

Third stage		
1 <sup>st</sup> semester	Lecture title	Hours
Title of the course: <b><i>Inorganic Pharmaceutical Chemistry</i></b> Course number: <b>311</b> Level: 3 <sup>rd</sup> Class, 1 <sup>st</sup> Semester Credit hours: <b>Theory 2 hours Laboratory 1 hour</b> Reference text: <b>1. <i>Inorganic Medicinal and Pharmaceutical Chemistry by Block, Roche Soine and Wilson, latest edition</i></b> <b>2. <i>Wilson and Gisvold; Textbook of Organic medicinal and Pharmaceutical chemistry; Delgado JN, Remers WA, (eds); latest edition</i></b> <b>Objectives:</b> To present a review of the principles of inorganic chemistry that applied to medicinal and /or pharmaceutical chemistry. It includes understanding atomic and molecular structures, and explanation of atomic structures and the relationship with binding forces and complexation. It also describes inorganic products used as pharmaceutical preparations or diagnostic tools.		
Inorganic Pharmaceutical Chemistry	Atomic and molecular structure/ Complexation.	6
	Essential and trace ions: Iron, copper, sulfur, iodine.	3
	Non essential ions: Fluoride, bromide, lithium, gold, silver and	2
	Gastrointestinal agents: Acidifying agents.	1
	Antacids.	2
	Protective adsorbents.	1
	Topical agents.	2
	Dental agents.	1
	Radiopharmaceutical preparations.	6
	Radio opaque and contrast media.	6
Title of the course: <b><i>Pharmacognosy II</i></b> Course number: <b>312</b> Level: 3 <sup>rd</sup> Class, 1 <sup>st</sup> Semester Credit hours/week : <b>Theory 2 Laboratory 1</b> Reference text: <b><i>Robbers JE, Speedie MK, Tyler VE (Eds.); Pharmacognosy and Pharmacobiotechnology; the latest edition.</i></b>		
	Introduction: General biosynthesis pathways of secondary metabolites.	2
	Carbohydrates.	2

Pharmacognosy II	Glycosides: Biosynthesis, physical and chemical properties; cardiac glycosides; saponin glycosides; anthraquinone	5
	Glycosides: Isothiocyanate glycosides; aldehyde glycosides; alcoholic glycosides; phenolic glycosides; lactone glycosides; coumarins and chromones	5
	Resins and resin combination; tannins.	2
	Lipids: fixed oils and waxes.	2
	Volatile oils: Introduction; chemistry of volatile oils; biosynthesis of volatile oils; hydrocarbons as volatile oils; alcohols as volatile oils; aldehydes as volatile oils.	4
	Ketones as volatile oils; Phenols as volatile oils; Oxides as volatile oils; Ester as volatile oils; Phenolic ethers as volatile oils.	3
	Non- medicinal toxic plants.	2
	Vitamins and Amino acids.	2
<p>Title of the course: <b>Pharmaceutical Technology I</b> Course number: <b>313</b>            Level: 3<sup>rd</sup> Class, 1<sup>st</sup> Semester            Credit hours/week : <b>Theory 3 Laboratory 1</b>            Reference text: <b>Pharmaceutical Dosage forms and Drug Delivery Systems By Haward A. Ansel; latest edition.</b> and <b>Sprowel's American Pharmacy.</b></p>		
Pharmaceutical Technology I	Dispersed systems: their classification; comparisons between	2
	Solutions and types of solutions.	2
	Solubility: Factors affecting solubility; expression of dissolution; dissolution rate versus solubility; preparation of solutions	4
	Official solutions; classification of official solutions; preparation and	4
	Aqueous solutions containing aromatic principles; aromatic waters; methods of preparations: stability	4
	Syrups: sugar based syrups; artificial and sorbitol based syrups;	4
	Definition and methods of clarification; filter aids in clarification.	3
	Preparation of solutions using mixed solvent systems; spirits, and	3
	Extraction; maceration and percolation.	3

