Table (1)
Study Plan
Prepharmacy Semester (1)

<table>
<thead>
<tr>
<th>Course Title</th>
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<th>Exam hours</th>
<th>Distribution of different grades on exams</th>
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<tr>
<td>Physics</td>
<td>121/C</td>
<td>3</td>
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<tr>
<td>Zoology</td>
<td>131/C</td>
<td>3</td>
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<tr>
<td>Botany</td>
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<td>3</td>
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Table (2)
Study Plan
Prepharmacy Semester (2)

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<tr>
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<td>122/C</td>
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<tr>
<td>Organic Chemistry</td>
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<td>150 110 40</td>
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<td>Medical Botany</td>
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<td>150 110 40</td>
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<tr>
<td>Anatomy and Histology</td>
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<td>Biostatistics</td>
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<tr>
<td>Zoology</td>
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1. Pre-Pharmacy: (Total credit hours: 38)

**Inorganic Chemistry (111/C)**
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Covers stoichiometry, atomic spectroscopy and modern electronic theory, the electron configurations and periodic classifications of atoms, chemical bonding and molecular structure, and nuclear chemistry.

**Physics (121/C, 122/C)**
Credit hours: 6
Lectures: 60 hrs; 2h/w for 30 weeks
Practical: 90 hrs; 3h/w for 30 weeks
Includes the study of description of motion, causes of motion, work, energy and machines, properties of liquids, properties of gases..

**Zoology (131/C)**
Credit hours: 3 hr
Lectures: 15 hrs; 1h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Deals with introductory information in cytology (manipulation of specimens, preparation of tissues, cell structure and chemical components of the cell), molecular biology and genetics, embryology, histology, general physiology, nutrition and nutrients, and metabolism.

**Botany (141/C)**
Credit hours: 3
Lectures: 30 hrs; 2 hrs/w, for 15 weeks.
Practical: 45 hrs; 3 hrs/w, for 15 weeks.
Deals with the plant taxonomy and plant physiology. Moreover, The course covers sources, origin and active constituents of the different parts of medicinal plants including their uses. The morphology and anatomy of these plants are also studied. In details, the two courses cover the following titles: morphology of seeds, roots, stems, leaves, flowers, and fruits, kingdoms Monera, Protista, fungi, plantae, plant physiology including diffusion, osmosis, permeability, photosynthesis, hormones, plant anatomy, principles of Pharmacognosy, origin of drugs, propagation from seeds, fermentation, factors affecting plant growth, selection and breeding of medicinal plants, preparation of drugs from plants, leaves, barks, galls, and woods.

**English Language (151/C)**
Credit hours: 2
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: None
Improves student’s ability for writing and speaking English language.

**Mathematics in Pharmacy (161/C)**
Credit hours: 2
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: None
Provides the basics of mathematical methods of integration, derivatization, and regression. It also covers the mean value theorem and curve sketching, and systems of linear equations and matrices.

**Medical Terminology and Pharmacy Orientation (171/3/1)**
Credit hours: 2
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: None
Introduces students to the core of the pharmacy curriculum. The course also enables students to understand the principles of medical and pharmaceutical terminology and how to use these terms in the description of normal and pathological conditions of human physiology.

**Physical Chemistry (112/C)**
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Covers many topics in physical chemistry including gas, liquid and solid states, chemical kinetics, chemical equilibrium, colloid properties of solutions, electrochemistry, colloids, phase equilibria, biophysical systems, transport of ions and molecules through the cell membrane, sound and light in medicine, and physics of diagnostic X-rays.

**Medical Botany (142/C)**
Credit hours: 3
Lectures: 30 hrs; 2 hrs/w, for 15 weeks.
Practical: 45 hrs; 3 hrs/w, for 15 weeks.
Deals with the plant taxonomy and plant physiology. Moreover, The course covers sources, origin and active constituents of the different parts of medicinal plants including their uses. The morphology and anatomy of these plants are also studied. In details, the two courses cover the following titles: morphology of seeds, roots, stems, leaves, flowers, and fruits, kingdoms Monera, Protista, fungi, plantae, plant physiology including diffusion, osmosis, permeability, photosynthesis, hormones, plant anatomy, principles of Pharmacognosy, origin of drugs, propagation from seeds, fermentation, factors affecting plant growth, selection and breeding of medicinal plants, preparation of drugs from plants, leaves, barks, galls, and woods.

**Organic Chemistry (132/C)**
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Introduces students to the basics of organic chemistry including the development of organic chemistry as a science, chemical bonds, shapes of molecules, polar and non-polar molecules, orbital hybridization, isomerism, nomenclature of molecules with chiral centers, types of reactions, classification of organic molecules, nucleophilicity and basicity, alkanes, alkenes, alkynes, polyenes, halogen compounds, alcohols, thioalcohols, ethers, thioethers, aldehydes, ketones, carboxylic acids, derivatives of carboxylic acids at the alkyl group, polycarboxylic acids, unsaturated dicarboxylic acids, amines.

**Anatomy and Histology (152/C)**
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks

Covers the general anatomy of the human body; with emphasis on muscular, cardiovascular, CNS, GIT, urinary, reproductive, and ENT systems. The course also illustrates and differentiates between different types of body cells and tissues.

