

## **B.Sc. Programme In PHARMACY**

### **Course Description**

#### **Faculty Requirements**

- 0304101 General Biology (1) (3 Cr. Hrs.)**  
**Prerequisite : ( None)**  
Internal structure of the cell. Molecules of the cell. Metabolism-respiration and photosynthesis, cell- cell signaling, cell division, Mendelian inheritance, molecular biology of the gene, DNA technology, chemical signals in plants and animals, phylogeny and systematic introduction to ecosystematics and introduction to ecosystems.
- 0304111 General biology Laboratory (1) (1 Cr. Hrs.)**  
**Prerequisite: ( 0304101 or Co-Req. 0304111)**  
Laboratory experiments in microscopy and cells, chemical aspects of cells, plant and animal tissues, animal and plant physiology. Mammalian anatomy, and systematic of major living groups.
- 10303101 General Chemistry (1) (3 Cr. Hrs.)**  
**Prerequisite : ( None)**  
Measurements and significant figures, chemical reactions, stoichiometry, the gaseous state, thermochemistry , electronic structure and periodicity, chemical bonding, molecular shapes, states of matter and intermolecular forces, physical properties of solutions, principles of equilibrium.
- 0303109 Experimental General Chemistry (1) (1 Cr. Hrs.)**  
**Prerequisite : (0303101 or Co-Req.)**  
The course includes experiments dealing with the following topics, safety and laboratory rules, chemical observations, stoichiometry, volumetric analysis, oxidation and reduction, colligative properties, thermochemistry and equilibrium.

**0301101 Calculus (1) (3 Cr. Hrs.) Prerequisite : ( None)**

Functions: domain, operations on function, graphs of functions, trigonometric functions; limits: meaning of a limit, computational techniques, limits at infinity, infinite limits :continuity; limits and continuity of trigonometric functions; the derivative : techniques of differentiation, derivatives of trigonometric functions chain rule; implicit differentiation; differentials; Rolls Theorem; the mean value theorem; the extended mean value theorem; L Hopital s rule; increasing and decreasing functions; concavity maximum and minimum and minimum values of a function; graphs of functions including rational functions (asymptotes) and factions with vertical tangents(cusps);antiderivatives; the indefinite integral; the definite integral; the fundamental theorem of calculus; the area under curve; the area between two curves; transcendental functions: inverse functions, logarithmic and exponential functions; derivatives and integrals; limits(the indeterminate forms);hyperbolic functions and their inverses; inverse trigonometric functions; some techniques of integration.

**0304102 General Biology (2) (3 Cr. Hrs.)  
Prerequisite :( 0304101)**

Animal and plant tissues Mammalian circulation, immune system, gas exchange, controlling the internal environment, nervous system and motor mechanism. Transport in plants, plant nutrition, plant reproduction and development. Eco-distribution and adaptations of organisms, population ecology and community ecology.

**0303231 Organic Chemistry (1) (3 Cr. Hrs.)  
Prerequisite : (0303101)**

Alkanes and cycloalkanes, alkenes and alkynes , stereochemistry, common organic reactions, substitution, addition, elimination, alcohols, ethers, conjugated systems.

**1902102 Computer Skills (2) (3 Cr. Hrs.)  
Prerequisite : (1900100)**

Introduction: forms, controls, properties, methods, events, files, Mouse events, click, mouse movement, drag and drop, Keyboard events: Press, up and down, Menus: Creation and Code writing, Dialogue boxes: Messges, input, built-in boxes, programming: Variables, statements, arithmetic logical operators, strings, built-in functions, Control statements: simple IF, multiple IF, CASE, Loops, FOR-NEXT, DO-WHILE,DO-UNTIL, Arrays, Files: Random, sequential, binary, procedures and functions, Applications using Visual Basic, Introduction to Microsoft Access. Weekly practice in the lab.