	Tinctures; fluid extracts; extracts of resins and oleoresins.	4
	Colloidal dispersions; lyophilic; lyophobic.	6
	Coarse dispersion; suspensions.	6
<p>Title of the course: <b>Biochemistry I</b> Course number: <b>314</b>            Level: 3<sup>rd</sup> Class, 1<sup>st</sup> Semester            Credit hours/week : <b>Theory 3 Laboratory 1</b>            Reference text: <i>Harper's Illustrated Biochemistry, Twenty-Sixth Edition</i></p> <p><b>Objectives:</b> To integrate key concepts describing the traditional core topics of Biochemistry: structure and metabolism. At the end of the semester the students should be able to understand the chemical structure, and function of all biomolecules present in the living organisms.</p>		
Biochemistry I	Introduction to the macromolecules biochemistry: Definitions and terms; proteins, enzymes, DNA; Clinical value.	2
	Amino acids: Structures of A.A (table of standard A.A abbreviation and	3
	Amino acids: Chemical reactions, Zwitter ions, titration curve calculating isoelectric point values. Examples and questions. Non standards A.A: Structures, existence	3
	Peptides: Peptide bond, resonance forms, isomers, physical properties and chemical reactions. Essential poly peptides in human body structures, roles and clinical values	3
	Proteins: Structure and conformations of proteins, Primary structure, Secondary structure (4 helix, 5 sheet), tertiary structure, quaternary structure. Classification, synthesis, cellular functions (Enzymes, cell signaling,	3
	Denaturation of proteins and protein sequencing: Determining A.A composition, N- terminal A.A analysis, C- terminal A.A analysis, Edman degradation, prediction protein sequence from DNA/ RNA sequences. Methods of protein study: Protein purification, cellular localization, proteomics and	3
	Carbohydrates: Chemistry and classification, biomedical importance, classification of CHO, Stereochemistry of monosaccharides, metabolism of CHO; Physiologically	3

Lipids: Introduction, classification of lipids, fatty acids (F.A), nomenclature of F.A, saturated F.A, unsaturated F.A, physical and physiological properties of F.A, metabolism of lipids. Phospholipids, lipid peroxidation <del>and antioxidants generation and identification of lipids</del>	3
Enzymes: Structures and mechanism, nomenclature, classification, mechanisms of catalysis, thermodynamics, specificity, lock and key model, induced fit model, transition state stabilization, dynamics and function, allosteric modulation. Biological function, cofactors, coenzymes, <del>involvement in disease</del>	3
Kinetics: General principles, factors effecting enzyme rates (substrate conc., pH, temperature, etc), single-substrate reaction (Michaelis- Menten kinetics), kinetic constants. <del>Enzyme inhibition</del>	2
Enzyme inhibition: Reversible inhibitors, competitive and non competitive inhibition, mixed-type inhibition, <del>Irreversible inhibition. Inhibition kinetics and binding</del>	1
Control of activity and uses of inactivators; multi- substrate reactions, ternary-complex mechanisms, ping-pong mechanisms, non- Michaelis- Menten kinetics, pre-steady-state <del>kinetic chemical mechanisms</del>	1
Nucleic Acid: Chemical structure, nucleic acid components, nucleic acid bases, nucleotides and deoxynucleotides (Properties, base pairing, sense and antisense, <del>sugar coiling, alternative structures, quadruple</del>	3
Biological functions of DNA: Genes and genomes, transcription and <del>translation replication</del>	2
Biochemistry of extracellular and intracellular communication: Plasma membrane structure and function; Biomedical importance, membrane proteins associated with lipid bilayer, membranes protein composition, dynamic	3
Artificial membranes model, the fluid mosaic model, membrane selectivity, physiological functions of plasma membranes.	1
Biochemistry of the endocrine system: Classification of hormones, biomedical importance, the target cell concept and hormone receptors, biochemistry of hormone action and <del>signal transduction</del>	3

