkins.
3. Greene RJ, Harris ND (2008). *Pathology and Therapeutics for Pharmacists*. London: Pharmaceutical Press.

PHRM-7205

Pharmaceutical Marketing

3(3+0)

Pharmaceutical Marketing concerns with understanding the basic marketing functions necessary to be performed for the achievement of organizational objectives by a Pharmacist particularly at a managerial position. Its study enables students to make an optimum marketing mix for targeting, positioning a pharmaceutical product in the different types of market after considering environmental factors. Its study enables students to make branding decision (How to name brands) and maintaining and extending product life cycle competitively. Students will be able to design and execute different types of advertisements and promotional mix with an understanding of various media for pharmaceutical products. Designing an effective sales force and conducting a target oriented salesmanship/Detailing by building a successful profitable relationship with physicians. Students will be able to select optimum distribution/marketing channels according to the nature of pharmaceutical products and setting a competitive price. The subject also gives student an insight of pharmaceutical business at the retail pharmacy level.

Contents

1. Modern marketing
2. Product planning and development
3. Promotion management
4. Personnel management,
5. Pharmacy layout design,

Recommended Texts

1. Kotler P, Clarke RN (1987). *Marketing for Health Care Organizations*. NJ: Prentice Hall.
2. Lidstone J, MacLennan J (1999). *Marketing planning for the pharmaceutical industry*. Farnham: Gower Pub Co.

Suggested Readings

1. Ahmad M, Bukhari NI(2001). *Pharmaceutical Management and Marketing*. Lahore: Tariq Academy.
2. Patrick TC, Pedro LJ (1979). *Pharmacy Management for students and practitioners*. Maryland Heights: Mosby Publishers.

Pharmaceutical Technology is an important course in the discipline of pharmacy that deals with the process of turning a new chemical entity (NCE) or old drugs into a medication to be used safely and effectively by patients. There are many chemicals with pharmacological properties, but need special measures to help them achieve therapeutically relevant amounts at their sites of action. It helps relate the formulation of drugs to their delivery and disposition in the body. Deals with the formulation of a pure drug substance into a dosage form. Branches of pharmaceutics include: Pharmaceutical formulation, Pharmaceutical manufacturing, Dispensing pharmacy, Pharmaceutical technology, Physical pharmacy, Pharmaceutical jurisprudence. The objective of this course is to introduce the students to the discovery, development and production of pharmaceutical dosage forms. It includes fundamentals of preparing dosage forms and demonstrates the application of engineering fundamentals to large scale production of dosage forms. It elaborates principles of drug absorption, drug stabilities issues, principles of sterilization and good manufacturing practices. It also introduce the students to noval drug delivery system which is target specific. The aim of advanced pharmaceutical course is to develop complete professional technologists for active pharmaceutical ingredients (API) and excipients. It provides basic knowledge of pharmaceutical formulations and their different quality control testing and ultimate effects on target.

Contents

1. Biotechnological aspect of product development. Concepts and techniques
2. Radiopharmaceutical formulation techniques, Q.C. instrumentation and application in healthcare system
3. Granulation technology
4. Quality control and GMP compliance in pharmaceutical industry. Importance of design/layout of pharmaceutical industry
5. Safety test in pharmaceutical preparations
6. Sustained release formulation.

Recommended Texts

1. Hellery, A.M., (2002). *Drug Delivery and Targeting*. London: Taylor & Francis.
2. Banker, G.S. and T.C.T. Rhodes, (2002). *Modern Pharmaceutics*. New York: Informa Health Care.

Suggested Readings

1. Allen, L.V., N.G. Popovich and H.C. Ansel, (2010). *Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems*. New York: Lippincott Williams & Wilkins.
2. Liu, D., (2008). *Water Insoluble Drug Formulations*. New York: CRC Press.
3. Ahuja, S. and S. Scypinski, (2010). *Handbook of Modern Pharmaceutical Analysis*. New York: Academic Press.

Clinical pharmacy provides the knowledge of direct patient care that optimizes the use of medication and promotes health, wellness and disease prevention. The clinical pharmacist plays a crucial role in different health care setups by evaluating and revising the medicines, medication history, dispensing errors, administration errors, analyzing drug interactions, pointing out the adverse drug reactions, exhorting individualization of dosage regimen. Clinical pharmacists are primary source of scientifically valid information and advice regarding safe, appropriate and cost effective use of medications. It provides the knowledge of different diseases, their mechanisms and their therapeutics treatments. This subject is helpful to understand or identify drug interactions, dose individualization according to different patient oriented parameters. It provides monitoring of different body disorders and their dose calculations. It also evaluate the appropriateness and effectiveness of patient's medications and also recognizes untreated health problems that could be improved or resolved with appropriate medication therapy. Our students work within the health care system as experts in the therapeutic use of medications. They will routinely provide medication therapy evaluations and recommendations to patients and other health care professionals.

Contents

1. Patient care Inpatient care, Ambulatory patient care, Managed care, Pharmacodynamics, Neonatal, Pediatrics and Geriatrics
2. Total parenteral nutrition, Preparation quality control calculations. Techniques, Dispensing of sterile products, Posology, Patient rehabilitation
3. Therapeutic and Monitoring
4. Cardiovascular disorders
5. Infectious diseases
6. Toxicology
7. Skin disorders
8. Hormonal disorders
9. CNS
10. ANS
11. AIDS
12. Bloods and etc.

Recommended Texts

1. Roger Walker (2018). *Clinical Pharmacy and Therapeutics*. Philadelphia: William & Wilkins.
2. Greene RJ, Harris ND (2008). *Pathology and Therapeutics for Pharmacists*. London: Pharmaceutical Press.

Suggested Readings

1. Gennaro AR. Remington (2011). *The Science and Practice of Pharmacy*. Philadelphia: Lippincott Williams & Wilkins.
2. Gourley H (1990). *Clinical Pharmacy & Therapeutics*. Philadelphia: William & Wilkins.

