EHEA bachelor's degree in Pharmacy

First Course	
First Semester	Second Semester
General and Inorganic Chemistry (6 cr)	Organic Chemistry I (6 cr)
Applied Mathematics and Biostatistics (6cr)	Analytical Chemistry (6 cr)
Parasitology (6 cr)	Biochemistry (6cr)
Introduction to laboratory work (3 cr)	Pharmaceutical Botany (6 cr)
Cell Biology (3 cr)	Physical Chemistry I (3cr)
History of Pharmacy (3 cr)	Introduction to Galenic Pharmacy (3 cr)
Physics Applied to Pharmacy (3 cr)	

First Course | Second Course | Third Course | Fourth Course | Fifth Course

Second Course	
First Semester	Second Semester
Organic Chemistry II (6cr)	Pharmaceutical Chemistry I (6cr)
Physical Chemistry II (6cr)	Microbiology I (6cr)
Molecular and Genomics Biology (6cr)	Instrumental Techniques (6cr)
Immunology (4.5cr)	Clinical and laboratory diagnosis (4.5cr)
Physiology and Pathophysiology I (6cr)	Physiology and Pathophysiology II (6cr)

Third Course	
First Semester	Second Semester
Pharmaceutical Chemistry II (6cr)	General Pharmacology (6cr)
Microbiology II (6cr)	Galenical Pharmacy I (6cr)
Physiology and Pathophysiology III (6cr)	Biopharmacy and Pharmacokinetics II (3cr)
Plant physiology (6cr)	Nutrition and Food Science (9cr)
Biopharmacy and Pharmacokinetics I (3cr)	Pharmaceutical Legislation and Professional Ethics (3cr)
Experimentation in Organic and Pharmaceutical Chemistry (3cr)	

First Course | Second Course | Third Course | Fourth Course | Fifth Course

Fourth Course

First Semester		Second Semester	
Pharmacology and Therapeutics I (6cr)		Pharmacology and Therapeutics II (6cr)	
Galenical Pharmacy II (6cr)		Public Health (6cr)	
Pharmacognosy (6cr)		Clinical Pharmacy and Pharmaceutical Care (6cr)	
		Toxicology (6cr)	
Mention of Assistential Pharmacy and Clinical Analysis	*Mention of Industrial Pharmacy and Pharmaceutical Research*	*Mention of Assistential Pharmacy and Clinical Analysis*	*Mention of Industrial Pharmacy and Pharmaceutical Research*
Clinical Microbiology and Parasitology (6cr)	Analysis and Control of Medicines and Health Products (3cr)	Phytotherapy (3cr)	Galenical Pharmacy III and Quality Management (6cr)
Management and Planning (6cr)	Pharmaceutical Biotechnology: Research (3cr)	Clinical Biochemistry and Molecular Pathology (3cr)	
	Pharmaceutical Biotechnology: Industry (3cr)		
	Genetic Engineering (3cr)		

Fifth Course

First Semester		Second Semester
Health and environmental management (6cr)		**Traineeships supervised (24cr)**
		Final Grade Work (6cr)
Mention of Assistential Pharmacy and Clinical Analysis	***Mention of Industrial Pharmacy and Pharmaceutical Research***	
Pharmacy Care (3cr)	**Pharmacology and toxicology in R+D+I (6cr)**	
Magistral and Officinal Formulation (3cr)	**Optional Subjects (18cr)**	
Optional Subjects (18cr)		

First Course | Second Course | Third Course | Fourth Course | Fifth Course

Optional Subjects

Mention of Assist. Pharmacy &Clinical Analysis	*Mention of Industrial Pharmacy &Pharmaceutical Research*
Bioethics Pharmaceuticals (3cr)	Structural Analysis of Drugs (3cr)
Human Biochemistry (3cr)	Clinical Trials and Pharmacovigilance (3cr)
Nutritional and Food Advise (3cr)	Molecular Basis of Cancer (3cr)
Chronobiology in Pharmacy (3cr)	Plant Biofactories for Pharmaceutical Products (3cr)
Dermopharmacy (3cr)	Biopharmacy and Pharmacokinetics Advanced (3cr)
Substance Abuse Dependence (3cr)	Biomembranes: Physicochemical aspects (3cr)
Pharmacoeconomics and Pharmaceutical Marketing (3cr)	Management of Water, Waste and Contaminated Sites in the Industry (3cr)
Hematology (3cr)	Molecular Pharmacology (3cr)
Immunodiagnosis (3cr)	Drug Design (3cr)
Parasites and Food (3cr)	Industrial Microbiology (3cr)
Health Promotion (3cr)	Medicinal Plants, Ethnobotany & bioprospecting (3cr)
Virology and Human Health (3cr)	Industrial Pharmaceutical Technology (3cr)

General and Inorganic Chemistry (6 cr): Atomic structure. Chemical bonds. Molecular structure and shape. Thermodynamic and kinetic aspects of chemical reactions. Acids and bases. Equilibrium solubility. Oxidation-reduction reactions. Chemistry of s- and p-block metals. Chemistry of non-metallic elements and their compounds. Chemistry of transition metals and coordination compounds.