	Special topics: Nutrition, digestion, and absorption. Biomedical importance, digestion and absorption of carbohydrates, lipids, proteins, vitamins and minerals: energy balance. Biochemistry of	3
<p>Title of the course: <b><i>Pathophysiology</i></b> Course number: <b>315</b>          Level: 3<sup>rd</sup> Class, 1<sup>st</sup> Semester          Credit hours/week : <b>Theory 3 Laboratory 1</b>          tutors : Dr Ajwad Awad Muhammad and Dr. Nathera Mohammad Ali          Reference text: <b><i>Essentials in Pathophysiology by: Carol Mattson Porth 2<sup>nd</sup> Ed. and pathophysiology of disease : an introduction to clinical medicine 7ed. Cary D. Hammer, editor</i></b>          Stephen J. Mc Phee editor  <b>Objectives:</b> Describe the basic concepts of pathophysiology at the cellular level related to injury, the self-defense mechanism, mutation, and cellular proliferation. Outline basic pathological factors that influence the disease process. Describe the impact and abnormal functions upon the organ (s) associated with the disease process of targeted body systems. Describe clinical manifestations associated with the diseased organ(s).</p>		
<b>Pathophysiology</b>	Introduction.	1
	Cell injury and tissue response; Degeneration; Necrosis; Atrophy;	6
	Disorders of electrolytes and water and acid–base balances: Hyper And Hyponatremia; Hyper and Hypokalemia; Syndrome of inappropriate secretion of ADH; Diabetes insipidus; Metabolic acidosis and alkalosis: Respiratory acidosis and	4
	Disorders of cardiovascular system: Hyperemia; Congestion and edema; Thrombosis; embolism and infarction; Shock; Coronary heart disease and MI; Rheumatic heart disease; Heart failure; Acute pulmonary edema; Essential hypertension; Secondary hypertension; Malignant	5
	Disorders of respiratory system: Pneumonias; Tuberculosis; Respiratory distress syndrome; Bronchial asthma; Emphysema and bronchiectasis; Cystic fibrosis; Pulmonary embolism; Pulmonary hypertension.	3
	Disorders of the renal system: Nephrotic syndrome; Glomerulonephritis; Diabetic glomerulosclerosis; Hypertensive glomerular disease; Pyelonephritis; Drug related nephropathies; Acute renal failure; Chronic renal failure.	4

Disorders of GI and hepatobiliary systems: Peptic ulcer and Zollinger –Ellison syndrome; Irritable bowel syndrome; Crohn's disease; Diarrhea; Celiac disease; Viral hepatitis; Primary biliary cirrhosis; Liver failure; Cholelithiasis.	4
Disorders of thyroid function: Hypothyroidism. Hyperthyroidism. Graves's disease. Thyrotoxicosis.	2
Disorders of adrenal function: Cushing syndrome. Adrenal cortical Insufficiency (primary and secondary). Congenital adrenal hyperplasia. Pheochromocytoma.	2
Diabetes mellitus and metabolic syndrome;	3
Dyslipoproteinemia.	2
Neoplasia	4
Metabolic & rheumatic disorders of skeletal system: -Osteoporosis, osteomalacia & rickets, rheumatoid arthritis, systemic lupus erythromatosus, ankylosing spondylitis, gout, osteoarthritis syndrome.	2
Alterations in the immune response (pathophysiology of immunopathology): - Hypersensitivity disorders. - Transplantation immunopathology. - Immunodeficiency disorders.	3