PHRM-7209

Biostatistics

3(3+0)

Biostatistics a branch of science that deal with statistical processes and methods applied to the collection, analysis, and interpretation of biological data and especially data relating to human biology, health, and medicine. In essence, the goal of biostatistics is to disentangle the data received and make valid inferences that can be used to solve problems in public health. Biostatistics uses the application of statistical methods to conduct research in the areas of biology, public health, and medicine. It encompasses the design of biological experiments, the collection and analysis of data from those experiments and the interpretation of the results. The major objective to teach biostatics in Pharmacological sciences is developing basic understanding on how to apply statistical methods on different experimental results. It provides a comprehensive understanding of techniques use to apply different statistical methods in designing of experiments. After completion of course students encompasses the methodology and theory of statistics as applied to problems in the life and health sciences. They will be trained in the skilled application of statistical methods to the solution of problems encountered in public health and medicine.

Contents

1. Definition of biostatistics
2. Application of statistics
3. Presentation and tabulation of data
4. Basic principles of experimental design
5. Types of design
6. Student t test
7. ANOVA test
8. Chi square test

Recommended Texts

1. Danfel W.W (1983). *Biostatics Foundation for Analysis in Health*.
2. Nilton J.S & Tsoko J. (1983). *Statistical Methods in Biological and Health Science*

Suggested Readings

1. Danfel W.W (1983). *Biostatics Foundation for Analysis in health*
2. Nilton J.S & Tsoko J. (1983). *Statistical Methods in Biological and Health Science*

PHRM-7210**Research Methodology****2(2+0)**

This course is designed to broaden the student's outlook to know about all Processes and procedures to formulate the novel DDS by transforming chemical compounds with useful effects on the human body into high-quality dosage forms that can appropriately exhibit effects against disease. Pharmaceutical technology course has been broadly categorized into the following three functions. Process technology for researching synthetic methods to be used to manufacture candidate compounds efficiently and consistently in large amounts. Formulation technology for investigating dosage forms, formulations, and packages based on absorption stability, and usability in consideration of the characteristics of candidate compounds. Analytical and quality evaluation technology for establishing a variety of analytical and quality evaluation systems. The major objective of Research Methodology is to develop understanding of students that how to design experiments after getting a quick review of literature. This course further aims to produce to enable the students to design new experiments after clear understanding of previous data to find lead molecules in pharmacology. This course particularly provide necessary knowledge for students who are key personals of drug development.

Contents

1. Source of literature
2. Literature survey
3. Writing techniques
4. Data analysis using statistical techniques
5. Understand research articles
6. Peer review journals

Recommended Texts

1. Hellery, A.M., (2002). *Drug Delivery and Targeting*. London: Taylor & Francis.
2. Banker, G.S. and T.C.T. Rhodes, (2002). *Modern Pharmaceutics*. New York: Informa Health Care.

Suggested Readings

1. Allen, L.V., N.G. Popovich and H.C. Ansel, (2010). *Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems*. New York: Lippincott Williams & Wilkins.
2. Liu, D., 2008. *Water Insoluble Drug Formulations*. New York: CRC Press.
3. Ahuja, S. and S. Scypinski, (2010). *Handbook of Modern Pharmaceutical Analysis*. New York: Academic Press.



MPhil
PHARMACY
PRACTICE

PHRM-7301

Public Health Pharmacy

3(3+0)

Public health as the science and art of preventing disease, prolonging life and improving quality of life through organized efforts and informed choices of society, organizations, public and private, communities and individuals. Analyzing the determinants of health of a population and the threats it faces is the basis for public health. The public can be as small as a handful of people or as large as a village or an entire city; in the case of a pandemic it may encompass several continents. The concept of health takes into account physical, psychological, and social well-being. As such, according to the World Health Organization, it is not merely the absence of disease or infirmity and more recently, a resource for everyday living. Public health is an interdisciplinary field. Public health Pharmacy is the science of protecting and improving the health of people and their communities. Public Health Pharmacy course is important in preventing health issues among community. After completion of this course students will be able to detect health issues as early as possible and responds appropriately to avoid the development of disease. Promoting healthy lifestyles, researching disease and injury prevention, and detecting, preventing and responding to infectious diseases.

Contents

1. Health Care
2. Medical Sociology: Health, illness and Healing
3. Introduction to public health pharmacy
4. Fundamentals to Healthcare System
5. Public Health Policy
6. Diseases Prevention and Health Promotion
7. Health technology Assessment
8. Community Pharmacy and public health practice
9. Ethical issues in public health
10. Public health law

Recommended Texts

1. P Rovers JP, Currie JD (2007). *A Practical Guide to Pharmaceutical Care - A clinical skills primer*. American Pharmacists association (www.pharmacists.com)
2. John Sexton, Gareth Nickless and Chris Green (2006). *Pharmaceutical Care Made easy*. London: Pharmaceutical Press.

Suggested Readings

1. A.J Winfield and R.M.E (2004). *Pharmaceutical Practice*. London: Churchill Levingstone.
2. Martin Stephen (2003). *Hospital Pharmacy*. London: Pharmaceutical Press.

PHRM-7302

Pharmacoepidemiology and Pharmacovigilance

3(3+0)

Pharmacoepidemiology is the study of the uses and effects of drugs in well-defined populations. It borrows from both pharmacology and epidemiology. Thus, pharmacoepidemiology is the bridge between both pharmacology and epidemiology. It is the study of the distribution and determinants of diseases and other health states in populations. Descriptive and Analytic epidemiology describes disease and/or exposure and may consist of calculating rates. Whereas in analytical includes observational studies, such as case-control and cohort studies, and experimental studies which include clinical trials or randomized clinical trials. The analytic studies compare an exposed group with a control group and usually designed as hypothesis testing by studies. This course gives an assessment of uses as well as risks that arise from the use of drugs. Pharmacovigilance and Pharmacoepidemiology together play an influential part in minimizing the adverse reactions and ensure the safety and efficacy of drugs. Students will be well-informed after completion, to work in all areas related to the assessment of drug safety and the management of risks and benefits of medications, including vaccines.

