

COURSES OF STUDY FOR B.Sc.:

Second Year

First Semester									
No.	Course	Weekly hours		Examination degree					Examination time
		Lec.	Lab.	periodical	Practical	written	oral	Total	
1	Physical pharmacy (2)	2	3	15	45	70	20	150	2
2	Pharmacognosy (3)	3	3	15	45	70	20	150	3
3	Pharmaceutical Organic Chemistry (3)	3	3	15	45	70	20	150	3
4	Pharmaceutical Applied & instrumental analysis (1)	2	3	15	45	70	20	150	2
5	General Microbiology	2	2	15	45	70	20	150	2
6	Pharmacy law	1	-	-	-	50	-	50	1
	Total	13	14					800	

Second Semester

No.	Course	Weekly hours		Examination degree					Examination time	
		Lec.	Lab.	periodical	Practical	written	oral	Total		
1	Pharmaceutics (1)	2	3	15	45	70	20	150	2	
2	Pharmacognosy (4)	2	3	15	45	70	20	150	3	
3	Pharmaceutical Organic Chemistry (4)	3	3	15	45	70	20	150	3	
4	Pharmaceutical Applied & instrumental analysis (2)	2	3	15	45	70	20	150	2	
5	Pharmaceutical Microbiology	2	2	15	45	70	20	150	2	
6	Pathology and Parasitology	2	1	10	15	40	10	150	3	
		2	1	10	15	40	10			
	Total	15	16						900	

SECOND YEAR

First term:

1. Physical Pharmacy-2 (2 hrs lect. , 3 hrs pract.):

Complexation and protein binding, Kinetics, Diffusion and dissolution, Micrometrics.

2. General Pharmacognosy and Medicinal Plants-3 (3 hrs lect. , 3 hrs pract.):

I- Drugs used as herbs (14 hrs):

Mentha, Thyme, Marjoram, Basil, Lobelia, Vinca, Sylibium, Ruta, Ephedra, Half-Bar, Lemon grass, Carrageen, Fucus, Citeraria and Ergot.

II- Drugs used as seeds (14 hrs):

1- Introduction

2- Strophanthus seed, Nux-vomica, Linseed, Foenugreek, Cardamom, Nutmegs, Colchicum, Black Mustard, Castor, Almond, Calabar, Psyllium, Coca beens, Nigella, Datura stramonium.

III- Drugs used as Fruits: (14 hrs)

1- Introduction

2- Umbelliferous fruits

Fennel, Anise, Hemlock, Ammi visnaga, Ammi majus, Coriander, Caraway, Dill, Cummin, Celery.

3- Non-Umbelliferous fruits

Capsicum, Colocynth, Vanulla Pods, Senna Pods, Cassia Pods, Bitter Orange Peel, Lemon Peel, Cocculus, Black pepper, Cubebs, Star anise, Ramarind Pulp, Juniper, Berries, Prunus, Pimento.

4- Cereals

3. Pharmaceutical Organic Chemistry-3 (3 hrs lect. , 3 hrs pract.):

I- Aromaticity and benzene derivatives (16 h)

1- Resonance theory, Molecular orbital theory, Huckel's rule for aromaticity. aromatic electrophilic

substitution reactions, classes of benzenoid compounds; synthesis and reaction mechanisms.

2- Monocyclic aromatic hydrocarbons (benzene and its derivatives).

Preparation of benzene and its homologues, Properties of benzene, annulenes, non-benzenoid aromatic compounds, aromatic ions, aromatic annulenes, azulene, antiaromatic and non-aromatic, isomerism of benzene derivatives and nomenclature.

3- General mechanisms for electrophilic aromatic substitution S_EAr ; halogenation, sulphonation, alkylation, acylation. Effect of substituents on S_EAr ; ortho-para and meta directors.

4- Alkyl benzenes (arenes) and alkenylbenzenes; properties, synthesis and reactions.

5- Aromatic sulphonic acids.

Benzene and toluenesulphonic acids; properties, synthesis and reactions.

6- Aromatic halogen compounds

Nucleophilic aromatic substitution (aryl halides), addition-elimination, and elimination-addition (Benzyne) mechanisms.

II - Other benzene derivatives (18 h)

1 - Phenols and quinones and their reactions.

Nomenclature, homologues, physical properties, preparation, reactions due to the hydroxyl group and reactions on the benzene ring.

2- Aromatic nitro-compounds.

Nitrating agents, mechanisms of nitration, Charge-transfer complexes, Aromatic nitroso-compounds, Reduction products of nitro-compounds.

3- Aromatic amino-compounds

General methods for preparation, properties and reactions

4- Aromatic alcohols, aldehydes and ketones.