2 <sup>nd</sup> semester	Lecture title	Hours
Title of the course: <b>Organic Pharmaceutical Chemistry I</b> Course number: <b>326</b> Level: 3 <sup>rd</sup> Class, 2 <sup>nd</sup> Semester Credit hours: <b>Theory 3 hours Laboratory 1 hour</b> Reference text: <b>Wilson and Gisvold Textbook of Organic medicinal and Pharmaceutical chemistry, Delgado JN, Remers WA, (Eds); 10<sup>th</sup> ed, 2004.</b>		
level, molecular To enable understanding mechanisms of drug action at : <b>Objectives</b> the role of medicinal chemistry in the discovery and development of synthetic and structure- therapeutic agents. It also enables students to understand the concept of of new compounds activity relationship and its application in design and synthesis or derivatives.		
<b>Organic Pharmaceutical Chemistry I</b>	Drug distribution.	4
	Acid- base properties.	3
	Statistical prediction of pharmacological activity.	3
	QSAR models.	2
	Molecular modeling (Computer aided drug design).	1
	Drug receptor interaction: force involved.	1
	Steric features of drugs.	2
	Optical isomerism and biological activity.	1
	Calculated conformation.	1
	Three- dimensional quantitative structure activity relationships and databases.	1
	Isosterism.	1
	Drug-receptor interaction and subsequent events.	1
	General pathways of drug metabolism: Sites of drug biotransformation; Role of cytochrome P450 mono-oxygenases in oxidative biotransformation; Oxidative reactions; Reductive reactions; Hydrolytic reactions; Phase II reactions.	22
	Factors affecting drug metabolism.	2

Title of the course: <b>Pharmacology I</b> Course number: <b>327</b> Level: 3 <sup>rd</sup> Class, 2 <sup>nd</sup> Semester Credit hours/week : <b>Theory 3</b> Reference text: <b>Lipincott Pharmacology 3<sup>rd</sup> Edition, 2006</b> <b>Objectives:</b> To introduce the pharmacy students to the basis of general pharmacology. The student will learn about various body systems and drugs used to affect them in health and disease. Moreover the course will cover the drugs used to treat microbial infections.		
pharmacology I	General introduction to Pharmacology.	2
	Pharmacokinetics.	4
	Drug Receptor interaction and Pharmacodynamics.	4
	The autonomic nervous system (ANS).	2
	Cholinergic system.	6
	Adrenergic system.	6
	Principal of antimicrobial therapy.	2
	$\beta$ - lactam and other cell wall synthesis inhibitor antibiotics	4
	Protein synthesis inhibitors	4
	Quinolones, Folate antagonists, and urinary tract antiseptics.	3
	Antimycobacterium drugs	2
	Antifungal drugs.	2
	Antiprotozoal drugs.	1
Anthelmintic drugs.	2	
Antiviral drugs.	1	
Title of the course: <b>Pharmaceutical Technology II</b> Course number: <b>328</b> Level: 3 <sup>rd</sup> Class, 2 <sup>nd</sup> Semester Credit hours/week : <b>Theory 3 Laboratory 1</b> Reference text: <b>Pharmaceutical Dosage forms and Drug Delivery Systems By Haward A. Ansel; latest edition.</b> and <b>Sprowel's American Pharmacy.</b> <b>Objectives:</b> To teach theoretical bases for the technology of preparing different dosage form with respect to their raw materials, compositions, methods of preparation, stability, storage and uses; in addition to define and characterize the possible incompatibilities that may occur in dosage forms.		
Pharmaceutical Technology II	Emulsions; purpose of emulsification; methods of emulsification; emulsifying agents; HLB system; stability of emulsions.	10
	Lotions; liniments and collodions.	5
	Suppositories.	6
	Powdered dosage forms.	10



	Semisolid dosage forms.	10
	Incompatibilities in pharmaceutical dosage forms.	4
<p>Title of the course: <b>Biochemistry II</b> Course number: <b>329</b></p> <p>Level: 3<sup>rd</sup> Class, 2<sup>nd</sup> Semester</p> <p>Credit hours/week : <b>Theory 3 Laboratory 1</b></p> <p>Reference text: <i>Harper's Illustrated Biochemistry, Twenty-Sixth Edition</i></p> <p><b>Objectives:</b> To provide a condensed curriculum of strong basic biochemistry and molecular biology. At the end of the semester the students should be able to understand all metabolic processes occurring in the living cell.</p>		
<b>Biochemistry II</b>	Bioenergetics.	2
	Biologic oxidation.	2
	The respiratory chain and oxidative phosphorylation.	2
	Over view of metabolism.	2
	Citric acid Cycle.	2
	Glycolysis.	2
	Metabolism of glycogen.	4
	Gluconeogenesis.	3
	Pentose phosphate pathway and other pathways of hexose metabolism.	3
	Biosynthesis of fatty acids.	3
	Oxidation of fatty acids.	2
	Metabolism of acylglycerol and sphingolipids.	2
	Lipid transport and storage.	2
	Cholesterol synthesis, transport, and excretion.	2
	Biosynthesis of the Nutritionally Nonessential Amino Acids.	3
Catabolism of Proteins & of Amino Acid Nitrogen	3	