**Biostatistics (162/C)**
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks

Includes introduction to computers, operating systems, introduction to windows, introduction to BASIC language, normal distribution, sampling theory, estimation theory, tests of hypotheses, and analysis of variance.

**Biophysics (122/C)**
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks

Includes the study of pressure and the circulatory system, molecular phenomena related to biological processes, internal energy, heat and temperature, the effects of heat, introduction to electricity and magnetism, practical electrical circuits, electrical safety in the hospital, electrical and electronic instruments, bioelectricity, elasticity and wave motion, the physics of hearing, the physics of vision, light and modern physics, and nuclear radiation.

**Zoology (172/C)**
Credit hours: 2 hr
Lectures: 15 hrs; 1h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks

Deals with taxonomy of animal kingdom, nutrition and nutrients, and metabolism.
Faculty of Pharmacy  Ain Shams University
Curriculum of Bachelor Degree in Pharmaceutical Sciences (B.Pharm.Sci)

Table (3)
Study Plan
First Year
<table>
<thead>
<tr>
<th>Course Title</th>
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<th>Exam hours</th>
<th>Distribution of different grades on exams</th>
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<tbody>
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<td>Pharmaceutical Organic Chemistry</td>
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<td>Pharmaceutics</td>
<td>221/3</td>
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<td>150</td>
</tr>
<tr>
<td>Analytical Pharmaceutical Chemistry</td>
<td>231/9</td>
<td>3</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Pharmacognosy</td>
<td>241/8</td>
<td>3</td>
<td>300</td>
<td>150</td>
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<td>Physiology</td>
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<td>Psychology and Sociology</td>
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Faculty of Pharmacy  Ain Shams University  
Curriculum of Bachelor Degree in Pharmaceutical Sciences (B.Pharm.Sci)  

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### Table (4)

**Study Plan**  
**First Year**  
**Semester (2)**

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<td>Pharmacognosy</td>
<td>232/8</td>
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<tr>
<td>General Microbiology and Immunology</td>
<td>242/7</td>
<td>3</td>
<td>300</td>
<td>150</td>
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<tr>
<td>Pharmaceutical Organic Chemistry</td>
<td>252/6</td>
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<tr>
<td>Human Rights*</td>
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**Total**  
Grades= 1500  
15  
13  
18

*This course is a university requirement not included in total grades.*
2. First Year Pharmacy: (Total credit hours: 36)

**Pharmaceutical Organic Chemistry (211/6, 252/6)**
Credit hours: 7
Lectures: 2 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks

Covers over study of structures, synthesis, electrophilic, nucleophilic aromatic substitution reactions and reactions of organic classes such as arenes, nitro compounds, amines, phenols compounds with examples of pharmaceutical products, in addition to study of stereochemistry, and structures and reactions of carbohydrates, organic acids and aldehydes.

**Pharmaceutics (221/3)**
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks

Introduces students to the basic knowledge of Pharmaceutics. It covers the basic principles of compatibility and incompatibility of drugs in prescriptions, solution and solubility,

**Analytical Pharmaceutical Chemistry (231/9, 212/9)**
Credit hours: 7
Lectures: 75 hrs; 3h/w for 15 weeks & 2h/w for 15 weeks
Practical: 90 hrs; 3h/w for 30 weeks

Refers to all methods used in qualitative and quantitative analysis as well as separation techniques; including acid-base titration, neutralization in aqueous and non-aqueous media, complexation titrations, precipitometric titrations, separation and identification of anions and cations, solvent extraction, spot tests, spectrophotometric, fluorimetric gravimetric analysis, and preparation of standard solutions.

**Pharmacognosy (241/8)**
Credit hours: 6
Lectures: 60 hrs; 2h/w for 30 weeks
Practical: 90 hrs; 3h/w for 30 weeks
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Deals with the morphological and histological structure of different organs of medicinal plants such as leaves, flowers, fruits, seeds, roots, rhizomes and barks. The role of these medicinal plants in the management of different disease conditions is also studied.

**Physiology (251/C)**  
Credit hours: 4  
Lectures: 45 hrs; 3h/w for 15 weeks  
Practical: 45 hrs; 3h/w for 15 weeks  
Covers the normal physiology of different body systems with some emphasis on the physiological changes that accompany diseases. The course covers cardiovascular, respiratory, digestive, nervous (central and peripheral), urinary, endocrine and reproductive systems as well as blood elements.

**Psychology and Sociology (261/C)**  
Credit hours: 2  
Lectures: 30 hrs; 2h/w for 15 weeks  
Practical: None
Covers different theories of Sociology and their application in the pharmaceutical profession. Also the course deals with the psychological basis for emotions, reflexes and psychological treatment. It also covers the assessment of the personality and psychological disturbances.

**Physical Pharmacy (222/3)**
Credit hours: 4
Lectures: 45 hrs; 3h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Covers the physical properties and guidelines for preparation of different pharmaceutical dosage forms such as emulsions, suspensions and colloidal, with emphasis on different theories that control the stability, compatibility and expiry date of pharmaceutical preparations.

**General Microbiology and Immunology (242/7)**
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks

provides an overview on nature of microbial world, properties and classification of virus and fungi, Taxonomy and structure of bacteria, bacterial growth, bacterial physiology and metabolism, microbial genetics, in addition to principles of immunity and immune system.