General methods for preparation, properties and reactions.

5- Aromatic carboxylic acids.

Monocarboxylic acids with carboxyl group attached to the ring, or attached to the side chain, properties, synthesis and reactions.

III- Aromatic polynuclear hydrocarbons (8 h)

Biphenyl, Naphthalene, Anthracene, and Phenanthrene.

Confirmation of structure, derivatives, nomenclature, synthesis, and reactions.

Practical Pharmaceutical Organic Chemistry III for 2nd year pharmacy (1st semester)

General precautions and glassware handling, Techniques, Melting point determination, Recrystallization, Acetylation of salicylic acid, Acetylation of aniline, IR spectra and problems

N.B. This course, also, includes 5 tutorial classes.

4. Pharmaceutical Applied and instrumental analysis-1 (2 hrs lect. , 3 hrs pract.):

I- Spectrophotometry

- UV&VIS:

Light and radiation, electromagnetic spectrum, interactions of photon with matter, electronic transitions, chromophores, auxochromes, bathochromic & hypsochromic shifts/ hyperchromic and hypochromic effects, absorption characteristics of chromophores, effect of pH on absorption spectra, Beer's- Lambert's law, colorimetry, standard series method and varying depth method, photoelectric instruments, applications (qualitative & quantitative).

- Spectrofluorometry:

Principle, fluorescence, phosphorescence, chemical structure and fluorescence, quenching, instruments, applications.

- Atomic absorption and flame emission:

Principle, excitation sources (Flame, non-flame excitation/ Hollow cathode lamp (a-plasma, b-laser, c-arc and spark), flame emission, atomic absorption, atomic fluorescence spectroscopy, theory, Instrumentation, applications.

II- Electrochemistry:

Potentiometry:

Introduction, electrode potential, electrochemical cells, reference and indicator electrodes, potentiometric titrations.

Conductimetry:

Introduction, conductance measurement, bases of conductimetric titrations, advantages of conductimetric titrations, applications.

Polarography:

Basic principles/ factors affecting the limiting, residual and diffusion currents, dropping mercury electrode, polarogram, half-wave potential, quantitative applications for inorganics and organics.

III. Thermal analysis:

Theory, types (thermogravimetry, differential scanning calorimetry), applications.

5.General and Pharmaceutical Microbiology-1, 2 (2 hrs lect. , 2 hrs pract.):

I- General microbiology:

A) General bacteriology

Structure of bacterial cell, bacterial physiology and metabolism, bacterial genetics, recombinant DNA technology and its applications, virulence factors of bacteria, antimicrobial chemotherapy, sterilization and disinfection.

B) general virology

Structure of virus, replication of viruses, general properties of viruses, genetics and gene therapy, classification of medically important viruses, pathogenesis and antiviral drugs.

C) general mycology

Structure and growth, pathogenesis, fungal toxins and allergies and antifungal drugs.

II- Immunology.

Immunity, cellular basis of the immune response, antigens and antibodies, humoral immunity, cell-mediated immunity, major histocompatibility complex and transplantation, complement, antigen-antibody reactions in the laboratory, hypersensitivity (allergy), tolerance and autoimmune diseases, tumor immunity and immunodeficiency.

6. Pharmacy law (1 hr lect.) :

الفصل الأول:

" مزاول مهنة الصيدلة "

الفصل الثاني:

" المؤسسات الصيدلانية "

تعريف ، أحكام عامة لكل المؤسسات الصيدلانية (الصيدليات العامة ، الصيدليات الخاصة ، وسطاء الأدوية ، مخازن الأدوية ، محال الإتجار في النباتات الطبية ومتحصلاتها ، مصانع المستحضرات الصيدلانية).

الفصل الثالث:

المستحضرات الصيدلانية الخاصة والدستورية.

الفصل الرابع:

إستيراد الأدوية والمستحضرات الصيدلانية والمستحضرات الأقربازينية والنباتات الطبية ومستحضرتها الطبيعية.

الفصل الخامس:

أحكام عامة

الفصل السادس:

العقوبات

الفصل السابع:

أحكام وقتية

الفصل الثامن:

أحكام ختامية

الجدول الأول

المواد الواجب حفظها في أماكن منعزلة ومغلقة ومكتوب عليها " مواد سامة " ويرسم عليها جمجمة وعضمتان.

الجدول الثاني:

المستحضرات الصيدلانية الجاهزة التي لاتصرف إلا بتذكرة طبية

الجدول الثالث:

المخدرات.

الجدول الرابع:

الأدوية التي يجوز للصيدلي صرفها بموجب تذكرة محررة بمعرفة المولدة.