	Catabolism of the Carbon Skeletons of Amino Acids.	2
	Conversion of Amino Acids to Specialized Products.	2
	Porphyrins & Bile Pigments	2
<p>Title of the course: <b>Pharmacognosy III</b> Course number: <b>3210</b>            Level: 3<sup>rd</sup> Class, 2<sup>nd</sup> Semester            Credit hours/week : <b>Theory 2 Laboratory 1</b>            Reference text: <b>Robbers JE, Speedie MK, Tyler VE (Eds.); Pharmacognosy and Pharmacobiotechnology; the latest edition.</b>  <b>Michael Heinrich, Joanne Barnes; Fundamentals of Pharmacognosy &amp; Phytotherapy.</b></p> <p><b>Objectives:</b> This course is intended to study chemistry of other natural products namely alkaloids and antibiotics. Also this course includes studying phytotherapy &amp; tissue culture techniques utilized for production of natural products.</p>		
Pharmacognosy III	Alkaloids: Introduction; Physical and chemical properties; pyridine, piperidine alkaloids; tropane alkaloids.	5
	Alkaloids: Quinoline tropan alkaloids; iso-quinoline alkaloids; imidazole alkaloids; indole alkaloids.	5
	Alkaloids: Steroidal alkaloids; lupinane alkaloids; alkaloidal amines; purine alkaloids.	4
	Antibiotics: Natural sources; biosynthetic pathways, isolation and purification.	6
	.phytotherapy :Introduction , principles,medicinal plants in selected health care systems.Important natural products & phytomecines used in pharmacy & medicine	10

Title of the course: <b>Medical ethics</b> Course number: <b>(3211)</b> Level: 3rd Class, 2nd Semester Credit hour/weeks: <b>Theory 1</b> Reference text: <b>1- Ruth Rodgers, (ed.); fast track: Law and Ethics in Pharmacy Practice. Pharmaceutical Press 2010.</b> <b>2-Joy Wingfield and David Badcott . Pharmacy Ethics and Decision Making. Pharmaceutical Press2007</b> <b>3-Robert J. Cipolle, Linda M. Strand, Peter C. Morley. Pharmaceutical Care Practice: The Clinician's Guide, 2nd Edition.</b> <b>4- Robert m. Veatch and Amy Haddad. Case Studies in Pharmacy Ethics. second edition. Copyright © 2008 by Oxford University Press, Inc.</b>		
<b>Objectives:</b> The course will provides an overview of ethical issues facing practicing pharmacists in order to enable the student to understand the basic concepts of ethics which formulate the relationship of pharmacist with the patient, colleges, and other health personnel in order to deliver his pharmaceutical services in good way.  The course will begin with an introduction to ethics in pharmaceutical practice and then proceed to examine in depth specific topics (Beneficence, Autonomy, Confidentiality, Consent...).  The course will include lectures, case analysis, and classroom discussion.		
Pharmacy Ethics	Introduction to Pharmacy Ethics (Theoretical considerations).	2
	Code of Ethics for Pharmacists.	1
	Common Ethical Considerations in Pharmaceutical Care Practice (Beneficence, Autonomy, Honesty, Informed Consent, Confidentiality, Fidelity .....).	3
	Interprofessional Relations.	2
	Making ethical decisions.	1
	Ethical issues related to clinical pharmacy research.	1
	Ethical problems in the pharmacist's clinical practice.	1
	Preventing misuse of medicines.	1
	Case studies in pharmacy ethics.	3