Contents

1. Pharmacoepidemiology:
2. Pharmacovigilance
3. Personalized/ individualized medicine Pharmacogenetics:
4. Multidisciplinary working (MDW) and multidisciplinary learning (MDL)

Recommended Texts

1. Nick Barber and Alan Wilson (2007). *Clinical Pharmacy*. London: Churchill Livingstone.
2. Guard Paul (2000). *A Behavioral Approach to Pharmacy Practice*. New York: Black Well.

Suggested Readings

1. R. Walker and C. Edward (2002). *Clinical Pharmacy and Therapeutics*. London: churchill livingstone
2. Robert J Cipolie, Linda M strand, Peter C (1998). *Pharmaceutical Care Practice*. New York: McGraw Hill.

Social and Administrative Pharmacy program is tailored carefully to the specific needs and objectives. It is a flexible, interdisciplinary program which utilizes all resources. The widespread use and dependency on drugs and drug products in today's society, coupled with an increased utilization and application of pharmaceutical services, has created a need for individuals who can study the social, psychosocial, political, legal, historic, and economic factors that impinge upon the use, non-use and abuse of drugs. Social & Administrative Pharmacy course will focus on the scientific and humanistic bases for understanding and influencing interactions involving patients, medicines, caregivers, and health care systems. After completing this course students will be able to work in government departments of health, pharmaceutical companies, professional societies, chain pharmacies, wholesalers or with private healthcare providers such as health maintenance organizations. Others work as researchers in social pharmacy, academic administrators or consultants in various fields of health care.

Contents

1. Introduction to Social Pharmacy & administrative pharmacy
2. Pharmaceutical Care Practice
3. Interpersonal and Interprofessional Communication in PC
4. Patient centeredness in Pharmaceutical care
5. Patient centered approach to Medication Management
6. Community/ Ambulatory Care Pharmacy Practice
7. Ethics in Pharmacy Practice

Recommended Texts

1. Robert J. Linda S. Peter M (2012). *Pharmaceutical care practice*. The patient centered to Medication Management. New York: McGraw-Hill Companies.
2. Yi-Yang. Donna WS (2011). *Understanding Pharmacoepidemiology*. New York: McGraw-Hill Companies..

Suggested Readings

1. Lyn R. Janice MM, (2007). *User Guide to Qualitative methods*. NY: Sage Publication, Inc.
2. Neuman WL (2006). *Social Research Methods Quantitative and Qualitative Approaches*. NJ: Pearson Education, Inc.

Clinical pharmacy provides the knowledge of direct patient care that optimizes the use of medication and promotes health, wellness and disease prevention. The clinical pharmacist plays a crucial role in different health care setups by evaluating and revising the medicines, medication history, dispensing errors, administration errors, analyzing drug interactions, pointing out the adverse drug reactions, exhorting individualization of dosage regimen. Clinical pharmacists are primary source of scientifically valid information and advice regarding safe, appropriate and cost effective use of medications. It provides the knowledge of different diseases, their mechanisms and their therapeutics treatments. This subject is helpful to understand or identify drug interactions, dose individualization according to different patient oriented parameters. It provides monitoring of different body disorders and their dose calculations. It also evaluate the appropriateness and effectiveness of patient's medications and also recognizes untreated health problems that could be improved or resolved with appropriate medication therapy. Our students work within the health care system as experts in the therapeutic use of medications. They will routinely provide medication therapy evaluations and recommendations to patients and other health care professionals. Clinical pharmacy is a health science discipline in which pharmacists provide patient care that optimizes medication therapy and promotes health, and disease prevention. In Clinical Pharmacy I, our students will get expertise in the therapeutic use of medications, medication therapy evaluations and recommendations to patients and other health care professionals.

Contents

1. Clinical Pharmacy Practice: Origin and history, definitions, concept, philosophy, choices, prescribing, evidence based practice.
2. Pharmaceutical Care Plan (PCP): Development, implementation and monitoring of PC plan.
3. Interpreting Laboratory Data: Main principle for adequate interpretation of laboratory data interpretation parameters.
4. Acquiring and Apply the knowledge and clinical skills required to manage drug therapy.
5. Medication Errors: Common terminology, Adverse medical events related to medications, drug use process, types of medication errors, systems failures leading to adverse drug events.
6. Development of Therapeutic Guidelines.

Recommended Texts

1. DiPiro JT (2003). *Encyclopedia of Clinical Pharmacy*. New York: Marcel Dekker Publishing.
2. Rantucci MJ (2006). *Pharmacists Talking with Patients*: a guide to patient counseling. London: Lippincott Williams & Wilkins.
3. Smith GDG, Aronson JK (1990), *Oxford Text Book of Clinical Pharmacology and Drug Therapy*, Oxford University Press, UK.

Suggested Readings

1. Rosenbuun D, Dresser M (2001). *Clinical Research Coordinator Book*. North Carolina: Garrison Inc.
2. Cook S (2004). *Clinical Studies Management*, a Practical Guide to Success, sue Harwood West Sussex: Publishing Limited

Clinical pharmacokinetics is the discipline that describes the absorption, distribution, metabolism, and elimination of drugs in patients requiring drug therapy. Pharmacokinetics, sometimes described as what the body does to a drug, refers to the movement of drug into, through, and out of the body the time course of its absorption, bioavailability, distribution, metabolism, and excretion. Drug pharmacokinetics determines the onset, duration, and intensity of a drug's effect. Both pharmacokinetics (ADME) and pharmacodynamics are important in determining the effect that a drug regimen is likely to produce. ... Drug metabolism lowers the serum concentration over time, resulting in drug concentrations lower than needed for clinical effect without repeated dosing. In this course students will learn the important concepts of pharmacokinetics, such as the biologic half-life, clearance, and bioavailability of drugs, can be utilized to describe and predict the time course of drug concentrations in plasma as a function of dose and frequency of drug administration. Within the pharmaceutical care process, pharmacists' clinical functions include appropriate and cost-conscious therapeutic drug monitoring and provision of clinical pharmacokinetic assessments.