الجدول الخامس:

المواد البسيطة التي يصرح بالإتجار فيها في مخازن الأدوية البسيطة.

الجدول السادس:

المواد القابلة للاحتراق
المواد القابلة للفرقة
المواد الخطرة
إشتراطات صحية خاصة بإنشاء المؤسسات الصيدلانية.

Second term:

1- Pharmaceutics-1 (2 hrs lect. , 3 hrs pract.):

Semisolid dosage forms: Ointments, gels and pastes.

Suppositories.

Cosmetics

Capsules and tablets

Preformation

2. General Pharmacognosy and Medicinal Plants-4 (2 hrs lect. , 3 hrs pract.):

I- Drugs used as Rhizomes: (10 hrs)

1- Introduction

2- Rhubarb, Ginger, Galangal, Curcuma, Hydrastis, Colchicum corm, Filix-Mas Valerian, White Hellebore, Green Hellebore, Podophyllum, Garlic.

II- Drugs used as Roots: (10 hrs)

1- Introduction.

2- Lpecacuanha, Liquorice, Gentian, Senega, Calumba, Krameria, Althaea, Aconite, Jalap, Rauwolfia, Sarsaparilla, Alkanna, Dandelion, Ginseng.

III- Unorganized and animal drugs: (8 hrs)

Opium, Aloes, Benzoin, Aloes, Benzoin, Balsam Rolu, Black Catechu, Cod-liver oil, Beeswax, Spermaceti, Wool Fat, Cantharides, Cochineal, Scorpion venom, Snake venoms, Honey, Royal Jelly, Musk, Ambergris.

3. Pharmaceutical Organic Chemistry-4 (3 hrs lect. , 3 hrs pract.):

Course contents:

1- Chemistry of heterocyclic compounds (21 h):

Furan, Thiophen, Pyrrole, Indole, Pyrazoles. Imidazoles, Oxazoles, Thiazoles, Pyridine, Diazines, Quinoline, Isoquinoline, Pyrans, Pyrones, and Purines.

Structure, properties, synthesis, electrophilic substitution reactions, nucleophilic substitution reactions, and addition reactions.

2- Spectroscopic identification of organic compounds (21 h):

Infrared spectroscopy:

Molecular vibrations, IR spectrum regions, effect of hydrogen bonding, IR absorptions of different types of functional groups, applications of infrared spectroscopy.

Nuclear magnetic resonance spectroscopy.

Nuclear spin, characteristics of NMR signals, chemical shifts, diamagnetic effects, magnetic anisotropic effect, spin-spin coupling, PASCAL's triangle, ^1H NMR absorptions of different types of protons, applications of ^1H NMR spectroscopy, and a brief account about ^{13}C NMR spectroscopy

Mass spectroscopy

Mass spectrometer, mass spectrum, fragmentation, and applications of mass spectrometry.

Practical Pharmaceutical Organic Chemistry IV for 2nd year pharmacy (2nd semester)

1- Bromination of acetanilide.

2- Hydrolysis of *p*-bromoacetanilide

3- Azo dyes and Iodoform

4- Distillation

5- NMR integrated problems

6- MS integrated problems

N.B. This course, also, includes 6 tutorial classes.

4. Pharmaceutical Applied and instrumental analysis-2 (2 hrs lect. , 3 hrs pract.):

I- Chromatography:

Introduction, Types of chromatographic methods, principles of chromatography (theory & terminology), column resolution, column efficiency, applications, TLC, PC, HPLC, GC, electrophoreses.

II- Analysis of oils and fats:

Introduction, Components of oils, fats, fatty acids, unsaponifiable matter, non-drying, semi-drying, drying examples of oils, stability of oils, Rancidity, physical,

colour tests, constant values & chemical examination of oils and fats, adulteration of oils and fats.

III. Water quality control:

Introduction, pharmaceutical waters, water treatment and purification, physical examination, chemical examination, acidity, alkalinity, hardness, residual chlorine, nitrogen forms analysis, dissolved oxygen, chemical oxygen demand, heavy metals, anions.

Practical: Assay of potassium permanganate. pH effects (sulfanilamide, thymol blue). determination of molar ratio and pK_a , fluorimetry, derivative spectroscopy, atomic absorption, flame photometry, polarimetry. Determination of hydrogen peroxide. potassium persulfate, calcium chloride (excess oxalic), reduced iron, analysis of Fe^{2+} - Fe^{3+} mixture. Determination of ferrocyanide by bromate. Determination of Fe^{2+} using $Cr_2O_7^{2-}$ using ceric sulphate. Determination of glycerol and copper sulfate. Determination of phenol. glucose-sucrose mixture. Determination of iodine by Andrew's. Water analysis (acidity, alkalinity, hardness), dissolved oxygen-absorbed oxygen, ammonia heavy metals. Analysis of oils and fats (physical examination "specific gravity, refractive index", colour tests), acid value, saponification value, iodine value. Chromatography.