Applied Mathematics and Biostatistics (6cr): Applied Mathematics. Differential Calculus. Integral Calculus. Models with differential equations. Biostatistics. Descriptive statistics and introduction to probability. Point and interval estimation. Classical hypothesis testing. Linear regression.

Parasitology (6 cr): Parasitology. Parasitism: concept and modalities. Cycles of parasites. Parasitic specificity. Pathogenesis of the parasitism. Protozoa: phyla *Sarcomastigophora, Apicomplexa, Ciliophora*, and *Microspora*. Metazoa: phyla *Plathelminthes, Nematoda* and *Arthropoda*.

Introduction to laboratory work (3 cr): Quality systems in the laboratory. Waste management. Security systems in the biological laboratory. Protocols of reception and registration of chemical and biological samples. Preservation and handling of samples. Labelling and pictograms. Laboratory techniques. Microscopy and Optical estereomicroscopy. Basic equipment and tools of laboratory. Glassware and basic laboratory equipment. Scales: description and use. Solutions (weight-weight, weight-volume, volume-volume). Determination of pH indicators and pH-meters. Experimental data: analysis, presentation and discussion of results.

Cell Biology (3 cr): The cell as a structural and functional unit of living systems. Cell membranes. Endoplasmic reticulum. Golgi apparatus. Exocytosis and endocytosis. Lysosomes. Mitochondria and peroxisomes. Cytoskeleton. Microtubules and actin filaments. Extracellular matrix. Cell junctions. Cell Adhesion. Cell nucleus. The eukaryotic genome. Organization of chromosomes. Biogenesis of ribosomes: the nucleolus. Cell cycle and its regulation. Mitosis. Meiosis.

History of Pharmacy (3 cr): Symbolic pharmacy. Symbolic homeopathy. Early pharmacy technology. China. India. Greco-Roman pharmacy. Byzantium: galenism compilation. The Arab world developments. The latin pharmacy. Renaissance: anatomy, epidemiology and physiology. Pharmaceutical chemistry. Alchemy pharmaceutical. Experimental Methodology. The Enlightenment. Chemistry. Botany. Homeopathy. Vaccination. Positivism. Darwinism. Medicine, experimental science. Microbiology. Industrialization of medicine. Anesthesia, antisepsis, asepsis. Analgesics, chemotherapy, antibiotics. Pharmacy and science. Scientific revolutions in the pharmacy.

Physics Applied to Pharmacy (3 cr): Units. Dimensions of physical quantities. Dimensional analysis. Waves. Electromagnetic waves. Interference. Optical imagery. Fluids. Aggregation states of matter. Fluid mechanics. General Thermodynamics. Thermodynamic Systems. Spontaneous transformation.

Organic Chemistry I (6 cr): Introduction of organic chemistry. Features of organic compounds. Alkanes. Cycloalkanes. Functionalized compounds containing single bonds. Stereoisomerism and chirality. Alkenes and alkynes. Conjugated systems. Carbonyl compounds. Nitrogen compounds containing multiple bonds. Benzene and aromaticity.

Analytical Chemistry (6 cr): Introduction to the analytical process. Fundamentals and applications of volumetric and gravimetric analysis. Types of analytical reactions. Acid-base balance. Regulatory solutions and regulatory capacity of pH. Formation of complexes. Oxidation-reduction. Solubility. Gravimetric analysis. Fundamentals and applications of instrumental analysis. Calibration. Quality parameters. UV-visible molecular absorption. Analytical Applications. Methods of separation. Liquid-liquid extraction. Chromatographic separations. Analytical applications.

Biochemistry (6cr): Structure of proteins and enzyme catalysis. Relationship between structure and function of proteins. Catalytic activity and enzyme kinetics. Regulation of enzyme activity. Metabolism: pathways of synthesis and degradation. Mechanisms regulating enzyme activity. Principles of bioenergetics. Free energy. Hormonal control of metabolism. Biosignalling. Glycolysis. Gluconeogenesis. Pyruvate dehydrogenase complex and the citric acid cycle. Electron transport chain and oxidative phosphorylation. Route pentose phosphate. Glycogen metabolism. Degradation and synthesis of fatty acids. Metabolism of cholesterol and lipoproteins. Metabolism of amino acids and urea cycle. Biosynthesis and degradation of nucleotides. Integration of metabolism.

Pharmaceutical Botany (6 cr): Botany. Definition of plant. Pharmaceutical botany. Multiplication. Biological cycles. Levels of organization. Systematic Botany. Records of plant biodiversity. Algae.Fungi. Plants with seed. Groups of pharmaceutical interest.