**Pharmaceutical Organic Chemistry (252/6)**
Faculty of Pharmacy  Ain Shams University
Curriculum of Bachelor Degree in Pharmaceutical Sciences (B.Pharm.Sci)

Credit hours: 7
Lectures: 3 hrs; 3h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks

Covers over study of structures, synthesis, reactions of organic classes such carbonyl compounds, carboxylic acids stereochemistry, and structures and reactions of carbohydrates,

**Human Rights (262/C)**

It’s a university requirement course which deals with human rights nationally and internationally.
### Table (5)
**Study Plan**  
**Second Year**  
**Semester (1)**

<table>
<thead>
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<th>Course Title</th>
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<th>Exam hours</th>
<th>Distribution of different grades on exams</th>
<th>Weekly hours</th>
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<tr>
<td>Pharmaceutical Organic Chemistry and Spectroscopy</td>
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<td>Pharmaceutical Microbiology</td>
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<td>Pharmaceutics</td>
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<td>Biochemistry</td>
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<td>Parasitology</td>
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<td>332/5</td>
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<td>Chemistry of Natural Products</td>
<td>342/8</td>
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<td>Pathology</td>
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3. Second Year Pharmacy: (Total credit hours: 36)

**Pharmaceutical Organic Chemistry & Spectroscopy (311/6)**
Credit hours: 4  
Lectures: 45 hrs; 3h/w for 15 weeks  
Practical: 45 hrs; 3h/w for 15 weeks

Covers the study of spectroscopy and elucidation of chemical structures by UV, IR, NMR, and mass spectroscopy, heterocyclic chemistry, polynuclear aromatic hydrocarbons, amino acids and peptides and lipids.

**Pharmaceutical Microbiology (321/7)**
Credit hours: 3  
Lectures: 30 hrs; 2h/w for 15 weeks  
Practical: 45 hrs; 3h/w for 15 weeks

Covers antimicrobial agents including antibiotics and non-antibiotics, sterilization (heat, radiation, gases, filtration, air, and their validation), and microbiological quality control of pharmaceuticals (hazards associated with contaminated products, raw materials, quality control
Pharmaceutics (331/3)
Credit hours: 6
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Covers topical preparations (ointments, gels, pastes), toothpastes, transdermal drug delivery, pharmaceutical aerosols, suppositories, hair care products, lipsticks, parenterals and other dosage forms.

Biochemistry (341/5)
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Includes the study of cell structure & biological membranes, chemistry of carbohydrates, lipids, amino acids, peptides & proteins, enzyme structure & function, chemistry of nucleotides & nucleic acid, porphyrins & bile pigments & biological oxidation.

Parasitology (351/C)
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
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Covers the study of Helminthes including classes Cestoda & Nematoda, Protozoa including classes Mastigophora, Ciliophora, and Apicomplexa, and Arthropoda including Insecta & Arachnida.

**Instrumental Analysis**  (361/9)  
Credit hours: 3  
Lectures: 30 hrs; 2h/w for 15 weeks  
Practical: 45 hrs; 3h/w for 15 weeks  
Helps students getting acquainted with the different methods of instrumental analysis and their application in the quantitative determination of pharmaceutical compounds. In detail, the course includes the study of spectrophotometry, spectrofluorometry, flame spectroscopy, atomic absorption, polarography, and different techniques of chromatography.

**Pharmaceutics** (312/3)  
Credit hours: 3  
Lectures: 30 hrs; 2h/w for 15 weeks  
Practical: 45 hrs; 3h/w for 15 weeks  
Covers topical preparations (ointments, gels, pastes), toothpastes, transdermal drug delivery, pharmaceutical aerosols, suppositories, hair care products, lipsticks, parenterals and other dosage forms.

**Medical Microbiology** (322/7)
Faculty of Pharmacy  Ain Shams University  
Curriculum of Bachelor Degree in Pharmaceutical Sciences (B.Pharm.Sci)  

Credit hours: 3  
Lectures: 30 hrs; 2h/w for 15 weeks  
Practical: 45 hrs; 3h/w for 15 weeks  
Covers in bacteriology: gram-positive cocci, gram-negative cocci, gram-positive bacilli, mycobacteria, gram-negative bacilli, Yersinia, Mycoplasma, Chlamydia, Rickettsiae, and Spirochetes, in virology: properties, cultivation, detection, growth, pathogenicity, infections, and classification of viruses. Individual classes of viruses are described, in mycology: diagnosis, chemotherapy, pathogenicity, and types of fungal infections.  

**Chemistry of Natural Products  (342/8)**  
Credit hours: 4  
Lectures: 45 hrs; 3h/w for 15 weeks  
Practical: 45 hrs; 3h/w for 15 weeks  
Concerns with the study of carbohydrates, glycosides, tannins, in addition to introduction to chromatography that covers principles, theories and application in natural product analysis.  