Contents:

1. Individualization of dosage regimen especially in pediatrics, women health, geriatrics and compromised vital organs
2. Design of dosage regimen
3. Therapeutic drug monitoring
4. Determination of dose
5. Effect of changing dose and dosing interval on pharmacokinetic parameters
6. Determination of dosing frequency
7. Determination of dose and dosage interval
8. Determination of route of administration
9. Dosing of drugs in infants and children, elderly people, obese patients
10. Inhibition and induction of drug absorption, metabolism and biliary excretion
11. Effect of food on drug disposition
12. Population and regional pharmacokinetics
13. Dose adjustment in renal and hepatic disease

Recommended Texts

1. Sharma A Jusko WJ (2003). *Characteristics of Indirect Pharmacodynamic Models and Applications to Clinical Drug Responses*. UK: Skies Publishers.
2. Gustafsson LL, Wikner O alvan G, et al (1983). *Disposition of Chloroquine in man after single intravenous and oral doses*. UK: Skies Publishers

Suggested Readings

1. Thomson AH, Way S, Bryson SM (1988), *Population Pharmacokinetics of Gentamicin in Neonate* UK: Skies Publishers.
2. Holford NHG A (1996). *Size Standard for Pharmacokinetics*. New York: Informa Press, Netherland.

Clinical pharmacy provides the knowledge of direct patient care that optimizes the use of medication and promotes health, wellness and disease prevention. The clinical pharmacist plays a crucial role in different health care setups by evaluating and revising the medicines, medication history, dispensing errors, administration errors, analyzing drug interactions, pointing out the adverse drug reactions, exhorting individualization of dosage regimen. Clinical pharmacists are primary source of scientifically valid information and advice regarding safe, appropriate and cost effective use of medications. It provides the knowledge of different diseases, their mechanisms and their therapeutics treatments. This subject is helpful to understand or identify drug interactions, dose individualization according to different patient oriented parameters. It provides monitoring of different body disorders and their dose calculations. It also evaluate the appropriateness and effectiveness of patient's medications and also recognizes untreated health problems that could be improved or resolved with appropriate medication therapy. Our students work within the health care system as experts in the therapeutic use of medications. They will routinely provide medication therapy evaluations and recommendations to patients and other health care professionals. In Clinical pharmacy II students will provide patient care that optimizes medication therapy and promotes health, and disease prevention. Our students will be the future pharmacists concerned with advancing the profession as a whole. After completion of this course they will get expertise in the therapeutic use of medications, medication therapy evaluations and recommendations to patients and other health care professionals.

Contents

1. Concept and competency requirements for advance clinical pharmacy practice.
2. RDU, Drug Utilization Evaluation: Define drug utilization evaluation, types of DUE,
3. Geriatric Pharmacy Practice.
4. Pediatric Pharmacy Practice.
5. Therapeutic Drug Monitoring: Common definitions used in therapeutic drug monitoring
6. Drugs Therapy Review: Terminology, significance and component of drug therapy review,
7. Hypertension, Myocardial Infarction, Diabetes, Carcinoma, Depression, Schizophrenia, Anxiety
8. Drug induced disease and drug abuse and misuse

Recommended Texts

1. Dipiro JT (2003). *Encyclopedia of Clinical Pharmacy*. New York: Marcel Dekker Publishing.
2. Rantucci MJ (2006). *Pharmacists Talking with Patients: a guide to patient counseling*. London: , Lippincott Williams & Wilkins.

Suggested Readings

1. Rosenbaum D, Dresser M (2001). *Clinical Research Coordinator Hand Book*. North Carolina Garrison, Inc.
2. Cook S (2004). *Clinical Studies Management, a Practical Guide to Success*. West Sussex: Horwood Publishing Limited.

Research Methods and Project Planning course includes both qualitative and quantitative research methods, including experiments, survey research, participant observation, and secondary data. Quantitative methods aim to classify features, count them, and create statistical models to test hypotheses and explain observations. Focusing towards identifying, prioritizing and stating the problem of research. Research methods are the strategies, processes or techniques utilized in the collection of data or evidence for analysis in order to uncover new information or create better understanding of a topic. This course give a way to systematically solve a research problem. Students will able to study how research is done scientifically. Its aims to give the work plan of research. It provides training in choosing methods materials, scientific tools and techniques relevant for the solution of the problem. Students will learn and get the necessary training in choosing methods, materials, scientific tools and training in techniques relevant for the problem chosen.

Contents

1. Introduction to research methods (Quantitative & Qualitative)
2. Identifying, prioritizing and stating the problem of research
3. Review of available literature and writing introduction
4. Formulating research objectives and study questions
5. Identifying variables and developing data collection tools
6. Choosing appropriate study design, population and sample
7. Planning for data collection, processing and analysis
8. Writing research methodology, results, discussions and recommendations
9. Submitting results of project as research article for publication
10. Use of computer and software in research

Recommended Texts

1. Harris Cooper (2010). *Research Synthesis and Meta Analysis: Applied Social Research methods serie*. New York:Sage Publications.
2. Beth Dawson, Robert G (2004). *Trapp. Basic & Clinical Biostatistics*. Singapore: LANGE Publication.

Suggested Readings

1. P. Armitage, G. Berry (2002). *Statistical Methods in Medical Research*. Malden, New York: Blackwell Science, Inc..
2. Gerstman BB (2008). *Basic Biostatistics: Statistics for Public Health Practice*. Sudbury: Jones & Bartlett Publishers.