Physical Chemistry I (3cr): Equilibrium. Phase diagrams of single substances. Ideal solutions. Non-ideal solutions. Colligatives properties of solutions. Phase equilibrium of multicomponent systems. Chemical equilibrium.

Introduction to Galenic Pharmacy (3 cr): Galenic Pharmacy as part of pharmacy and pharmacist functions. Drug: definition and concepts. Bibliography and bibliographical sources. Drug administration. Routes of administration. Classification of drug dosage forms. Drug disposition and modification in the body. Concept of dose. Efficacy, safety and stability of drugs. Formulation and preparation of drugs: basic concepts. Interpretation of pharmaceutical formulations. Pharmaceutical unit operations.

Organic Chemistry II (6cr): Reactions of compounds containing single bonds. Organic reactions: general concepts. Aliphatic nucleophilic substitution reactions. Elimination reactions. Reactions of unsaturated hydrocarbons. Reactions of benzene and its derivatives. Aromatic heterocycles. Reactions of carbonyl compounds. Aldehydes and ketones. Nucleophilic addition reactions. Carboxylic acids and their derivatives. Substitution reactions on the acyl group. Carbonyl compounds. Reactions at the α-position and condensation reactions.

Physical Chemistry II (6cr): Physical Kinetics. Transport processes. Determination of the viscosity. Surface Chemistry. Interfaces. Capillarity. Surfactants and tensioactives. Thermodynamics of surfaces. Characteristics of colloidal systems. Kinetic properties. Optical properties. Electrical properties: isoelectric point. Chemical kinetics. Reaction models. Effect of temperature on reaction rate. Theoretical kinetic models: the theory of collisions and the transition state. Potential energy surfaces. Reactions in the gas phase and in solution. Catalysis. Photochemistry.

Molecular and Genomics Biology (6cr): Anatomy of the genomes. DNA as genetic material. Prokaryotic genome. Eukaryotic genome. Genotype. Phenotype. Dominance. Genome replication and cell division. Mutations and DNA repair. Recombination. Transcription. Control of the onset of transcription in prokaryotes and in eukaryotes. Triggers. Interaction between transcription factors and the preinitial complex. Repressors of eukaryotic transcription. Accessibility of the genome. Synthesis and processing of RNA. RNA synthesis in bacteria. Synthesis of mRNA in eukaryotes. Elimination of introns (splicing). Synthesis and processing of non-coding RNA. Transport and degradation of RNA. Role of tRNA in protein synthesis. The genetic code. Structure of ribosomes. Postraductional processing. Regulation of genome activity.

Immunology (4.5cr): Introduction to the immune system. Natural or innate immune response. Specific or acquired immune response. Cellular bases of immunity. Cells of the immune system. Lymphoid organs and tissues. Molecules of the immune system. Antigens. Receptors. Major histocompatibility complex (MHC). Adhesion molecules and their ligands. Complement system. Cytokines. Regulation of the immune response. Maturation of T and B cells. Mechanisms of antigen presentation. Molecular basis of lymphocyte activation. Effector mechanisms in T helper cells and T cytotoxic and regulation of the response. Immune response to infections and parasites. Vaccines. Immunodeficiencies. Response mediated by IgE and allergy. Autoimmunity. Immunology of transplantation. Tumor Immunology. Immunopharmacology.

Physiology and Pathophysiology I (6cr): Structure and function of the human body. Anatomy and Physiology. Pathophysiology. Internal environtment and homeostasis. Regulatory systems of the body. Concept of health and disease. Tissues. Principles of support and movement. Skeletal and muscular systems. Arthritis and osteoarthritis. Cellular physiology. Communication in the nervous tissue. Physiology of muscle contraction. Nervous system. Pain. Special senses. Motor functions. Autonomic nervous system. Central nervous system. Sleep and sleep disorders. Seizures. Dementia. Psychiatric disorders..

Pharmaceutical Chemistry I (6cr): Introduction to pharmaceutical chemistry. Introduction to the synthesis of enantiomerically pure drugs: preliminary concepts. Enantiomers and biological activity: enantioselectivity in drug-target interactions. Synthesis of enantiopure compounds: methodology and representative examples. General principles of drug synthesis. Synthesis of arylalkylamines, aryloxypropanolamines, arylacetic acids, aryloxyacetic acids and related compounds. Synthesis of drugs containing non-aromatic heterocyclic systems. Synthesis of drugs containing non-condensed aromatic heterocyclic systems. Synthesis of drugs containing condensed heteropolycyclic systems. Semisynthesis of β-lactam antibiotics.

Microbiology I (6cr): The microbial word. Basic microbiological techniques. Bacterial morphology, structure and function. Metabolism and growth of bacteria. Bacterial genetics. Viruses and their characteristics. Fungi and their characteristics.

