Third stage		
1st semester	**Lecture title**	**Hours**
Title of the course: ***Inorganic Pharmaceutical Chemistry*** Course number: **311** Level: 3rd Class, 1st Semester Credit hours: **Theory 2 hours** **Laboratory 1 hour** Reference text: ***1. Inorganic Medicinal and Pharmaceutical Chemistry by Block, Roche Soine and Wilson, latest edition*** ***2. Wilson and Gisvold; Textbook of Organic medicinal and Pharmaceutical chemistry; Delgado JN, Remers WA, (eds); latest edition*** **Objectives**: 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 mercury.	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: ***Pharmacognosy* II** Course number: **312** Level: 3rd Class, 1st Semester Credit hours/week : **Theory 2** **Laboratory 1** Reference text: ***Robbers JE, Speedie MK, Tyler VE (Eds.); Pharmacognosy and Pharmacobiotechnology; the latest edition.***		
	Introduction: General biosynthesis pathways of secondary metabolites.	2
	Carbohydrates.	2

Pharmacognosy II	Glycosides: Biosynthesis, physical and chemical properties; cardiac glycosides; saponin glycosides; anthraquinone glycosides; flavonoid glycosides; cyanophore lycosides.	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
Title of the course: ***Pharmaceutical Technology*** **I** Course number: **313** Level: 3rd Class, 1st Semester Credit hours/week : **Theory 3 Laboratory 1** Reference text: ***Pharmaceutical Dosage forms and Drug Delivery Systems By Haward A. Ansel; latest edition.*** and ***Sprowel's American Pharmacy***.		
Pharmaceutical Technology I	Dispersed systems: their classification; comparisons between different systems.	2
	Solutions and types of solutions.	2
	Solubility: Factors affecting solubility; expression of dissolution; dissolution rate versus solubility; preparation of solutions containing non-volatile materials.	4
	Official solutions; classification of official solutions; preparation and uses.	4
	Aqueous solutions containing aromatic principles; aromatic waters; methods of preparations; stability.	4
	Syrups: sugar based syrups; artificial and sorbitol based syrups; stability of syrups.	4
	Definition and methods of clarification; filter aids in clarification.	3
	Preparation of solutions using mixed solvent systems; spirits, and elixirs.	3

	Extraction; maceration and percolation.	3
	Tinctures; fluid extracts; extracts of resins and oleoresins.	4
	Colloidal dispersions; lyophilic; lyophobic.	6
	Coarse dispersion; suspensions.	6
Title of the course: ***Biochemistry* I** Course number: **314** Level: 3rd Class, 1st Semester Credit hours/week : **Theory 3 Laboratory 1** Reference text: ***Harper's Illustrated Biochemistry, Twenty-Sixth Edition*** **Objectives**: 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.		
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 side chain); Classification, properties, isomerism.	3
	Amino acids: Chemical reactions, Zwitter ions, titration curve calculating isoelectric point values. Examples and questions. Non standards A.A: Structures, existence and clinical value.	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, and ligand transport, structural proteins), protein in nutrition.	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 bioinformatics, structure predication and simulation.	3

	Carbohydrates: Chemistry and classification, biomedical importance, classification of CHO, Stereochemistry of monosaccharides, metabolism of CHO; Physiologically important monosaccharides, glycosides, disaccharides, polysaccharides.	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 and antioxidants, separation and identification of lipids, amphipathic lipids.	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, involvement in disease.	3
	Kinetics: General principles, factors effecting enzyme rates (substrate conc., pH, temperature, etc), single-substrate reaction (Michaelis-Menten kinetics), kinetic constants. Examples of kinetic questions and solutions.	2
	Enzyme inhibition: Reversible inhibitors, competitive and non competitive inhibition, mixed-type inhibition, Irreversible inhibition. Inhibition kinetics and binding affinities (*k*i), questions and solutions.	1
	Control of activity and uses of inactivators; multi-substrate reactions, ternary-complex mechanisms, ping-pong mechanisms, non-Michaelis- Menten kinetics, pre-steady-state kinetics, chemical mechanisms.	1
	Nucleic Acid: Chemical structure, nucleic acid components, nucleic acid bases, nucleotides and deoxynucleotides (Properties, base pairing, sense and antisense, super-coiling, alternative structures, quadruple structures.	3
	Biological functions of DNA: Genes and genomes, transcription and translation, replication.	2
	Biochemistry of extracellular and intracellular communication: Plasma membrane structure and function; Biomedical importance, membrane proteins associated with lipid bilayer, membranes protein composition, dynamic structures of membranes, a symmetric structures of membranes.	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 signal transduction.	3
	Special topics: Nutrition, digestion, and absorption. Biomedical importance, digestion and absorption of carbohydrates, lipids, proteins, vitamins and minerals; energy balance. Biochemistry of hemostasis and clot formation.	3
Title of the course: ***Pathophysiology*** Course number: **315** Level: 3rd Class, 1st Semester Credit hours/week : **Theory 3 Laboratory 1** tutors : Dr Ajwad Awad Muhammad and Dr. Nathera Mohammad Ali Reference text: ***Essentials in Pathophysiology by: Carol Mattson Porth 2nd Ed.and pathophysiologly of disease : an introduction to clinical medicine 7ed.Cary D. Hammer, editor*** Stephen J. Mc Phee editor **Objectives**: 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).		
Pathophysiology	Introduction.	1
	Cell injury and tissue response; Degeneration; Necrosis; Atrophy; Hypertrophy; Metaplasia and Calcification; Inflammation and Repair.	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 alkalosis.	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 hypertension; Hypotension; Aneurysm versus varicose veins;	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; Dyslipoproteinemia. Neoplasia Metabolic &rheumatic disorders of skeletal system: -Osteoporosis, osteomalacia & rickets, rheumatoidarthritis, systemic lupus erythromatosus, ankylosing spondylitis, gout, osteoarthritis syndrome. Alterations in the immune response (pathophysiology of immunopathology): - Hypersensitivity disorders. - Transpalantation immunopathology. - Immunodeficiency disorders.	3 2 4 2 3
English		