Biostatistics for Pharmacy is a course to disentangle the data received and make valid inferences that can be used to solve problems in public health. Biostatistics uses the application of statistical methods to conduct research in the areas of public health, and medicine. It encompasses the design of practice research, the collection and analysis of data and the interpretation of the results. The objective of the scientific manuscript is to provide a clear specification of the hypothesis to be tested. In other words, they have to provide the parameters to be tested. It also helps in selecting and defining endpoints in clinical research. Biostatistics principles helps post graduate pharmacy students to understand and evaluate the results of health care studies. It also enables them to participate in medical research projects and communicate the results of bio statistical research to patients and other health care workers in ways that are easy for them to understand. After completion of this course they will be able to design and evaluate their result.

Contents

1. Introduction
2. Sample and Population
3. Test of Hypothesis and significance
4. Goodness of fit test:
5. Student "t" and "F" Distribution:
6. Analysis of variance:
7. Experimental Designs:

Recommended Texts

1. Nilton, JS and Tsokos J D (1983). *Statistical Methods in Biological and Health Sciences*. New York: McGraw-Hill.
2. Remington RD, Schork M A (1985). *Statistics with Application to the Biological and Health Sciences*. NJ: Prentice Hall Inc.

Suggested Readings

1. Bryan Kestenbaum (2018). *Epidemiology and Biostatistics Practice Problem Workbook*. NY: Springer.
2. Wayne W. Daniel, Chad L (2018). *Cross. Biostatistics: A Foundation for Analysis in the Health Sciences*.



PhD
PHARMACOLOGY



PHRM-8101**Research methodology****3(3+0)**

Pharmacology is branch of medical science that deals with the study of effects of chemical substances on function of living system. In general this subject explains what the drug does to the body and what the body does to the drug. Drug can be used to treat, prevent and cure of any disease. The main objectives of this course are to give an understanding of the fundamental principles of Pharmacodynamics (i.e. drug receptor interactions) and pharmacokinetics (i.e. absorption, distribution, metabolism, and elimination of drugs). The objective of research methodology in PhD Pharmacology is to have students possess a comprehensive understanding of general field of pharmacology, such as analysis of data interpretation critical analysis. The major objective of Research Methodology in Pharmacological sciences is to develop understanding of students that how to design experiments after getting a quick review of literature. This course further aims to produce to enable the students to design new experiments after clear understanding of previous data to find lead molecules in pharmacology. This course particularly provide necessary knowledge for students who are key personals of drug development

Contents

1. Source of literature
2. Literature survey
3. Writing techniques
4. Critical methodology
5. Intrinsic analysis
6. Extrinsic analysis
7. interpretation
8. Data analysis using statistical techniques
9. Understand research articles
10. Peer review journals

Recommended Texts

1. Goodman Gillman (1996). *Pharmacological Basis of Therapeutics*, New York: McGrawHill Book Company.
2. Lippincott(2001). *Pharmacology*, New York: Lippincot William & Willkins.

Suggested Readings

1. Lippincott (2001). *Pharmacology*, New York: Lippincot William & Willkins.
2. J D Tripathy (2004). *Essential of Medical Pharmacology*, New Delhi: Japees Brother.
3. Katzung B G (2001). *Basic and Clinical Pharmacology*, New York: McGraw-Hill Medical Publishers.

PHRM-8102

Battery of Pharmacological test

3(3+0)

Pharmacology is branch of medical science that deals with the study of effects of chemical substances on function of living system. In general this subject explains what the drug does to the body and what the body does to the drug. Drug can be used to treat, prevent and cure of any disease. The main objectives of this course are to give an understanding of the fundamental principles of Pharmacodynamics (i.e. drug receptor interactions) and pharmacokinetics (i.e. absorption, distribution, metabolism, and elimination of drugs). The major objective to study Battery of Pharmacological test in PhD Pharmacology to develop understanding of PhD students to design different experiments for basic understanding of pharmacology. It provides a comprehensive understanding of techniques and a thorough knowledge of literature with originality in the application of knowledge, together with a practical understanding of how research and enquiry are used to create and interpret knowledge in the field of pharmacology.

Contents

1. Experimental models for screening of anti-hypertensive drugs
2. Experimental models for screening of Antihyperlipidemic drugs
3. Experimental models for screening of anti-diabetic drugs
4. Experimental models for screening of hepatoprotective drugs
5. Experimental models for screening of anti-cancer drugs

Recommended Texts

1. Goodman Gillman (1996). *Pharmacological Basis of Therapeutics*. New York: McGrawHill Book Company.
2. Lippincott (2001). *Pharmacology*, New York: Lippincot William & Willkin..

Suggested Readings

1. Lippincott, Pharmacology (2001). New York: Lippincot William & Willkin.
2. J D Tripathy (2000). *Essential of Medical Pharmacology*, New Delhi: Japees Brother.
3. Katzung B G (2001). *Basic and Clinical Pharmacology*, New York: McGraw-Hill Medical Publishers.

PHRM-8103

Toxicokinetic studies & Metabolic disorders

3(3+0)

Toxicokinetic studies is the study of absorption, distribution, metabolism/biotransformation, and excretion (ADME) of toxicants in relation to time. The basic kinetic concepts for the absorption, distribution, metabolism, and excretion of chemicals in the body system initially came from the study of drug actions or pharmacology. Toxicokinetics represents the extension of kinetic principles to the study of toxicology and encompasses applications ranging from the study of adverse drug effects to investigations. Moreover metabolic disorders are usually defined as inborn errors of metabolism, encompassing deficiencies in enzymes involved in the metabolism of carbohydrates, amino acids derived from proteins, and fatty acids liberated from lipids. This course covers an important parameter in toxicokinetics that is time course of blood or plasma concentration of the toxicant with time. The major objective to study Toxic kinetic studies & metabolic disorders in PhD Pharmacology to develop understanding of PhD students to design different experiments for basic understanding metabolic related diseases. It provides a comprehensive understanding of both metabolic diseases and toxic symptoms of drugs.