Instrumental Techniques (6cr): Introduction to instrumental techniques. Analytical process. Instrumental Analysis. Classification of instrumental techniques. Instrument components. Spectroscopic techniques. Electrochemical techniques. Separation Techniques.

Clinical and laboratory diagnosis (4.5cr): The analytical process. Pre-test phase. Analytical phase. Post-test phase. Biochemical Analysis. Hematological Analysis. Immunological analysis. Microbiological Analysis. Parasitological analysis.

Physiology and Pathophysiology II (6cr): Introduction. Physiology and Pathophysiology of the Blood and Haemostasis. Inflammation and Pathophysiology of the Immune System. Disorders of cell differentiation and proliferation. Physiology and Pathophysiology of the Integumentary System . Physiology and Pathophysiology of the Cardiovascular System. Physiology and Pathophysiology of the Digestive System.

Pharmaceutical Chemistry II (6cr): Organic compounds, drugs and medicines. Stages in the action of drugs. Discovery and Drug Development. Physicochemical properties and activities of drugs. Metabolism of drugs. Metabolic consequences. Interactions between drugs and their biological targets. Molecular topology and biological activity. Strategies in pursuit of new structures active. Optimization of prototype: structure-activity relationships qualitative and quantitative. Families of representative drugs.

Microbiology II (6cr): Bacteriology. Taxonomic organization of the bacteria. Pathogenicity factors. Systematic microbiology. Microorganism-animal host interactions. Spiral-Shaped Gram-negative rods. Proteobacteria. Gram-negative anaerobic bacteria. Gram-positive bacteria. Actinobacteria. Virology. Taxonomy and viral diversity. Viruses. Subviral particles. Mycology.

Physiology and Pathophysiology III (6cr): Anatomy and physiology of the respiratory system. Disorders of ventilation. Lung cancer. Anatomy and physiology of the urinary system. Disorders of renal function. Acid basic balance. Endocrine system: functions and general organization. Pituitary gland. Thyroid gland. Adrenal gland. Endocrine pancreas. Calcemia and phosphatemia. Pathophysiology of the endocrine system. Thermoregulation. Anatomy and physiology of the reproductive system. Disorders of the reproductive system.

Plant physiology (6cr): Introduction and General Concepts. Structural and functional characteristics of plant cell. Obtaining resources and energy. Primary Metabolism. Secondary Metabolism. Growth and development. Introduction to Plant Biotechnology.

Biopharmacy and Pharmacokinetics I (3cr): Introduction to Pharmacokinetics and Biopharmacy. Description and objectives of the various processes and access of the drug by the body. System LADMER. Biopharmaceutical classification of drugs. Non-compartmental kinetic treatment.

Experimentation in Organic and Pharmaceutical Chemistry (3cr): Safety regulations in the chemical laboratory and structural determination by spectroscopic methods. The laboratory notebook. Introduction to structural determination of organic compounds by spectroscopic methods. Techniques of laboratory work and chemical application in the synthesis of various drugs and other organic compounds.

General Pharmacology (6cr): The Pharmacology. Drug, active principle and medicine. Historical evolution and relationship with other disciplines. Molecular mechanisms of pharmacological action. Pharmacokinetics. Adverse effects and interactions. Pharmacological modulation of neurotransmission systems and cellular mediators. Clinical Pharmacology. Drug Development. Factors that influence the drug action. Use of drugs in sport. Use of drugs for diagnosis. Veterinary Pharmacology.

Galenical Pharmacy I (6cr): Drug preformulation. Characteristics of the active ingredient and dosage form. Test compatibility and stability. Pharmacotechnic specifications. Drug packaging. Water for pharmaceutical use. Liquid dosage forms: solutions, suspensions, emulsions and new liquid dosage forms. Semi-solid dosage forms: ointment, suppositories, pessaries. Sterile dosage forms. Lyophilization. Sterile dosage forms for parenteral administration. Sterile ophthalmic pharmaceutical forms of administration. Quality Control.

Biopharmacy and Pharmacokinetics II (3cr): Bioavailability and bioequivalence. Pharmacokinetic compartmental. Relations PK / PD. Biopharmaceutical aspects of the different routes of administration.

Nutrition and Food Science (9cr): Concepts and areas. Nutritional needs and nutritional recommendations. Carbohydrates. Lipids. Proteins and amino acids. Vitamins. Minerals. Water and electrolytes. Other compounds. The food chain. Stability and quality of food. Legislation. Security. Analysis and control of food. Healthy Diets. Food and nutrition throughout the life. Food and sport. The diet as a cause and protection against disease. Intolerance, food allergies and congenital metabolic disorders.

Pharmaceutical Legislation and Professional Ethics (3cr): Pharmaceutical Legislation. European Union and legislative harmonization. Medicinal products for human use prepared industrially. Clinical trials. Pharmacovigilance. Generic drugs. Special Medications. Medicines that can be advertised. Magistral and officinal formulas. Rational use of medicines. Medical prescription. Medical devices. Cosmetics. Medicines for veterinary use. Establishments manufacturing, distribution and dispensing of medicines. Pharmaceutical industry. Pharmaceutical distribution. Hospital pharmacy services. Pharmacies.