**0551214 Physiology for Pharmacy (1) (2 Cr. Hrs.)  
Prerequisite : (0304102)**

Correlation of morphological, biochemical, and functional organization of the human body as related to normal state. Topics include cell, nerve and muscle, autonomic nervous system, blood and body fluids, cardiovascular system, respiratory system physiology.

**0532201 Anatomy and Histology for Pharmacy (2 Cr. Hrs.)  
Prerequisite : (0304102)**

An overview of structure of the human body and tissues and their cooperative role in normal function. Topic include: embryology, blood, nervous, musculoskeletal, skin, cardiovascular, digestive, urinary, respiratory, endocrine, and reproductive system.,

**0551215 Physiology for Pharmacy (2) (2 Cr. Hrs.)**  
**Prerequisite : (0551214)**

Correlation of morphological, biochemical, and functional organization of the human body as related to normal state. Topics include: GI system, endocrine system, reproductive systems, renal system, central nervous system and special topics such as skin, and sensory organs.

**0534315 Pathology for Pharmacy (2 Cr. Hrs.)**  
**Prerequisite : ( 0532201)**

Introduces the basic concepts, terminology, etiology, and characteristics of inflammation, cell injury, aging, neoplasia, and skin disorders.

**1203301 Pathophysiology for Pharmacy (3 Cr. Hrs.)**  
**Prerequisite : (0551215 )**

Considers the nature of major diseases, associated alterations in structure and function of human organs, and their clinical manifestations. Topics include cardiology, rheumatology, endocrine gastrointestinal disorders and hematologic/ oncologic, respiratory, renal and infectious diseases.,

### **Specialty Requirement**

**1202134 Physicochemical Principles of Pharmacy (2 Cr. Hrs.)**

**(Prerequisite 0303101)**

Study of the physicochemical properties of molecules incorporated in pharmaceutical preparations.

**1203251 Biochemistry (1) (2Cr. Hrs .)**  
**(Prerequisite 0303231 )**

Provides principle information concerning the chemical and physical properties of biomolecules (carbohydrates, lipids and proteins) and their interrelated functioning in a biological system. Bioenergetics and oxidative phosphorelations will be covered.

**1201215 Pharmaceutical Organic Chemistry (3 Cr. Hrs.)**  
**(Prerequisite 0303231)**

Classification, nomenclature, properties, reactions and preparation of various organic compounds (emphasis on those of pharmaceutical significance). Preparation methods and characteristics of heterocyclic and polycyclic aromatic compounds of pharmaceutical interest. In addition to stereochemistry and its relation to pharmacologically active compounds.

**1201212 Pharmaceutical Organic Chemistry -Practical (1 Cr. Hrs.)**

**(Prerequisite 1201215 or Co-Req.)**

Applications of various methods and techniques used in the identifications of functional groups of organic compounds of pharmaceutical interest. Synthesis of some compounds will be undertaken.