2nd semester	**Lecture title**	**Hours**
Title of the course: ***Organic Pharmaceutical Chemistry* I** Course number: **326** Level: 3rd Class, 2nd Semester Credit hours: **Theory 3 hours Laboratory 1 hour** Reference text: ***Wilson and Gisvold Textbook of Organic medicinal and Pharmaceutical chemistry, Delgado JN, Remers WA, (Eds); 10th ed, 2004.*** **Objectives**: To enable understanding mechanisms of drug action at molecular level, 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 activity relationship and its application in design and synthesis of new compounds or derivatives.		
Organic Pharmaceutical Chemistry I	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: ***Pharmacology* I** Course number: **327** Level: 3rd Class, 2nd Semester Credit hours/week : **Theory 3** Reference text: ***Lipincott Pharmacology 3rd Edition, 2006*** **Objectives**: 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. Pharmacokinetics.	2 4
	Drug Receptor interaction and Pharmacodynamics. The autonomic nervous system (ANS).	4 2
	Cholinergic system.	6
	Adrenergic system.	6
	Principal of antimicrobial therapy.	2
	β- lactam and other cell wall synthesis inhibitor antibiotics	4
	Protien 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: ***Pharmaceutical Technology*** **II** Course number: **328** Level: 3rd Class, 2nd Semester Credit hours/week : **Theory 3 Laboratory 1** Reference text: ***Pharmaceutical Dosage forms and Drug Delivery Systems By Haward A. Ansel; latest edition.*** and ***Sprowel's American Pharmacy***. **Objectives**: 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
Title of the course: ***Biochemistry*** **II** Course number: **329** Level: 3rd Class, 2nd Semester Credit hours/week : **Theory 3 Laboratory 1** Reference text: ***Harper's Illustrated Biochemistry, Twenty-Sixth Edition*** **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.		
Biochemistry II	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

Title of the course: ***Pharmacognosy* III** Course number: **3210**
Level: 3rd Class, 2nd Semester

Credit hours/week : **Theory 2** **Laboratory 1**
Reference text: ***Robbers JE, Speedie MK, Tyler VE (Eds.); Pharmacognosy and Pharmacobiotechnology; the latest edition.***

Michael Heinrich, Joanne Barnes; Fundamentals of Pharmacognosy & Phytotherapy.

Objectives: This course is intended to study chemistry of other natural products namely alkaloids and antibiotics. Also this course includes studying phytotherapy & tissue culture techniques utilized for production of natural products.

	Alkaloids: Introduction; Physical and chemical properties; pyridine, piperidine alkaloids; tropane alkaloids.	5
	Alkaloids: Quinoline tropan alkaloids; iso-quinoline alkaloids; imidazole alkaloids; indole alkaloids.	5

Pharmacognosy III	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: ***Medical ethics*** Course number: **(3211)**
Level: 3rd Class, 2nd Semester
Credit hour/weeks: **Theory 1**
Reference text:
1- *Ruth Rodgers, (ed.);* ***fast track: Law and Ethics in Pharmacy Practice.*** *Pharmaceutical Press 2010.*
2-*Joy Wingfield and David Badcott* **. *Pharmacy Ethics and Decision Making.*** *Pharmaceutical Press2007*
3-*Robert J. Cipolle, Linda M. Strand, Peter C. Morley.* ***Pharmaceutical Care Practice: The Clinician's Guide,*** *2nd Edition.*
4- *Robert m. Veatch and Amy Haddad.* ***Case Studies in Pharmacy Ethics.*** *second edition. Copyright © 2008 by Oxford University Press, Inc.*

Objectives:
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

English language		