Pharmacology and Therapeutics I (6cr): Pharmacology and treatment of disorders of the immune system. Pharmacology of inflammatory and rheumatic disorders. Pharmacology and treatment of gastrointestinal disorders. Pharmacotherapy of disorders of the respiratory system. Pharmacology and therapeutics for infectious and parasitic diseases. Anti-cancer pharmacology and therapeutics. Dermatologic Pharmacology. Ocular Pharmacology.

Galenical Pharmacy II (6cr): Solid pharmaceutical forms. Division of solids applied to obtain pharmaceutical forms. Agglomeration of individual systems applied to obtain pharmaceutical forms. Drying applied to obtain pharmaceutical forms. Capsules. Tablets. Coating. Other solid dosage forms. Aerosols for inhalation. Systems not pressurized dispensers. Modified-release dosage forms. Osmotic tablets, arrays, and other bioadhesive systems. Transdermal systems. Diffusion pumps and implants. Radiopharmaceuticals. Veterinary Drugs. Health Products. Medical devices.

Pharmacognosy (6cr): Concept and content of Pharmacognosy. Obtainance and storage of drugs. Morphology of drugs. Chemical constituents of the drug. Quality control of drugs and plant products extraction. Use of drugs and its principles. Research on new drugs from natural sources. Primary metabolic compounds and derivatives. Carbohydrates. Gums and mucilage. Heparin and heparinoids. Polysaccharide immunomodulators. Amino acid derivatives. Peptide and protein hormones. Blood. Lipid substances. Polyphenols. Terpenoids. Alkaloids. Analgesics. Central stimulants. Blockers on the neuromuscular junction.

Clinical Microbiology and Parasitology (6cr): Purpose of Clinical Microbiology and Parasitology. Community and nosocomial infections. Laboratory methods for studying and monitoring of microorganisms. Epidemiological control of infections.Diagnosis of urinary tract infections. Diagnosis of infections of the gastrointestinal tract. Diagnosis of systemic infections.Diagnosis of respiratory infections. Diagnosis of infections of the genital tract. Diagnosis of infections of the nervous system. Diagnosis of infections of the skin and subcutaneous tissues. Antimicrobial susceptibility.

Management and Planning (6cr): General Concepts. The economic system: production and consumption. The budget as a management tool. Market and Product. Structure of the pharmaceutical companies. Pharmacoeconomics. Planning and management of pharmacy. Quality management. Safety and risk prevention. Analysis of the performance of the pharmacy. Techniques to improve the performance of the pharmacy. Merchandising. Taxes and fees to the pharmacy. Internal management and planning hospital pharmacy services and health centers.

Analysis and Control of Medicines and Health Products (3cr): Analysis and control of medicines. Introduction to analysis and control of drugs. Case studies related to the analysis and control of drugs. Analysis and control of health products. Introduction to analysis and control of medical devices. Equipment care and modern dressings. Equipment hygiene and protection. Products and orthopedic support. Accessories for inhalation and ventilation. Contraceptive Products. Diagnostic Products.

Pharmaceutical Biotechnology: Research (3cr): The recombinant DNA, a biotechnology revolution. Identification and validation of new therapeutic targets. Computers and drug design. Molecular tools for diagnosis and prognosis of diseases. Pharmacogenomics and pharmacogenetics. Using genetically modified animals. Gene Therapy. Enzymes as therapeutic agents.

Pharmaceutical Biotechnology: Industry (3cr): Microbial Biotechnology. Metagenomics. Microbial cell factories for the production of non-microbial protein source. The industrial culture medium. Predictive models. Application of prior process to the penicillin production. Zooming. Strategies for the recovery of biotechnological products. Plant Biotechnology. Production systems in two phases. Biotransformation in plant systems. Metabolic engineering. Production of therapeutic proteins in plants. Biotechnology & Drugs. Stability studies of biological and biotechnological products. Quality requirements. Criteria for acceptance. Standards of good manufacturing of biological and biotechnological products. Clinical trials and biotechnological drugs. Orphans and biosimilar biotechnological drugs.

Genetic Engineering (3cr): Recombinant DNA technology. Mutagenesis. Advanced Techniques and application of PCR. Transfection and selection of genes in mammalian cells. Analysis of gene expression. Analysis of gene function using RNAi. Analysis of gene function using animal models. Genetic engineering in plants.

Pharmacology and Therapeutics II (6cr): Pharmacology of neurologic and psychiatric disorders. Pain management. Pharmacology of endocrinologic and metabolic disorders. Pharmacology of urologic and gynecologic disorders. Pharmacology of hematologic disorders. Pharmacology of cardiovascular disorders.