- 1202231 Pharmaceutical Calculations and Compounding (2 Cr. Hrs.)**  
**(Prerequisite 1202134)**  
 Formulation and compounding of various pharmaceutical dosage forms (solutions, suspensions, emulsions and ointments). In addition to calculation methodologies needed to produce any pharmaceutical preparation.
- 1202234 Pharmaceutical Calculations and Compounding - Practical (1 Cr. Hrs.)**  
**(Prerequisite 1202231 or Co-Req.)**  
 Application of pharmaceutical preparation methods. Introduction to pharmaceutical packaging. Utilization of component properties in pharmaceutical preparations and their impact on the final product.
- 1203252 Biochemistry - Practical (1Cr. Hrs.)**  
**(Prerequisite 1203251 or Co-Req.)**  
 Application of basic methods in the identification of sugars, proteins and fats. In addition to the analysis of these groups in biological fluids and analysis of enzymatic reactions.
- 1203253 Biochemistry (2) (3 Cr. Hrs.)**  
**(Prerequisite 1203251)**  
 Main biochemical concepts regarding the different metabolic pathways of biomolecules; carbohydrates, lipids. Proteins and nucleotides. Storage and expression of genetic information will be covered in this course.
- 1201201 Pharmaceutical Chemical Analysis (2 Cr. Hrs.)**  
**(Prerequisite 0303231)**  
 discusses various analytical methods used in drug analysis in order to identify structure, purity and action.
- 1201202 Pharmaceutical Chemical Analysis - Practical (1Cr. Hrs.)**  
**(Prerequisite 1201201 or Co-Req)**  
 The practical course is designed for the applications of various analytical methods to substances used in pharmacy and medicine .
- 1202235 Physical Pharmacy (2 Cr. Hrs.)**  
**(Prerequisite 1202134)**  
 Study of physico-chemical properties that control complex formation including drug stability and factors affecting it and shelf-life determinations. In addition, diffusion and absorption will be discussed.
- 1202236 Physical Pharmacy - Practical (1 Cr. Hrs.)**  
**(Prerequisite 1202235 or Co-Req.)**  
 Involves the physicochemical principles which controls the basic processes e.g. drug diffusion through membranes, the effect of temperature on solubility, factors affecting drug stability, improving drug solubility using different methods, distribution of drugs between two immiscible solvents and calculations of complex stability constants.

- 1201321 Pharmacognosy (2 Cr. Hrs.)**  
**(Prerequisite 0304102 + 1203251)**  
 Study of basic information on pharmacognosy and medicinal plants regarding classification and identification of their components with emphasis on primary metabolites (carbohydrates, lipids, amino acids and drugs derived from them).
- 1201322 Pharmacognosy - Practical (1 Cr. Hrs.)**  
**(Prerequisite 1201321 or Co-Req.)**  
 Physical and microscopical examinations of some medicinal plants and identification of them and of their components using chromatographic and compendial qualitative and quantitative analysis.
- 1203363 Pharmacology (1) (3 Cr. Hrs.)**  
**(Prerequisite 0551215)**  
 Basic principles of pharmacology: pharmacodynamics, pharmacokinetic principles, adverse drug reactions, drug-drug interactions, development of new drugs. Major categories: drugs affecting autonomic nervous system, cardiovascular system, blood, autacoids, respiratory and gastrointestinal system.
- 1202331 Pharmaceutical Technology (1) (2Cr. Hrs.)**  
**(Prerequisite 1202231)**  
 Comprehensive survey of industrial processes used in the production of pharmaceuticals. Transfer processes and unit operation with emphasis on subjects of pharmaceutical interests especially tableting.
- 1202332 Pharmaceutical Technology - Practical(1) (1 Cr. Hrs.)**  
**(Prerequisite 1202331 or Co-Req)**  
 Cover the unit process operation (size reduction, mixing, granulation and tableting) in addition to quality control and pre-formulation; suggesting formula for certain drug knowing its physiochemical properties, formulation and evaluation using proper instruments .
- 1202381 Pharmaceutical Statistics (2Cr. Hrs.)**  
**(Prerequisite 0301101)**  
 Application of basic statistical principles in different pharmaceutical fields ; research results analysis, pharmaceutical marketing and industry.
- 1201323 Phytochemistry (1) (2 Cr. Hrs.)**  
**(Prerequisite 1201321+ 1201215)**  
 Provides sufficient information on different naturally occurring secondary metabolites, originating from acetate and malonate pathway, and natural nitrogenous compounds and alkynes. The topics emphasize the chemical, biological, and therapeutic activities of these compounds.
- 1203364 Pharmacology (2) (3Cr. Hrs.)**  
**(Prerequisite 1203363)**

Study of drugs used in the management of infectious diseases, neuro-diseases, blood diseases, tumors and kidney diseases.