Contents

1. Fructose induced metabolic disorders
2. Glucose induced metabolic disorders
3. Therapeutic index
4. Dose response relationship
5. Glucose induced metabolic disorders

Recommended Texts

1. Goodman Gillman (1996). *Pharmacological Basis of Therapeutics*. New York: McGraw-Hill Book Company.
2. Lippincott (2001). *Pharmacology*. New York: Lippincot William & Willkins.

Suggested Readings

1. J D Tripathy (2001), *Essential of Medical Pharmacology*, New Delhi: Japees Brother.
2. Katzung B G (2001), *Basic and Clinical Pharmacology*, New York: McGraw-Hill Medical Publishers.

PHRM-8104

Evaluation selected drug activities

(3+0)

Pharmacology in general explains what the drug does to the body and what the body does to the drug. Drug can be used to treat, prevent and cure of any disease. This course is focus on the drug activities and its measurements of the physiological response that a drug produces. A less active drug produces less response, and a more active drug produces more response. Identification and the comparative evaluation, qualitative and quantitative, of drug activities, reviews and appraisals of various pharmacological techniques utilized in the systematic search for and the evaluation of potential. The major objective to study Evaluation selected drug activities in PhD Pharmacology is to develop understanding of PhD students to know about drugs used to treat hypertensive, diabetes, ulcer from natural origin. After completion of this course students will be able work and design the experiment on the drug activities of Cardio protective drugs, Anti-diabetic drugs, Anti-ulcer drugs Anti-hypertensive drugs and Antispasmodic drugs.

Contents

1. Cardio protective drugs
2. Anti-diabetic drugs
3. Anti-ulcer drugs
4. Anti-hypertensive drugs
5. Antispasmodic drugs

Recommended Texts

1. Goodman Gillman (1996), *Pharmacological Basis of Therapeutics*. New York: McGraw-Hill Book Company.
2. Lippincott (2001), *Pharmacology*, New York: Lippincot William & Willkins.

Suggested Readings

1. J D Tripathy (2001), *Essential of Medical Pharmacology*, New Delhi: Japees Brother.
3. Katzung B G (2001), *Basic and Clinical Pharmacology*, New York: McGraw-Hill Medical Publishers.

**PHRM-8105 Screening of Medicinal Plants for Selected Pharmacological Activities
3(3+0)**

Medicinal plants are considered as a rich resources of ingredients which can be used in drug development either pharmacological, non- pharmacological or synthetic drugs. These plants play a critical role in the development of future research directions human cultures around the whole world. The pharmacological activity of a biopharmaceutical is evaluated using in vitro and/or in vivo assays. These assays include in vitro binding assays to demonstrate the affinity of the biopharmaceutical for the target and in vivo studies to establish the potential biological activity in appropriate animal models. After screening drug development process started that can be used to treat, prevent and cure of any disease. The main objectives of this course are to give an understanding of the fundamental principles of Pharmacodynamics (i.e. drug receptor interactions) and pharmacokinetics (i.e. absorption, distribution, metabolism, and elimination of drugs). The major objective to study Screening of medicinal plants in PhD Pharmacology to develop understanding of PhD students to design different experiments for basic understanding of effect of natural products on blood pressure, hepatic system, respiratory and other systems of body.

Contents

1. Screening of anti-hypertensive drugs
2. Screening of antihyperlipidemic drugs
2. Screening of anti-diabetic drugs
3. Screening of hepatoprotective drugs

Recommended Texts

1. Goodman Gillman (1996), *Pharmacological Basis of Therapeutics*. New York: McGraw-Hill Book Company.
2. Lippincott (2001), *Pharmacology*, New York: Lippincot William & Willkins.
3. Katzung B G (2001), *Basic and Clinical Pharmacology*, New York: McGraw-Hill Medical Publishers.

Suggested Readings

1. Lippincott (2001), *Pharmacology*. New York: Lippincot William & Willkins.
2. J D Tripathy (2004), *Essential of Medical Pharmacology*. New Delhi: Japees Brother.

Ethnopharmacology is the study of medicines derived from naturally occurring substances like plants and fungi that have been traditionally used for medicinal purposes. This makes ethnopharmacology more important today than ever. Ethnopharmacology links natural sciences research on medicinal, aromatic and toxic plants with sociocultural studies and has often been associated with the development of new drugs. This course covers the antimicrobial agents that are classified into several categories, as inhibitors for bacterial cell wall such as beta-lactam drugs, fosfomycin, and vancomycin; inhibitors for protein biosynthesis such as tetracycline, macrolides, aminoglycoside antibiotics; inhibitors for DNA synthesis such as 4-quinolones; inhibitors. With the help of the systemic antimicrobial agent's research antimicrobial therapy develop for serious systemic infections which has been treated via the parenteral or oral route. Traditionally, serious systemic infections have been treated initially with intravenous antibiotics. The major objective to study Systemic antimicrobial agents and Ethno pharmacological studies in PhD Pharmacology to develop understanding of PhD students to design different experiments for basic understanding of anthelmintic, antioxidants and haptic protective drugs.

Contents

1. Screening of anti-hypertensive drugs
2. Screening of antihyperlipidemic drugs
3. Screening of anti-oxidants drugs
4. Experimental models for screening of anthelmintic drugs
5. Experimental models for screening of anti-cancer drugs

Recommended Texts

1. Goodman Gillman(1996), *Pharmacological basis of Therapeutics*. New York: McGraw-Hill Book Company.
2. Lippincott (2001), *Pharmacology*, New York: Lippincot William & Willkins.

Suggested Readings

1. J D Tripathy (2000). *Essential of Medical Pharmacology*, New Delhi: Japees Brother.
2. Katzung B G (2007). *Basic and Clinical Pharmacology*, New York: McGraw-Hill Medical Publishers.