**Pathology (352/C)**  
Credit hours: 3  
Lectures: 30 hrs; 2h/w for 15 weeks  
Practical: 30 hrs; 2h/w for 15 weeks  
Covers the basic pathological conditions such as inflammation and healing, bacterial infection (toxemia, septicemia, pyaemia), cell injury (swelling, necrosis, apoptosis), intra- and extracellular
Faculty of Pharmacy  Ain Shams University  
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accumulation (fatty changes, hyaline changes, amyloidosis, pathological calcification, pathological pigmentation), granuloma, tuberculosis, syphilis, leprosy, Rhinoscleroma, Sarcoidosis, Actinomycosis, Moniliasis, parasitic diseases, circulatory disturbances (hyperemia, thrombosis, embolism, ischemia, infarction, gangrene, edema, hemorrhage, shock), disorders of cellular growth and tumors.

**Biochemistry (332/5)**
Credit hours: 6  
Lectures: 30 hrs; 2h/w for 15 weeks  
Practical: 45 hrs; 3h/w for 15 weeks  
Includes the study chemistry, digestion, absorption & metabolism of carbohydrates, lipids & proteins. By the end of the course, student should be able to understand how human body manipulates & utilizes food components & what are the different strategies selected by the body to get enough energy under different environmental, health & dietary status.

**Pharmacy Administration (362/2)**
Credit hours: 1  
Lectures: 15 hrs; 1h/w for 15 weeks  
Practical: None  
Covers fundamentals of administration, function of management, communication skills in pharmacy, principles of hospital pharmacy, community pharmacy practice, and location analysis.
### Table (7)
#### Study Plan
#### Third Year
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<th>Course Title</th>
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<tr>
<td>Industrial Pharmacy</td>
<td>451/4</td>
<td>3</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Pharmaceutical Chemistry</td>
<td>461/6</td>
<td>3</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Pathophysiology</td>
<td>471/C</td>
<td>2</td>
<td>150</td>
<td>120</td>
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<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>Grades=1950</td>
<td>18</td>
</tr>
</tbody>
</table>
Faculty of Pharmacy  Ain Shams University  
Curriculum of Bachelor Degree in Pharmaceutical Sciences (B.Pharm.Sci)  
====================================================================

Table (8)  
Study Plan  
Third Year  
Semester (2)  

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Code #</th>
<th>Exam hours</th>
<th>Distribution of different grades on exams</th>
<th>Weekly hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>Written</td>
</tr>
</tbody>
</table>
| Drug Design           | 412/6  | 3          | 300   | 150     | 60   | 60        | 30      | 3         | 3        | 4
| Pharmacology          | 422/1  | 3          | 300   | 180     | 60   | -         | 60      | -         | 2        | 2
| Clinical Biochemistry | 432/5  | 3          | 300   | 150     | 60   | 60        | 30      | 3         | 2        | 3
| Toxicology            | 442/1  | 2          | 200   | 120     | 40   | -         | 40      | -         | 2        | 2
| Clinical Pharmacy     | 452/2  | 3          | 300   | 150     | 60   | 60        | 30      | 3         | 2        | 3
| Pharmacokinetics      | 462/2  | 3          | 300   | 150     | 60   | 60        | 30      | 3         | 2        | 3
| Industrial Pharmacy   | 472/4  | 3          | 300   | 150     | 60   | 60        | 30      | 3         | 2        | 3
| Total                 |        |            |       |         |      |           |         | 15        | 15       | 20

Grades= 2000

21
4. Third Year Pharmacy: (Total credit hours: 42)

**Pharmaceutics (411/3)**
Credit hours: 3  
Lectures: 30 hrs; 2h/w for 15 weeks  
Practical: 45 hrs; 3h/w for 15 weeks

Includes parenterals (types, solvents, release, preformulation & formulation, containers and closures, stability), ophthalmic products (drugs, penetration, formulation, containers, contact lens products), blood and related products (collection, blood clotting, anticoagulant, blood groups, concentrated human RBCs, dried human plasma, control of blood products, plasma substitutes), complexation and protein binding, radiopharmaceuticals, and non-prescription drugs (dental, ophthalmic, and drugs for treatment of acne, dandruff, seborrhea, psoriasis).

**Pharmacology (421/1, 422/1)**
Credit hours: 5  
Lectures: 60 hrs; 2h/w for 30 weeks  
Practical: 45 hrs; 3h/w for 15 weeks
Faculty of Pharmacy  Ain Shams University
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In the first semester, this course covers general principles of pharmacology (e.g. pharmacodynamics, pharmacokinetics, tolerance, adverse reactions), autonomic nervous system (adrenergic agonists and antagonists, cholinergic agonists and antagonists, neuromuscular blockers), cardiovascular system (antihypertensive drugs, antianginal drugs, antiaryrrhythmic drugs, drugs used in congestive heart failure), gastrointestinal drugs (treatment of ulcers, digestants, antiemetic, antidiarrhial, prokinetic agents), autacoids (histamine and antihistamines, bradykinin and its antagonists, endogenous kallikrein-kinogen-kinin system), eicosanoids and PAF), and drugs for treatment of bronchial asthma. In the second semester, CNS acting drugs (anxiolytics and hypnotics, opioid analgesics, antidepressants, neuroleptics), analgesics, antipyretic and anti-inflammatory drugs, hormones, and chemotherapy (cytotoxics, anthelmentics, antimalarials, antibacterial, antifungal, ant viral) are being taught.