Public Health (6cr): Basics. Epidemiology and Population Health. *Public health. Preventive Medicine. Community Health.Data and statistics used in epidemiology. Demographics Healthcare.* Communicable Diseases: epidemiology and prevention. Chronic diseases: epidemiology and prevention.

Clinical Pharmacy and Pharmaceutical Care (6cr): History, evolution, functions and applications of clinical pharmacy. Drug selection. Drug Information. Dispensing drugs systems. Intravenous Mixtures. Artificial nutrition. Use of drugs and patient information. Interpretation of clinical history. Compliance with the prescription. Safe use of drugs. Pharmacoepidemiology. Clinical trials. Drug Research. Methodological bases of clinical pharmacokinetics. Pharmacogenetics. Therapeutics in pregnancy and breastfeeding. Paediatric Clinical Pharmacy. Geriatric Clinical Pharmacy. Pharmaceutical Care.

Toxicology (6cr): Introduction to Toxicology. Epidemiology of poisoning. Toxicokinetics and Toxicodinamics. Absorption, distribution and disposal of toxic. Metabolism of toxic. Molecular and cellular mechanisms of action of toxic. Genotoxicity and carcinogenicity. Toxicology of organs and systems. Diagnosis and treatment of poisoning. Evaluation of toxicity. Topics of toxicological interest. Environmental Toxicology. Drug Addiction. Medications: Acute toxicity and RAMS.

Phytotherapy (3cr): Phytotherapy: concept and content. Preparations and administration forms of herbal medicine. The phytotherapy drug: Rules. Safety and efficacy of phytotherapy preparations. Phytotherapy of the central nervous system. Phytotherapy of pain Phytotherapy of the respiratory system. Phytotherapy of the cardiovascular system. Phytotherapy of the genitourinary system. Phytotherapy of the digestive system and metabolism. Immunomodulators and adaptogens. Dermatological phytotherapy.

Clinical Biochemistry and Molecular Pathology (3cr): Changes in carbohydrate metabolism. Changes in lipid metabolism. Liver Disorders. Calcium, phosphorus and bone. Pregnancy. Assessment of renal function. Evaluation of the electrolyte balance. Alterations of acid-base balance. Alteration of purine and pyrimidine metabolism. Cancer.

Galenical Pharmacy III and Quality Management (6cr): Quality management in the pharmaceutical industry. Concept for the pharmaceutical industry. Applying a system of quality assurance. Types of laboratories and content of the technical facilities. Implementation of best practices in pharmaceutical studies and validation of rating. Pharmaceutical validation. Planning for pharmaceutical production. Requirements for class IV drugs. Industrial production of drugs. Drug stability. Field trip-visit to pharmaceutical laboratory.

Health and environmental management (6cr): Environment and sustainability. Pollution and contaminants. Chemical, biological and physical pollution. Quality and environmental management. Air quality and atmospheric environment management. Quality and water management. Waste Management. Management of contaminated soil. Energy management. Management and control of urban pests. Environmental management in pharmaceutical activity.

Pharmacy Care (3cr): Community pharmacy, hospital and primary care at the state level and in Catalonia. Coordination between different levels of care. Development of protocols and guidelines Drug Therapies. Pharmacotherapy follow-up in cardiovascular diseases. Pharmacotherapy follow-up in metabolic disorders. Pharmacotherapy follow-up in respiratory disorders. Pharmacotherapy follow-up in psychiatric disorders. Pharmacotherapy follow-up in addictions. Pharmacotherapy follow-up in AIDS. Pharmacotherapy follow-up in treatment of pain. Home care and care-partner. Polytherapy. Pharmacotherapy follow in other situations.

Magistral and Officinal Formulation (3cr): General Concepts. Magistral formulations and officinal preparations. Therapeutic potential of officinal and magistral drugs. Legal framework. Recipes, type and valuation. Bibliography of interest about magistral formula and officinal preparations. Raw materials, suppliers, documentation. Organization of a laboratory of magistral formulation. Stability and expiry landslides of magistral formulations and officinal preparations. Labelling. Fitting. Pharmacy forms. Oral solid forms. Non-sterile liquid forms. Sterile liquid forms. Semi-solid and solid forms of application on mucous membranes. Forms of application to skin.

Pharmacology and toxicology in R+D+I (6cr): Overview of the pharmaceutical industry. Stages in the process of discovery and development of new drugs. Legal framework. Search and validation of new therapeutic targets. Structure and geometry of protein targets. Drug screening. Tools to evaluate the efficacy and pharmacological activity. Molecular studies and animal models. Tools to evaluate the pharmacokinetics and toxicokinetics. Safety pharmacology. Tools to assess toxicity. Development planification. Evaluation of safety margins in different phases of the drug development. Working under Good Laboratory Practice (GLP). Other approaches to R & D in the pharmaceutical industry. Assessment of toxicity in other areas of R & D.