	<b>Department of Pharmacognosy</b>	
	Title of the course: <i>Pharmacognosy II</i>	
	Level: 3 <sup>rd</sup> Class, 1 <sup>st</sup> Semester	
	Credit hours/week : <b>1</b>	
	Reference text: <i>Lab manual for Practical Pharmacognosy Adopted by the Department</i>	
	<b><u>Objectives:</u></b> To enable students practicing the techniques of extraction, separation, and identification of constituents isolated from natural sources, using microscopes and chromatographic methods	
<b>No</b>	<b>Lecture title</b>	<b>hours</b>
1	Cardio-active glycosides	4
2	Anthraquinone glycosides.	4
3	Saponin glycosides.	4
4	Tannins.	2
5	Volatile oils	4
6	Isolation of piperine from black pepper.	4
7	Isolation of belladonna alkaloids and their identification.	4
8	Isolation of caffeine from tea.	4

	<b>Department of Clinical Laboratory Sciences</b>
	Title of the course <b>Biochemistry I</b>
	Level: 3 <sup>rd</sup> Class, 1 <sup>st</sup> Semester
	Credit hours/week : <b>1</b>
	Reference text: <i>Lab Manual for Practical Biochemistry Adopted by the Department</i>
	<b>Objectives:</b> <u>To integrate key concepts describing the traditional core topics of Biochemistry: structure and metabolism. At the end of the semester the students should be able to understand the chemical structure, and function of all biomolecules present in the living organisms</u>
<b>No.</b>	<b>Lecture title</b>
1	Effects of acids on carbohydrates: Molish test; Bials test; Anthron test; Seliwanoffs test; Mucic acid test.
2	Classification of carbohydrates according to reducing properties: Benedicts test; Fehlings test; Barfoed test.
3	Classification of carbohydrates according to reducing properties: Iodine test; Osazone test.
4	Determination of unknown carbohydrates sample.
5	Color reactions of proteins: Biuret test; Ninhydrin test.
6	Color reactions of proteins: Millons test; Hopkins-Cole test; unoxidized sulfur test.
7	Solubility of proteins (effects of acid, neutral salts, heavy metals, and alkaloidal reagents).
8	Determination of unknown sample of proteins.
9	Experiments on solubility of lipids.
10	Acrolin test for lipids; Soap; Studying properties of soap.
11	Determination of saponification number.
12	Properties of lipids: Iodine test for lipids.
13	Properties of enzymes: Effects of heat on enzymes.
14	Properties of enzymes: Effect of concentration of enzyme (salivary amylase) on reaction velocity.
15	Properties of enzymes: Effect of pH on enzymatic activity.

	<b>Department of Clinical Laboratory Sciences</b>	
	Title of the course: <b><i>Pathophysiology</i></b>	
	Level: 3 <sup>rd</sup> Class, 1 <sup>st</sup> Semester	
	Credit hours/week : <b>1</b>	
	Reference text: <b><i>Lab Manual for Practical Pathophysiology Adopted by the Department.</i></b>	
	<b><u>Objectives:</u></b> Describe the basic concepts of pathophysiology at the cellular level related to injury, the self-defense mechanism, mutation, and cellular proliferation. Outline basic pathological factors that influence the disease process. Describe the impact and abnormal functions upon the organ (s) associated with the disease process of targeted body systems. Describe clinical manifestations associated with the diseased organ(s).	
<b>No</b>	<b>Lecture title</b>	<b>hours</b>
1	General introduction and slide preparation.	2
2	Cell injury and degenerations.	2
3	Growth disturbances.	2
4	Inflammation.	2
5	Thrombosis.	2
6	Neoplasia.	2
7	Disorders of respiratory system.	2
8	Disorders of the cardiovascular system	2
9	Disorders of renal system.	2
10	Liver disorders.	2
11	Disorders of the gastrointestinal tract.	2
12	Disorders of the central nervous system.	2
13	Disorders of the reproductive system.	2
14	Disorders of skeletomuscular system.	2
15	Disorders of endocrine system.	2