**Biopharmaceutics  (431/3)**
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Covers fundamentals and background principles of biopharmaceutics, biological availability and drug metabolism through studying drug metabolism, absorption, distribution, elimination, and bioavailability. An assessment of biopharmaceutical properties is also elaborated.

**Chemistry of Natural Products  (441/8)**
Credit hours: 4
Faculty of Pharmacy  Ain Shams University
Curriculum of Bachelor Degree in Pharmaceutical Sciences (B.Pharm.Sci)

Lectures: 45 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Concerns with study of alkaloids, volatile oils (separation, preparation, medical application), and techniques used for analysis and quantitative measurement of natural products such as HPLC, gas chromatography, IR, UV, mass spectroscopy, and NMR.

**Industrial Pharmacy (451/4, 472/4)**
Credit hours: 6
Lectures: 60 hrs; 2h/w for 30 weeks
Practical: 90 hrs; 3h/w for 30 weeks
Covers several aspects of formulation, industrial processing, fundamentals of unit operations (drying, extraction, distillation, evaporation, air conditioning and humidification, filtration), fluid flow, heat flow, mass transfer, and materials of fabrication for a pharmaceutical plants. The course also includes manufacturing the product on a small scale, quality control tests, packaging and all the other procedures involved in drug industry.

**Pharmaceutical Chemistry (461/6)**
Credit hours: 4
Lectures: 45 hrs; 3h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Facility of Pharmacy  Ain Shams University  
Curriculum of Bachelor Degree in Pharmaceutical Sciences (B.Pharm.Sci)  
====================================================================
25
Covers antibiotics (β-lactams, tetracyclines, aminoglycosides, chloramphenicol, macrolides), sulfonamides and dihydrofolate reductase inhibitors, antineoplastic, antimalarial, antifungal, antiviral, antiinfective, antiprotozoal, antimycobacterial, antileprosy, antidiabetic drugs. In addition, diuretics, diagnostic agents and immunostimulants are also included.

Pathophysiology (471/C)
Credit hours: 2
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: None
Covers the basic physiological changes that accompany different diseases in the human body. This includes cardiovascular, respiratory, digestive, nervous, urinary, endocrine, reproductive, and blood systems. Also, it covers genetic disorders, malignancy, and epidemic diseases.

Drug Design (412/6)
Credit hours: 4
Lectures: 45 hrs; 3h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Faculty of Pharmacy  Ain Shams University
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An advanced course that covers non-computational drug design (improvement of binding interaction between drug and its target, drug actions at receptors, steric features of drugs, improvement of pharmacokinetics properties of the drugs, quantitative structure activity relationship (2D & 3D), prodrugs), Drug metabolism (phases I & II), adrenergic agents, cardiovascular drugs, hypolipidemic agents, anticoagulants, CNS stimulants, CNS depressants, cholinergics and anticholinergics, antiparkinsonism drugs, local anesthetics, antiallergic drugs, antulcer drugs, and eicosanoids.

**Clinical Biochemistry** *(432/5)*

Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks

Clinical study that includes hormones & their disturbances, liver & kidney function tests, biomarkers of cardiovascular diseases, disorders of carbohydrate, lipid & protein metabolism, prenatal diagnosis, tumor markers, acid-base balance, and molecular biology techniques (PCR, DNA sequencing, Southern blot, cloning, transgenic animal model, site-directed mutagenesis, and applications of recombinant DNA technology in medicine, forensics, environmental health, and pharmaceutical production).

**Toxicology** *(442/1)*

Credit hours: 2
Faculty of Pharmacy  Ain Shams University  
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====================================================================

Lectures: 30 hrs; 2h/w for 15 weeks  
Practical: None  

Covers general principles of toxicology (acute, subacute and chronic toxicity, systemic versus local effects, domestic and occupational exposure, intentional and non-intentional poisoning, mechanisms of toxicity, factors modifying toxicity, chemical carcinogenesis, mutagenesis, teratogenesis, and markers of toxicity), toxic agents (metals, pesticides, animal poisons, plant poisons, food poisoning), environmental toxicology (air pollution, water pollution, biohazards of chemical and biological warfare).

**Clinical Pharmacy  (452/2)**  
Credit hours: 3  
Lectures: 30 hrs; 2h/w for 15 weeks  
Practical: 45 hrs; 3h/w for 15 weeks  

An integrated course that utilizes previous studies in pathophysiology, basic and clinical biochemistry, pharmacology in the design of effective and safe treatment for patients. The course is divided into theoretical lectures and practical discussions that convey to students scientific and practical experience in handling patients.

**Pharmacokinetics  (462/2)**
Faculty of Pharmacy  Ain Shams University  
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====================================================================

Credit hours: 3  
Lectures: 30 hrs; 2h/w for 15 weeks  
Practical: 45 hrs; 3h/w for 15 weeks  

Covers mathematical fundamental, zero and first order kinetics, pharmacokinetics models, one-compartment open model – iv bolus (mathematical treatment, graphical representation, evaluation of pharmacokinetics parameters, excretion, metabolism, clearance, apparent volume of distribution, area under the curve), two-compartment open model – iv bolus, one-compartment open mode – iv infusion, one-compartment open model – extravascular administration, nonlinear pharmacokinetics, multiple drug dosing, clinical applications.