PhD

PHARMACEUTICS



Pharmaceutical Statistics is an important course in postgraduate studies in pharmacy research that is used to summarize experimental data in terms of central tendency (mean or median) and variance (standard deviation, standard error of the mean, confidence interval or range) but more importantly it enables us to conduct. The use of statistics allows researchers to draw reasonable and accurate inferences from collected information and to make sound decisions in the presence of uncertainty. Mastery of statistical concepts can prevent numerous errors and biases in medical research. Statistics is fundamental in the study of pharmaceutical and related sciences. Its knowledge is required to interpret data and analysis is applied to the comparison of pharmacological activities of therapeutic agents, the evaluation of the physicochemical properties of dosage forms, and the validation of analytical methods. This course will divulge understanding of different good practices as well as statistical treatment of different analytical procedures like dissolution, pharmaceutical validation, stability analysis, bioavailability and bioequivalence etc. used to evaluate pharmaceuticals.

Contents

1. Introduction, Good Pharmacy Practices, Good Manufacturing Practices, Good Laboratory Practices, Good Clinical Practices, Good Statistical Practices, Testing of hypothesis, sampling, ANOVA
2. Pharmaceutical Validation, Standard Curve, Calibration and validation of assay results, IPQC (In process quality control) validation, multiple stage test.
3. Dissolution Testing, Probability of passing the test, methods of assessing the similarity through dissolution profiles and their comparison
4. Bioavailability and Bioequivalence. Test for average bioequivalence (ABE), individual bio-equivalent (IBE), suggested by FDA, Design of experiment. Sample size, determination, In-vitro bioequivalence.
5. Stability Analysis, Model and design for stability analysis, shelf life determination, multiple ingredient/ response, Batch to batch variation etc.

Recommended Texts

1. James E. De Muth; (2016). *Basic Statistics and Pharmaceutical Statistical Applications*. New York: CRC Press Pharmacy Education Series.
2. Shein-Chung Chow, Jung Shao (2010). *Statistics in Drug Research: Methodologies and Recent Developments*. New York: CRC Press.

Suggested Readings

1. Jones, David(2010). *Pharmaceutical Statistics*, London: Pharmaceutical Press.
2. Sanford Bolton, Charles Bon (2005). *Pharmaceutical Statistics Practical and Clinical Applications*,

Biopharmaceutics examines the interrelationship of physical/chemical properties of drug, dosage form in which drug is given, and the route of administration on the rate and extent of systemic drug absorption. The importance of the drug substance and drug formulation on absorption and in vivo distribution of drug to site of action, is described as a sequence of events that precede elicitation of drug's therapeutic effect. Drugs are substances intended for use in the diagnosis, cure, mitigation, treatment or prevention of disease. Drugs are given in variety of dosage forms such as tablets, capsules, suspensions, emulsions etc. Drug products can be considered to be drug delivery systems that release and deliver drug to site of action such that they produce the desired effects. Drug product performance is elaborated as the release of drug substance from the drug product either for local drug action or for drug absorption into plasma for systemic effects. Advances in pharmaceutical technology and manufacturing have focused on developing quality drug products that are safer, more effective and convenient for the patient. The suggested dosage regimen, including starting dose, maintenance dose, dosage form and dosage interval, is determined in clinical trials to provide the drug concentrations that are therapeutically effective in most patients. These parameters are affected by the design of dosage form and physicochemical properties of the drug. In advanced biopharmaceutics different methods are used to evaluate or calculate pharmacokinetics parameters of different drugs and different patients for safer usage of medications.

Contents

1. Pharma kinetics:
2. Protein Binding: Kinetics, Binding Constants, Adverse Drug Reactions
3. Pharmacogenetics: Polymorphism in drug metabolism, cytochrome P-450 isozymes, classification, drug transport, adverse drug reaction.
4. Pharmacodynamics: Models, Relationship between pharmaco-dynamics and pharmacokinetics, drug tolerance, hypersensitivity and adverse response.

Recommended Texts

1. Shutosh Kar (2010). *Essentials of Biopharmaceutics and Pharmacokinetics*.
2. Rajesh Krishna (2012). *Biopharmaceutics Applications in Drug Development*.

Suggested Readings

1. Li, A.P., (2004). *In Vitro Approaches for Evaluation of Drug Efficiency and Toxicity*. CRC Press, LLC, USA.
2. Niazi, S., (2009). *Handbook of Pharmaceutical Manufacturing Formulations*: Compressed Solid Products. New York: Informa Health Care.
3. Schoenwald, R.D., (2002). *Pharmacokinetics in Drug Discovery and Development*, CRC Pres, LLC, USA.

PHRM-8203

Advanced Pharmaceutical Technology

3(3+0)

The objective of this course is to introduce the students to the basic knowledge of pharmaceutical formulation, how to evaluate the uptake of pharmaceutical components by the body, the quality systems used by the pharmaceutical industry, how to use chemistry, biochemistry and chemical engineering in the field of drug product development. It also provides the knowledge of the drug discovery, development and production of pharmaceutical dosage forms. It includes fundamentals of preparing dosage forms and demonstrates the application of engineering fundamentals to large scale production of dosage forms. It elaborates principles of drug absorption, drug stabilities issues, principles of sterilization and good manufacturing practices. It also introduces the students to novel drug delivery system which is target specific. The aim of advanced pharmaceutical course is to develop complete professional technologists for active pharmaceutical ingredients (API) and excipients. It provides basic knowledge of pharmaceutical formulations and their different quality control testing and ultimate effects on target. Physical and spectroscopic methods for the qualitative and quantitative analysis of drug molecules are prescribed. Degradation processes both chemical and physical that are peculiar to API's and stability of cell based systems will be presented. Introduction to recombinant DNA technology, large scale production and purification and isolation procedures used.

Contents

1. Equipment qualification, FAT, SAT, DQ, IQ, OQ, PQ, All types of equipment inclusive of HVAC.
2. Preventive and maintenance programs for plant engineering operative equipment.
3. Re-engineering of pharmaceutical operations.
4. Identifications of the equipment sensitivities and incompatibility with production materials e.g. metal contacts with powders and solutions.
5. Contact of packaging components like PVC, Aluminum Foils.
6. Procedures for plant shut downs and for maintenance

Recommended Texts

1. Hellery, A.M., (2002). *Drug Delivery and Targeting*. London: Taylor & Francis.
2. Banker, G.S. and T.C.T. Rhodes, (2002). *Modern Pharmaceutics*. New York: Informa Health Care.