- 1201315 Pharmaceutical Instrumental Analysis (Cr. Hrs.) 2**  
**(Prerequisite 1201201)**  
Study of the basic instrumental methods used in the qualitative and quantitative analysis of pharmaceutical active and non-active chemicals in different dosage forms. In addition to analysis stated in the pharmacopoeias e.g. spectroscopy and chromatography.
- 1201316 Pharmaceutical Instrumental Analysis - Practical (1Cr. Hrs.)**  
**(Prerequisite 1201315 or Co-Req.)**  
Practical application of instrumental methods. In addition, training on the interpretation of instrumental analysis results and applications of these methods in the elucidation of their structures and concentration determination of the studied samples.
- 1202341 Pharmaceutical Microbiology (1) ( 3**  
**Cr. Hrs.)**  
**(Prerequisite 0304102)**  
Basic information of microorganisms, their basic structure and mode of growth. Medical, pharmaceutical and environmental importance of some microorganisms. Basic principles of immunity and immunization. Anti-microbial chemotherapy: mode of action and prudent use.
- 1202333 Pharmaceutical Technology (2) (2**  
**Cr. Hrs.)**  
**(Prerequisite 1202331 )**  
The principles and designs of liquid and semisolid dosage forms. Physicochemical factors, which influence their formulation, stability and large-scale manufacture will be discussed. Subjects like microencapsulation & packaging processes will be also covered. General concepts of good manufacturing practice will be discussed.
- 1202334 Pharmaceutical Technology Practical (2) (1 Cr.**  
**Hrs.)**  
**(Prerequisite 1202333 or Co-Req.)**  
Application of different tablet coating (film coating and enteric coating). Evaluating the coating process and coated dosage forms. In addition to design and evaluation of sustained release matrix. Quality control of semisolid dosage forms will be addressed. The evaluation of micro encapsulation will be covered.
- 1200401 Pharmaceutical Field Training (1) (2 Cr.**  
**Hrs.)**  
**(Prerequisite 1203364)**  
Field training according to a prepared plan under direct supervision of a faculty member. Evaluation at the end of training.
- 1201401 Medicinal Chemistry (1) (3Cr.**  
**Hrs.)**  
**(Prerequisite 1201215+1203364)**  
Introduction to medicinal chemistry. Study of drug physicochemical properties, distribution, metabolism and excretion. In addition to structure activity relationships. Emphasis on drugs used for the treatment of some vital organs.

- 1201425 Phytochemistry (2) (2 Cr. Hrs.)**  
**(Prerequisite 1201323)**  
 Provides information on the importance of naturally occurring products from their chemical, pharmaceutical and therapeutic applications. Natural products are classified to: volatile oils, resins, balsams, terpenoids, cardiac glycosides, saponins, phenolic and related compounds, coumarins and tannins.
- 1203426 Therapeutics (1) (3 Cr. Hrs.)**  
**(Prerequisite 1203364)**  
 Patho-physiology, symptoms and aims of treatment. In addition to the basic knowledge on the drugs used, kinetics drug interactions, dose calculations, side effects, treatment algorithms and patient awareness. The diseases of the following systems will be covered: cardiovascular, endocrine, GIT and rheumatic diseases.
- 1203474 Biopharmaceutics (2 Cr. Hrs.)**  
**(Prerequisite 1202235)**  
 Study the factors influencing drug availability to the systemic circulation. Physicochemical properties of active ingredients, pharmaceutical dosage forms, physiological factors and routes of administration, will be discussed.
- 1202441 Pharmaceutical Microbiology (2) (2 Cr. Hrs.)**  
**(Prerequisite 1202341)**  
 Study sterilization, disinfection, anti-sepsis, preservation and good manufacturing practice in the control of contamination. Methods used for the evaluation of antimicrobial efficacy and factors affecting it. Some applications of microorganisms in pharmaceutical sciences.
- 1202442 Pharmaceutical Microbiology - Practical (1 Cr. Hrs.)**  
**(Prerequisite 1202441 or Co-Req.)**  
 Develop the skills of identifying microorganisms, measuring the efficacy and potency of different antimicrobial agents, using different sterilization methods. Designing optimum sterilization cycles. Techniques for microbial quality monitoring for both sterile and non sterile dosage forms.
- 1203451 Pharmaceutical Clinical Biochemistry (2 Cr. Hrs.)**  
**(Prerequisite 1203301+ 1203253)**  
 Introduction to clinical aspects of biochemical analysis. Utilization of laboratory findings in the diagnosis and treatment of diseases will be discussed.
- 1201402 Medicinal Chemistry (2) (2 Cr. Hrs.)**  
**(Prerequisite 1201401)**  
 Study of chemistry of drugs; chemical structure and mechanism of action. Antibiotics; their chemistry, mechanisms of actions and medical uses ....etc are extensively discussed .
- 1201403 Medicinal Chemistry - Practical (1Cr. Hrs.)**  
**(Prerequisite 1201401 or Co-Req.)**