Traineeships supervised (24cr): Traineeships can be performed in a Pharmacy office or in Hospital Pharmacy. Pharmacy office: learning in the receptor centre. Hospital Pharmacy: learning in the receptor centre. Formative-reflexive memory directed to professional competences. Work about pharmaceutical education to the citizen.

Final Grade Work (6cr): Presentation and defense of a university degree final project consisting of an exercise to integrate the training content received and the skills acquired during undergraduate studies. The objective of this work is to provide students with an appropriate academic framework that allows: 1. Relation, explore and rationally manage the training content received through the grade and apply them in developing a topic of interest in the pharmaceutical field. 2. Implement specific skills acquired over the degree of Pharmacy in that development. It can be developed from: A) The review, documentation and research literature. B) The development of a research project in University Departments. C) Activities carried out in companies or other institutions (hospitals, health centers, clinical laboratories, pharmaceutical companies, pharmacies, research centers and other accredited centers).

Bioethics Pharmaceuticals (3cr): Bioethics: concept, general principles and international agreements. Oviedo Convention. Bioethics and Law. Ethical aspects of pharmaceutical research. Orphan Drugs. Ethical aspects of advertising of medicinal products. Immigration and bioethics. International cooperation: NGO's pharmaceutical. Human rights and access to medicinal products. Bioethical Dilemmas in the origin and end of human life. Ethics and professional ethics.

Human Biochemistry (3cr): Nutrients: basic concepts. Formation of reactive oxygen species in aerobic metabolism of nutrients. Antioxidant systems. Gastrointestinal system and its role in the control of food intake and metabolism. Mechanisms of metabolic regulation. Nervous system. Liver. Muscle metabolism. Biochemistry of adipose tissue. Integration of metabolism.

Nutritional and Food Advise (3cr): Legislative aspects and definition of food supplement, specific feeds, food for risk population. Relationships between health problems and risk populations. Specific use of food supplement. Food for special use: celiac, food substitutes, food for infants and children.

Chronobiology in Pharmacy (3cr): Introduction to Chronobiology. The time in living beings. Importance of biological rhythms in health sciences. Types of biological rhythms. Methods for analysis. Endogenous nature of the circadian rhythms. Changes in circadian rhythms. Entrainment and synchronization of biological rhythms. Anatomy and Physiology of the circadian system. Circadian rhythms in humans and its alterations. Applied Chronobiology.

Dermopharmacy (3cr): General concepts and scope of the Dermopharmacy. Legal aspects: Spanish and European legislation. Computer tools and literature in the field of cosmetology and Dermopharmacy. Structure and physiology of the skin: dermopharmaceutical implications. Skin types. Cosmetic forms and general items for cosmetics formulation. General rating of dermopharmaceutics products. Emulsions and creams. Foamy products. Other forms of preparation and application in cosmetics. Perfumes and colognes. Sensory analysis of raw materials and finished cosmetic products.

Substance Abuse Dependence (3cr): Definitions, general and specific concepts. Epidemiology and risk associated. Social and health impact. Prevention and control strategies. Smoking. Alcoholism. Other Addictions: Cannabis, Cocaine, Heroin, Amphetamines and MDMA, ecstasy, hallucinogens, opiates and psychotropic abuse. The Substance Abuse Care Network. Role of the pharmacist.

Pharmacoeconomics and Pharmaceutical Marketing (3cr): Economics, health economics and pharmacoeconomics. Drug policies: global, national and local. Pharmacoeconomic analysis. Different types of pharmacoeconomic analysis. Case studies. Pharmaceutical Marketing: concept and specific characteristics. Marketing Department: Organisation and human resources (HR). Pharmaceutical market. Market research: definition and justification. Market Segmentation: Concept and bases of segmentation. Pharmaceutical products. Analysis of the product portfolio. Positioning: objectives and analysis. Communication and media promotion. Distribution Channels.

Hematology (3cr): Introduction to the study of Hematology. Hematopoiesis. Blood. Complet Blood Count. Anemia. Alterations of leukocytes. Bone marrow failure. Myelodisplastic syndromes. Myeloproliferative neoplasms. Acute myeloblastic leukemia and acute lymphoblastic leukemia.

Immunodiagnosis (3cr): Basic techniques of the laboratory of immunology. Immunochemistry. Specific antibodies. Cellular immunity. Immunogenetics. Immunoallergy. Diagnostic tests for immune-based diseases. Immunodeficiencies. Autoimmune diseases. Allergy. Lymphoproliferative diseases. Transplantation. Immunotherapy.

Parasites and Food (3cr): General concepts. Parasites with health importance present in water and raw vegetables. Analysis and treatment of drinking, irrigation and plants water. Parasites with health importance present in meat. Terms of preservation and processing of meat. Parasites with health importance present in fish. Terms of preservation and processing of fish. Parasites with health importance present in other foods. Conditions and conservation treatment. Arthropodes and food. Parasite causing deterioration of food.