Pharmacology (422/1)  
Credit hours: 5  
Lectures: 30 hrs; 2h/w for 15 weeks  
Practical: 45 hrs; 3h/w for 15 weeks  

In the first semester, this course covers general principles of pharmacology (e.g. pharmacodynamics, pharmacokinetics, tolerance, adverse reactions), autonomic nervous system (adrenergic agonists and antagonists, cholinergic agonists and antagonists, neuromuscular blockers), cardiovascular system (antihypertensive drugs, anti-anginal drugs, antiarrythmic drugs, drugs used in congestive heart failure), gastrointestinal drugs (treatment of
ulcers, digestants, antiemetic, antidiarrhial, prokinetic agents), autacoids (histamine and antihistamines, bradykinin and its antagonists, endogenous kallikrein-kininogen-kinin system), eicosanoids and PAF), and drugs for treatment of bronchial asthma. In the second semester, CNS acting drugs (anxiolytics and hypnotics, opioid analgesics, antidepressants, neuroleptics), analgesics, antipyretic and anti-inflammatory drugs, hormones, and chemotherapy (cytotoxics, anthelmentics, antimalarials, antibacterial, antifungal, ant viral) are being taught.
<table>
<thead>
<tr>
<th>Course Title</th>
<th>Code #</th>
<th>Exam hours</th>
<th>Distribution of different grades on exams</th>
<th>Weekly hours</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>Written</td>
</tr>
<tr>
<td>Clinical Pharmacy</td>
<td>511/2</td>
<td>3</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Clinical Pharmacology</td>
<td>521/1</td>
<td>3</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Pharmacy Practice</td>
<td>531/2/3</td>
<td>3</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Quality Control of Herbal Products</td>
<td>541/8</td>
<td>3</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Biotechnology</td>
<td>551/7</td>
<td>2</td>
<td>200</td>
<td>120</td>
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<tr>
<td>Pharmaceutical Chemistry</td>
<td>561/6</td>
<td>3</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Pharmacy Law</td>
<td>571/C</td>
<td>1</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>First Aid</td>
<td>581/C</td>
<td>1</td>
<td>50</td>
<td>50</td>
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<tr>
<td>Total</td>
<td></td>
<td></td>
<td>Grades=1800</td>
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### Table (10)
#### Study Plan
#### Fourth Year

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Code #</th>
<th>Exam hours</th>
<th>Distribution of different grades on exams</th>
<th>Weekly hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dosage Form Design</td>
<td>512/3</td>
<td>3</td>
<td>Total 300, Written 150, Oral 60, Practical 60, Midterm 30</td>
<td></td>
</tr>
<tr>
<td>Public Health</td>
<td>522/C</td>
<td>2</td>
<td>Total 200, Written 140, Oral 40, Midterm 20</td>
<td></td>
</tr>
<tr>
<td>Analysis of Food and Cosmetics</td>
<td>532/9</td>
<td>3</td>
<td>Total 300, Written 150, Practical 60, Midterm 30</td>
<td></td>
</tr>
<tr>
<td>Good Manufacturing Practice</td>
<td>542/4/9</td>
<td>2</td>
<td>Total 200, Written 120, Oral 40, Midterm 40</td>
<td></td>
</tr>
<tr>
<td>Drug and Poison Information</td>
<td>552/1</td>
<td>1</td>
<td>Total 100, Written 80, Midterm 20</td>
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</tr>
<tr>
<td>Clinical Toxicology</td>
<td>562/1</td>
<td>3</td>
<td>Total 300, Written 150, Practical 60, Midterm 30</td>
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</tr>
<tr>
<td>Elective Course (1)</td>
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</tr>
<tr>
<td>Elective Course (2)</td>
<td>-</td>
<td>3</td>
<td>Total 300, Written - Practical - Midterm -</td>
<td>3 2 3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>Grades= 2000</td>
<td>15 16 21</td>
</tr>
</tbody>
</table>

Distribution of weekly hours and grades for each elective course is applied according to what is mentioned in tables 11-A, 11-B, 11-C of the elective courses. The faculty council sets the regulations that organize teaching these courses.
5. Fourth Year Pharmacy: (Total credit hours: 40)

**Clinical Pharmacy (511/2)**
Credit hours: 3  
Lectures: 30 hrs; 2h/w for 15 weeks  
Practical: 30 hrs; 2h/w for 15 weeks  
Covers hepatology (laboratory investigations, jaundice, acute viral hepatitis, chronic hepatitis, complications), obstetrics (disorders of pregnancy that include hypertension, congestive heart failure, chronic renal failure, diabetes mellitus, thyroid disorders), peptic ulcer, gastroesophageal reflux, and diabetes mellitus (classification, types, lab tests, lines of treatment, insulin)

**Clinical Pharmacology (521/1)**
Credit hours: 3  
Lectures: 30 hrs; 2h/w for 15 weeks  
Practical: 45 hrs; 3h/w for 15 weeks  
Covers lines of treatment for hormone disturbances, anemia, osteoarthritis & osteoporosis, rheumatoid arthritis, epilepsy, parkinsonism, dementia, and hyperlipidemia. Also, the course includes diuretics, general anesthetics and immunopharmacology.
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Pharmacy Practice  (531/3/2)
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Covers parapharmaceutics and health care accessories, medical gases, veterinary pharmaceutical dosage forms, some of the incompatibilities encountered in pharmacy practice, pediatric and geriatric aspects of pharmaceutics, extemporaneous prescription compounding, dispensing of cytotoxics agents, therapeutic drug monitoring, home health care, patient compliance and patient counseling, drug information and pharmaceutical advice, and pharmaceutical care and disease state management.