5.General and Pharmaceutical Microbiology-2 **(2 hrs lect. , 2 hrs pract.):**

I- Pharmaceutical microbiology:

Disinfectants, antiseptics, preservatives, microbial contamination of pharmaceutical preparations, microbial control of non-sterile pharmaceutical products, aseptic area, factors affecting antimicrobial activity of antimicrobial agents, sterility testing, microbiological assay of antibiotics, microbiological assay of accessory factors, microbiological quality of pharmaceuticals, biotechnology and industrial microbiology, production of pharmaceuticals by microorganisms, designing of a fermentation unit for industrial fermentation, media and raw materials used for fermentation, ethyl alcohol (acetic acid, butanol, acetone, lactic acid, citric acid, glutamic acid, dextran) production by fermentation, production of enzymes and vitamins and antibiotics (penicillins, streptomycin, tetracycline and griseofulvin) by microorganisms, steroid transformation by microorganisms, production of cortisone from progesterone by fermentation, industrial engineering, recombinant DNA technology, gene cloning and expression, monoclonal antibody production, insulin production and recombinant vaccines.

II- Medical microbiology

A- Medical bacteriology

Gram positive cocci (staphylococci, streptococci, pneumococci), Gram negative cocci (Neisseria), Gram positive rods (Corynebacterium, Bacillus species, mycobacterium and clostridium), Gram negative rods (Enterobacteriaceae [E. coli, Klebsiella, Enterobacter, Salmonella, Shigella, Proteus, Yersinia], pseudomonas, Vibrios, brucella, Haemophilus and Bordetella), spirochetes (Treponema, Borrelia and Leptospira), mycoplasma, legionella and rickettsiae.

B- Medical virology

Classification of viruses,

RNA viruses (Picorna viruses [Poliovirus-Enteroviruses-Hepatoviruses], Reo viruses [Rotavirus], Orthomyxo viruses [Influenza viruses], Paramyxo viruses [Measles-Mumps-Parainfluenza], Rhabdo viruses [Rabies], Retro viruses [HIV, HTLV], Toga viruses [Encephalitis], Flavi viruses [yellow fever-Dengue-HCV-HGV], Corona viruses [SARS] and Delta viruses [HDV]. DNA viruses herpes viruses [HSV I and II, CMV and EBV, Hepadna viruses [HBV], pox viruses [small pox-cowpox] and adenoviruses.

C- Medical mycolgy

Cutaneous and subcutaneous mycoses, systemic mycoses, opportunistic mycoses and diagnostic medical microbiology.

6.1. Pathology (2 hrs lectr., 1 hr pract.):

Inflammation; Repair (healing); Cell response to injury: Gangrene; Bacterial infections: Mode of infection, mechanism of disease, production, effects, types, common acute bacterial infections (staphylococcal infection, streptococccal infection), compli-cations (toxaemia, bacteraemia, septicemia, pyemia). Tuberculosis (general pathology). Circulatory disturbances: Hyperemia, venous congestion, hemorrhage, thromobosis, embo-lism, ischemia, infarction, edema. Disturb-ances of growth: Atrophy, hypoplasia, agenesis, hyperplasia, hypertrophy, meta-plasia. Tumors (neoplasia): General aspects of benign and malignant tumors, nomen-clature and examples, causes of death in malignant tumors, etiology. Pathological and medical terminology.

6.2. Parasitology (2 hrs lectr., 1 hr pract.):

Introduction for general parasitology. Helminthology: phylum Platyhelminthes or flat worms. Phylum Nemathelminthes: which includes Nematoda "round worms": Class Trematoda "flukes". Class Cestoda "tape

worms": *Taenia* spp. "*saginata* and *solium*", *Echinococcus granulosus*, *Hymenolepis nana*. Class Nematoda "round worms": *Ascaris lumbricoides*, *Enterobius vermicularis*, *Trichuris trichura*, *Trichinella spiralis*, *Ancylostoma duodenale*, *Wuchereria bancrofti*. Protozoology: *Entamoeba histolytica* and *coli*", *Giardia lamblia*, *Trichomonas vaginalis*, African trypanosomes, *Leishmania tropica*, *Plasmodium vivax*, *Toxoplasma gondii*, *Balantidium coli*. Role played by arthropods in transmission of parasitic diseases.