Health Promotion (3cr): Concept and functions of the Health Promotion. The promotion of health as a process of intervention: environment. Definition and objectives of Health Education. The vaccination as a strategy for the Health Promotion. The screening as a strategy of population prevention. Screening for cardiovascular disease. The colorectal cancer screening. Screening for sexually transmitted infections.

Virology and Human Health (3cr): Introduction. How do viruses cause disease. Host resistance to viral infections. Methods of laboratory diagnosis and viral manipulation. Control of viral diseases by immunization, general aspects. Treatment of viral infections with antiviral drugs. Specific infections.

Structural Analysis of Drugs (3cr): Methods for determining the molecular structure. Ultraviolet-Visible Spectroscopy and Infrared Spectroscopy. Nuclear Magnetic Resonance Spectroscopy. Spin-spin coupling. Mass Spectrometry. Biomedical applications of spectroscopic methods. Structural Analysis of Drugs.

Clinical Trials and Pharmacovigilance (3cr): Introduction. Regulations on clinical trials. Development of a drug: a clinical trial phases. Methodology and design of clinical trials. Introduction to Good Clinical Practice (GCP). Results and problems of interpretation of clinical data. Publication of clinical data and evaluation of the literature. Pharmacological Studies. Recent agents in clinical trials and innovations. Decision-making in health care based on scientific evidence.

Molecular Basis of Cancer (3cr): Introduction to Cancer. Molecular basis of cell proliferation. Molecular basis of apoptosis. Tumor suppressor genes involved in the machinery regulating cell cycle. Signal transduction pathways. Cancer Therapy and Pharmacogenetics.

Plant Biofactories for Pharmaceutical Products (3cr): Introduction. Plant Biotechnology. Concepts and relations with other sciences. Special features of the plant cell in relation to other living organisms and systems used in biotechnology. *In vitro* plant cultures. *In vitro* plant cultures as vehicles for genetic transformation. Applications of Plant Biotechnology in the chemical-pharmaceutical sector. Ethical and legal considerations.

Biopharmacy and Pharmacokinetics Advanced (3cr): Introduction: applications of Biopharmacy and Pharmacokinetics in drug development and clinical practice. Design and evaluation of new drug release systems. Studies in vitro and in vivo. Biopharmacy. Transdermal delivery systems. In vitro-in vivo correlations. Bioequivalence studies. Pharmacokinetics. Toxicokinetics studies. Introduction to population of pharmacokinetic analysis. Applications of Biopharmacy and Pharmacokinetics in clinical practice (Human and Veterinary). Pharmacokinetic-pharmacodynamic studies. Application of population pharmacokinetic analysis in clinical practice, design of optimal dosing regimens.

Management of Water, Waste and Contaminated Sites in the Industry (3cr):
Pharmaceutical industry and green chemistry. Clean production and best available technologies. Waste management of flow. Management of solid waste. Wastewater management. Management of gaseous effluents. Contaminated areas and areas of interior. Managing contaminated sites. Atmosphere inside industrial facilities.

Molecular Pharmacology (3cr): Molecular Endocrine Pharmacology. Pharmacological targets in the treatment of type 2 diabetes. Molecular Neuropharmacology. Molecular Biology of addiction. Molecular Pharmacology of psychostimulants. Prospects for therapeutic modulators of Sirtuin. New pharmacological targets for the treatment of neurodegenerative diseases.

Drug Design (3cr): General design and optimization of a drug. Stages involved in the development of a drug. Strategies in the search for new candidates. Key methodologies in identification and optimization of a drug candidate. The combinatorial chemistry in drug discovery. Quantitative structure activity relationships (QSAR). From drug candidate to registration. Strategies for development of new drugs

Industrial Microbiology (3cr): Products of microbial origin. Getting products from microorganisms. Control of fermentation process. Production processes. Bioconversion. Production of vaccines. Legal protection. Biosafety. European legislation. Microbiological analysis. Control of microbiological quality in the finished product. Non-sterile pharmaceutical preparations: microbial load test. Microbiological reviews. Detection of genotoxic products. Microbiology of water.

Medicinal Plants, Ethnobotany and bioprospecting (3cr): Ethnobotany and bioprospecting. Ethnobiodiversity. Ethnobotany and popular culture. Pharmaceutical ethnobotany and bioprospecting. Issues of concern. Possible solutions to problems.The main groups of traditional medicinal plants. Other plant groups related to medicinal plants. The trade in medicinal plants: the global market, global data and evolution. The national and international legislation on the collection of medicinal plants.

Industrial Pharmaceutical Technology (3cr): Science, technics and technology. Departments and services. Pressure. Vacuum. Climate control air Sterilization of air . Distillation. Desiccation. Study of processes. Freeze-drying. Granulation. Compression. Coating of tablets. Encapsulation. Preparations for parenteral administration. Suppositories.