	<b>Department of Pharmaceutical Chemistry</b>	
	Title of the course: <b><i>Inorganic Pharmaceutical Chemistry</i></b>	
	Level: 3 <sup>rd</sup> Class, 1 <sup>st</sup> Semester	
	Credit hours/week: <b>1</b>	
	Reference text: <b><i>Lab Handbook for Practical Inorganic Pharmaceutical Chemistry Adopted by the Department.</i></b>	
	<b><u>Objectives:</u></b>	
<b>No</b>	<b>Lecture title</b>	<b>hours</b>
1	Preparation and standardization of 1N HCl (known sample).	2
2	Preparation and standardization of 1N HCl (quiz and unknown).	2
3	Preparation and standardization of 1N NaOH (known sample).	2
4	Preparation and standardization of 1N NaOH (quiz and unknown).	2
5	Assay of NaOH solution (known sample).	2
6	Assay of NaOH solution (unknown sample).	2
7	Assay of sodium benzoate (known sample).	2
8	Assay of sodium benzoate (quiz and unknown).	2
9	Assay of Borax (explanation of basic concepts).	2
10	Assay of Borax (quiz and unknown).	2
11	Assay of citric acid (known sample).	2
12	Assay of citric acid (unknown sample).	2
13	Assay of magnesium hydroxide (known sample).	2
14	Assay of magnesium hydroxide (quiz and unknown).	2
15	Assay of ammoniated mercury (unknown sample).	2

	<b>Department of Pharmaceutics</b>	
	Title of the course <b><i>Pharmaceutical Technology I</i></b>	
	Level: 3 <sup>rd</sup> Class, 1 <sup>st</sup> Semester	
	Credit hours/week: <b>1</b>	
	Reference text: <b><i>Lab manual for Practical Pharmaceutical Technology Adopted by the Department.</i></b>	
	<b><u>Objectives: To teach theoretical bases for the technology of preparing different dosage forms with respect to their raw materials, compositions, methods of preparation, stability, storage and uses.</u></b>	
<b>No</b>	<b>Lecture title</b>	<b>hours</b>
1	Solutions (into body cavity, oral and external use).	4
2	Syrups: Preparation techniques and quality evaluation.	6
3	Elixirs: Preparation techniques and quality evaluation.	4
4	Spirits: Preparation techniques and quality evaluation.	6
5	Suspensions: Preparation techniques and quality evaluation.	4
6	Dispersion of oils in inhalations.	6



	<b>Department of Pharmacognosy</b>	
	Title of the course <b><i>Pharmacognosy III</i></b>	
	Level: 3 <sup>rd</sup> Class, 2 <sup>nd</sup> Semester	
	Credit hours/week : <b>1</b>	
	Reference text: <b><i>Lab Manual for Practical Pharmacognosy Adopted by the Department.</i></b>	
	<b><u>Objectives:</u></b> This course is intended to study chemistry of other natural products namely alkaloids and antibiotics. Also this course includes studying tissue culture techniques utilized for production of natural products.	
<b>No</b>	<b>Lecture title</b>	<b>hours</b>
1	Isolation of <i>Peganum harmala</i> alkaloids.	4
2	Preparation of Khellin.	4
3	Flavonoids of <i>Ruta graveolens</i> .	4
4	Extraction of hesperidin.	4
5	Isolation of pectin.	2
6	Isolation of citric acid from lemon juice.	4
7	Isolation of Podophyllotoxin from <i>Podophyllum emodi</i> ; Isolation of Rotenone from <i>Lonchocarpus</i> Spp.	4
8	Isolation of <i>Peganum harmala</i> alkaloids.	4