Suggested Readings

1. Allen, L.V., N.G. Popovich and H.C. Ansel, (2010). *Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems*. New York: Lippincott Williams & Wilkins.
2. Liu, D., (2008). *Water Insoluble Drug Formulations*. New York: CRC Press.
3. Ahuja, S. and S. Scypinski, (2010). *Handbook of Modern Pharmaceutical Analysis*. New York: Academic Press.

Pharmaceutical Care is a patient-centered, outcomes oriented pharmacy that requires the pharmacist to work in concert with the patient and the patient's other healthcare providers to promote health, to prevent disease, and to assess, monitor, initiate, and modify medication use to assure that drug therapy. This course aims to study the applications of Clinical pharmacy which is the branch of pharmacy in which pharmacists provide patient care that optimizes the use of medication and promote health, wellness, and disease prevention. The objective is promotion of human health through safe, efficacious and affordable pharmaceutical interventions. To provide pharmacy students with knowledge as well as technical and scientific skills for appropriate use of therapeutic substances. The end of this course the students will be able to describe the terminologies of various Disease, interpret the relationships between clinical pharmacy, pharmaceutical care and good pharmacy practice, recognize the importance of pharmacist in patient education and counseling about compliance, explain the role of pharmacist in treatment of poisoning and general management of poisoning & over dosage.

Contents

1. Pharmacokinetic of Drug Interactions, Population pharmacokinetic
2. Therapeutic Drug monitoring
3. Therapeutic equivalence and non-inferiority
4. Pharmacoeconomics

Recommended Texts

1. Hansten P, Horn J (2010). *Drug interactions Analysis and Management*. Philadelphia: Lippincott Williams & Wilkins.
2. Koda-Kimble *et al* (2005). *Applied Therapeutics: the Clinical use of Drugs*. Baltimore: Lippincott Williams & Wilkins.

Suggested Readings

1. Gennaro AR (2011). Remington: *The Science and Practice of Pharmacy*. Philadelphia: Lippincott Williams & Wilkins.
2. Gourley H (1992). *Clinical Pharmacy & Therapeutics*. Baltimore: William& Willkins.
3. Greene RJ, Harris ND (2008). *Pathology and therapeutics for pharmacists*. London: Pharmaceutical Press.

This course is at postgraduate level and main aims of this subject is to study physical and chemical properties of a drug, and its dosage form, as related to the onset, duration, and intensity of drug action, including coconstituents and mode of manufacture. Drugs are given in a variety of dosage forms or *drug products* such as solids (tablets, capsules), semisolids (ointments, creams), liquids, suspensions, emulsions, etc, for systemic or local therapeutic activity. Drug products can be considered to be drug delivery systems that release and deliver drug to the site of action such that they produce the desired therapeutic effect and are also designed specifically to meet the patient's needs including palatability, convenience, and safety. *Biopharmaceutics* examines the interrelationship of the physical/chemical properties of the drug, the dosage form (drug product) in which the drug is given, and the route of administration on the rate and extent of systemic drug absorption.

Contents

1. Introduction and drug development process
2. Drug manufacturing process
3. Peptide Based Pharmaceuticals
4. Cytokines, Interferons and Interleukins

Recommended Texts

1. Shargel, L., S. Wu-Pong and A.B.C. Yu, (2012). *Applied Biopharmaceutics and Pharmacokinetics*. New York: McGraw-Hill, Medical Pub.
2. Schoenwald, R.D., (2002). *Pharmacokinetics in Drug Discovery and Development*, New York: CRC Pres.

Suggested Readings

1. Li, A.P., (2004). *In Vitro Approaches for Evaluation of Drug Efficiency and Toxicity*. New York: CRC Press.
2. Niazi, S., (2009). *Handbook of Pharmaceutical Manufacturing Formulations: Compressed Solid Products*. New York: Informa Health Care, USA.
3. Ahuja, S. and S. Scypinski, (2010). *Handbook of Modern Pharmaceutical Analysis*. New York: Academic Press.

PHRM-8206

Rate Controlled Drug Delivery Systems

3(3+0)

Rate Controlled Drug Delivery Systems is one of the important aspect of Pharmaceutics which focus on drugs that need to be delivered at a constant, or zero-order, rate has led to the development of rate-controlled drug delivery systems, which by definition deliver drug in precise quantities over time. The objective of this course is to introduce the students to the discovery, development and production of pharmaceutical dosage forms. It includes fundamentals of preparing dosage forms and demonstrates the application of engineering fundamentals to large scale production of dosage forms. It elaborates principles of drug absorption, drug stabilities issues, principles of sterilization and good manufacturing practices. It also introduce the students to noval drug delivery system which is target specific. The aim of advanced pharmaceutical course is to develop complete professional technologists for active pharmaceutical ingredients (API) and excipients. It provides basic knowledge of pharmaceutical formulations and their different quality control testing and ultimate effects on target.

Contents

1. Concept and system design, fundamental of Rate Controlled Drug Delivery.
2. Mucosal Drug Delivery Systems
3. Nasal and Ocular Drug Delivery Systems.
4. Vaginal and Intrauterine DDS.

Recommended Texts

1. Hellery, A.M., (2002). *Drug Delivery and Targeting*. London: Taylor & Francis.
2. Banker, G.S. and T.C.T. Rhodes, (2002). *Modern Pharmaceutics*. New York: Informa Health Care.

Suggested Readings

1. Allen, L.V., N.G. Popovich and H.C. Ansel, (2010). *Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems*. New York: Lippincott Williams & Wilkins.
2. Liu, D., (2008). *Water Insoluble Drug Formulations*. New York: CRC Press.
3. Ahuja, S. and S. Scypinski, (2010). *Handbook of Modern Pharmaceutical Analysis*. New York: Academic Press.