Clinical Toxicology  (541/1)
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Includes management of poisoning (investigation, differential diagnosis, symptomatic treatment, treatment measures, specific antidotes), medicinal cabinets (salicylates, acetaminophen, cardiac glycosides, tricyclic antidepressants, theophylline, hypervitaminosis), teratogenesis (sensitivity to teratogens, testing for teratogenesis, in vitro tests, hazards for drug use in pregnancy, drugs in breast milk), and drug dependence (cannabis,
Faculty of Pharmacy  Ain Shams University  
Curriculum of Bachelor Degree in Pharmaceutical Sciences (B.Pharm.Sci)

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cocaine, heroin, barbiturates, phencyclidine, amphetamine, designer drugs, sedatives, benzodiazepines, halluciogens, nicotine).

**Biotechnology (551/7)**
Credit hours: 2
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: None
Covers fermentation industry, immobilization technique, biotechnological products (Biomass, enzymes, antibiotics, amino acids, organic acids, vitamins, insulin, monoclonal antibodies, viral vaccines, modification of gene expression), principle of gene therapy, biotransformation, bioinsecticides, biopolymers, biosurfactants, biodegradation, bioleaching of metals, biosensors, biofuels, and genetic engineering (bacterial operon, principles of isolation and purification of nucleic acids (assessment of purity, quantitation), DNA manipulation, selection and screening of recombinants, southern hybridization, site directed mutagenesis, cloning).

**Pharmaceutical Chemistry (561/6)**
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Covers vitamins (water and fat soluble vitamins), hormones (thyroid, corticosteroids, sex hormones, peptide hormones), CNS depressants, aging and antiaging therapies.

**Pharmacy Law (571/C)**
Faculty of Pharmacy  Ain Shams University  
Curriculum of Bachelor Degree in Pharmaceutical Sciences (B.Pharm.Sci) 

Credit hours: 1  
Lectures: 15 hrs; 1h/w for 15 weeks  
Practical: None  
Covers pharmacy laws, regulations of pharmacy practice, and laws that prohibit drugs intake & handling, govern medical services, control chemical & pharmaceutical commercial handling. Fundamentals and applications of Human Rights: general and pharmaceutical aspects.  

**First-Aid (581/C)**  
Credit hours: 1  
Lectures: 15 hrs; 1h/w for 15 weeks  
Practical: None  
The course covers the basic guidelines for handling emergency status such as trauma, myocardial infarction, burns, poisoning, bleeding and coma.  

**Dosage Form Design (512/3)**  
Credit hours: 3  
Lectures: 30 hrs; 2h/w for 15 weeks  
Practical: 45 hrs; 3h/w for 15 weeks  
Covers the study of development and registration of new pharmaceutical formulations, vehicles, polymers, new pharmaceutical forms, and in vitro assessment of dosage forms.  

**Public Health (522/C)**  
Credit hours: 3
Faculty of Pharmacy Ain Shams University
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Lectures: 45 hrs; 3h/w for 15 weeks
Practical: None
Covers definition of public health and preventive medicine, epidemiology, epidemic curve, herd immunity, disease surveillance, disease eradication, morbidity rates, natality rates, mortality rates, methods of epidemiologic studies, communicable diseases, control of communicable diseases, immunobiologic agents (vaccines, toxoid, immunoglobulin, antitoxin), nosocomial infections, non communicable diseases, mental health, mental retardation, occupational medicine, environmental health, nutrition, food microbiology, microbiology of milk, microbiology of water, wastes disposal, and family health.

**Analysis of Food & Cosmetics** (532/9)
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Covers the study of properties, composition, analysis of milk, tests for adulteration, oils & fats, analysis of oils and fats, analysis of cosmetics.

**Good Manufacturing Practice** (542/4/9)
Credit hours: 2
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: None
Aims for introducing students to general guidelines and principles of good manufacturing practice & rules for monitoring and verification of product quality.

**Drug and Poison Information (552/1)**
Credit hours: 1
Lectures: 15 hrs; 1h/w for 15 weeks
Practical: None
Refers to drug & poison database and how to find, retrieve, analyze, and transfer this information. In detail the course covers systematic approaches to answering questions, formulating effective responses, drug information resources, literature evaluation, professional writing, legal responsibility for the provision of drug information, ethical aspects, medication misadventures and errors.