	<b>Department of Clinical Laboratory Sciences</b>	
	Title of the course: <b><i>Biochemistry II</i></b>	
	Level: 3 <sup>rd</sup> Class, 2 <sup>nd</sup> Semester	
	Credit hours/week : <b>1</b>	
	Reference text: <i>Lab Manual for Practical Biochemistry Adopted by the Department</i>	
	<b><u>Objectives: To provide a condensed curriculum of strong basic biochemistry and molecular biology. At the end of the semester the students should be able to understand all metabolic processes occurring in the living cell</u></b>	
<b>No.</b>	<b>Lecture title</b>	<b>hours</b>
1	General urine examination: Physical properties.	2
2	General urine examination: Chemical properties; Protein in urine; Sugar in urine.	2
3	General urine examination: Ketone bodies in urine (Rothera test); Bile salts in urine (Hays test); Bilirubin in urine.	2
4	General urine examination: Evaluation of unknown urine sample.	2
5	Cerebrospinal fluid analysis: Measurement of glucose in CSF.	2
6	Cerebrospinal fluid analysis: Measurement of chloride in CSF.	2
7	Cerebrospinal fluid analysis: Measurement of proteins in CSF.	
8	Serum calcium measurement.	2
9	Blood phosphorus measurement (inorganic phosphate).	2
10	Serum total proteins (quantitative analysis).	2
11	Estimation of urea level in the blood.	2
12	Measurement of serum uric acid level.	2
13	Measurement of serum ascorbic acid level.	
14	Gastric juice analysis: Detection of free hydrochloric acid concentration.	2
15	Gastric juice analysis: detection of free acid, total acid content.	2

<b>Department of Pharmaceutical Chemistry</b>		
Title of the course: <b><i>Organic Pharmaceutical Chemistry I</i></b>		
Level: 3 <sup>rd</sup> Class, 2 <sup>nd</sup> Semester		
Credit hours: <b>1</b>		
Reference text: <b><i>Lab Handbook for Practical Pharmaceutical Chemistry Adopted by the Department</i></b>		
<b>Objectives:</b> the role of medicinal chemistry in the discovery and development of synthetic therapeutic agents. It also enables students to understand the concept of structure-activity relationship and its application in design and synthesis of new compounds or derivatives.		
<b>No</b>	<b>Lecture title</b>	<b>hours</b>
1	Preparation and standardization of 0.1N KMnO <sub>4</sub> (known sample).	2
2	Preparation and standardization of 0.1N KMnO <sub>4</sub> (quiz and unknown).	2
3	Assay of hydrogen peroxide solution (known sample).	2
4	Assay of hydrogen peroxide solution (quiz and unknown sample).	2
5	Assay of ferrous sulfate (known sample).	2
6	Assay of ferrous sulfate (unknown sample).	2
7	Preparation and standardization of 0.1N Na <sub>2</sub> S <sub>2</sub> O <sub>4</sub> solution (known sample).	2
8	Preparation and standardization of 0.1N Na <sub>2</sub> S <sub>2</sub> O <sub>4</sub> solution (quiz and unknown sample).	2
9	Assay of copper sulfate (known sample).	2
10	Assay of copper sulfate (unknown sample).	2
11	Assay of Chlorinated Lime (known sample).	2
12	Assay of Chlorinated Lime (quiz and unknown).	2
13	Preparation and assay of Lugol's Solution (known sample).	2

14	Preparation and assay of Lugol's Solution (quiz and unknown).	2
15	Assay of Alum (unknown sample).	2
<b>Department of Pharmaceutics</b>		
Title of the course: <b><i>Practical Pharmaceutical Technology II</i></b>		
Level: 3 <sup>rd</sup> Class, 2 <sup>nd</sup> Semester		
Credit hours/week : <b>1</b>		
Reference text: <b><i>Lab Manual for Practical pharmaceutical Technology Adopted by the Department.</i></b>		
<b><u>Objectives:</u></b> To teach theoretical bases for the technology of preparing different dosage forms with respect to their raw materials, compositions, methods of preparation, stability, storage and uses; in addition to define and characterize the possible incompatibilities that may occur in dosage forms.		
<b>No</b>	<b>Lecture title</b>	<b>hours</b>
1	Emulsions: Preparation techniques and quality evaluation.	6
2	Suppositories: Preparation techniques and quality evaluation.	6
3	Powders: Preparation techniques and quality evaluation.	6
4	Capsules: Preparation techniques and quality evaluation.	6
5	Semisolid dosage forms: Preparation techniques and quality evaluation.	6