**Quality Control of Herbal Products (562/8)**
Credit hours: 3
Lectures: 30 hrs; 2h/w for 15 weeks
Practical: 45 hrs; 3h/w for 15 weeks
Deals with the principles of quality control: definitions, documentation, environmental monitoring, packaging systems, the finished product, the quarantine, and quality control laboratory. Emphasis on quality control of herbal products is achieved by focusing on major steps in quality control scheme, quantitative chromatographic analysis of herbal products,
storage, preservation, marker determination, validation and applications to the quality control of renal herbals.
### Table (11-A)

**Study Plan (Elective Courses)**

**Fourth Year**  **Semester (2)**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Code #</th>
<th>Exam hours</th>
<th>Distribution of different grades on exams</th>
<th>Weekly hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>Written</td>
</tr>
<tr>
<td>Chemistry and Analysis of Food</td>
<td>601/9</td>
<td>3</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>602/1/6</td>
<td>3</td>
<td>300</td>
<td>180</td>
</tr>
<tr>
<td>Planning, Marketing &amp; Economics of Drugs</td>
<td>603/4</td>
<td>3</td>
<td>300</td>
<td>180</td>
</tr>
<tr>
<td>Clinical Pharmacy</td>
<td>604/2</td>
<td>3</td>
<td>300</td>
<td>180</td>
</tr>
<tr>
<td>Cosmetics</td>
<td>605/3</td>
<td>3</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Hospital Pharmacy</td>
<td>606/2/3</td>
<td>3</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Drug Interactions</td>
<td>607/1</td>
<td>3</td>
<td>300</td>
<td>180</td>
</tr>
</tbody>
</table>

* The specified departments set the curriculum for each course and specify its references in collaboration with one or more other departments according to the faculty council settings. The faculty council sets the regulations that organize teaching these courses.
### Table (11-B)
Study Plan (Elective Courses - continued)

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Code #</th>
<th>Exam hours</th>
<th>Distribution of different grades on exams</th>
<th>Weekly hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>Written</td>
</tr>
<tr>
<td>Clinical Pharmacy Practice</td>
<td>608/2</td>
<td>3</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Dosage Form Design</td>
<td>609/3</td>
<td>3</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Clinical Pharmacokinetics</td>
<td>610/2</td>
<td>3</td>
<td>300</td>
<td>180</td>
</tr>
<tr>
<td>Drug Stability</td>
<td>611/3</td>
<td>3</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Drugs of Abuse and Addiction</td>
<td>612/1</td>
<td>3</td>
<td>300</td>
<td>180</td>
</tr>
<tr>
<td>Nonprescription Drugs (O.T.C)</td>
<td>613/3</td>
<td>3</td>
<td>300</td>
<td>180</td>
</tr>
<tr>
<td>Communications in Pharmacy</td>
<td>614/2</td>
<td>3</td>
<td>300</td>
<td>180</td>
</tr>
</tbody>
</table>

* The specified departments set the curriculum for each course and specify its references in collaboration with one or more other departments according to the faculty council settings. The faculty council sets the regulations that organize teaching these courses.
### Table (11-C)
#### Study Plan (Elective Courses - continued)
##### Fourth Year  Semester (2)

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Code #</th>
<th>Exam hours</th>
<th>Distribution of different grades on exams</th>
<th>Weekly hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>Written</td>
</tr>
<tr>
<td>Drugs Spectrophotometric Quality Control</td>
<td>615/9</td>
<td>3</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Microbiological Quality Control</td>
<td>616/7</td>
<td>3</td>
<td>300</td>
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<tr>
<td>Clinical Nutrition</td>
<td>617/2</td>
<td>3</td>
<td>300</td>
<td>180</td>
</tr>
<tr>
<td>Production of Medicinal and Aromatic Plants</td>
<td>618/8</td>
<td>3</td>
<td>300</td>
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<tr>
<td>Tissue Culture</td>
<td>619/7</td>
<td>3</td>
<td>300</td>
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<td>Industrial Microbiology</td>
<td>620/7</td>
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<td>300</td>
<td>150</td>
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</tbody>
</table>

*The specified departments set the curriculum for each course and specify its references in collaboration with one or more other departments according to the faculty council settings. The faculty council sets the regulations that organize teaching these courses.*
Elective courses

Elective courses are offered during the fourth academic year of study [Final year]. The student is allowed to choose any elective course only once per semester, these electives are:

- Chemistry and Analysis of Food (601/9) 3 (2+3)
- Chemotherapy (602/1/6) 3 (3+0)
- Planning, Marketing & Economics of Drugs (603/4) 3 (3+0)
- Clinical Pharmacy (604/2) 3 (3+0)
- Cosmetics (605/3) 3 (2+3)
- Hospital Pharmacy (606/2/3) 3 (2+3)
- Drug Interactions (607/1) 3 (3+0)
- Clinical Pharmacy Practice (608/2) 3 (2+3)
- Dosage Form Design (609/3) 3 (2+3)
- Clinical Pharmacokinetics (613/3) 3 (3+0)
- Drug Stability (611/3) 3 (2+3)
- Drugs of Abuse & Addiction (612/1) 3 (3+0)
- Nonprescription Drugs (613/3) 3 (3+0)
<table>
<thead>
<tr>
<th>Subject</th>
<th>Code</th>
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<tr>
<td>Communications in Pharmacy (614/2)</td>
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<td>Drug Spectrophotometric Quality Control (615/9)</td>
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<td>Microbiological Quality Control (616/7)</td>
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<td>Clinical Nutrition (617/2)</td>
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<td>Production of Medicinal &amp; Aromatic Plants (618/8)</td>
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<td>Industrial Microbiology (620/7)</td>
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