Assays and tests of medicinal substances and their pharmaceutical preparations will be carried out to provide means of quality control by applying the various methods and techniques described in the official compendias.

- 1201427 Phytochemical Analysis (2Cr. Hrs.)**  
**(Prerequisite 1201315+ 1201425)**  
Provides student with basic information on analytical and instrumental methodology in the plant sciences and their utilization in natural products investigations, in particular herbal drugs identification and evaluation. This encompasses methods and techniques relevant to the extraction, separation, purification, identification and evaluation (qualitative and quantitative) of natural products and their derived substances and metabolites. Topics related to analysis of plant-derived extracts and plant products used as food, pharmaceutical, and/or medicinal substances, where emphasis will be placed upon chemical, spectroscopic and chromatographic evaluation. Methods of analysis used to evaluate selected herbal drugs approved and included in herbal pharmacopoeias and compendial sources will be given and discussed.
- 1201428 Phytochemical Analysis Pract. (1 Cr. Hrs.)**  
**(Prerequisite 1201427 or Co-Req.)**  
Application of qualitative analysis of secondary metabolites using thin layer chromatography (TLC) and the isolation and identification of secondary metabolites from plant drugs, using chromatographic and spectroscopic methods (TLC, IR, UV).
- 1203475 Pharmacokinetics (2 Cr. Hrs.)**  
**(Prerequisite 1203474)**  
Study of the pharmacokinetic concepts, terminology, models, factors affecting drug absorption, distribution, metabolism, excretion and its importance in drug activities and side effects. Emphasis will be placed upon the prediction of plasma levels of drugs under varying conditions applying different pharmacokinetic parameters.
- 1203476 Case Studies in Pharmacokinetics (1 Cr. Hrs.)**  
**(Prerequisite 1203475 or Co-Req.)**  
Handling kinetic data and solving problems that may be encountered in a clinical set up.
- 1203429 Therapeutics (2) (3 Cr. Hrs.)**  
**(Prerequisite 1203346)**  
Patho-physiology, symptoms and aims of treatment. In addition to the basic knowledge on the drugs used, kinetics drug interactions, dose calculations, side effects, treatment algorithms and patient awareness. The diseases of the following systems will be covered: infections, neuro diseases, blood diseases, tumors, respiratory diseases and kidney diseases.
- 1203401 Pharmacoeconomics (2 Cr. Hrs.)**  
**(Prerequisite 1203364)**  
Methods and techniques for evaluating costs and cost-effectiveness of health, medical, and pharmaceutical interventions. Emphasis on economic evaluation, decision analysis, and modeling techniques for resource allocation and decision making. Applications to technology assessment, health policy, clinical practice, drug pricing policy and price control, drug expenditure, and resource allocation.



- 1200402 Pharmaceutical Field Training (2) (2 Cr. Hrs.) (Prerequisite 1203364)**  
Field training according to a prepared plan under direct supervision of a faculty member. Evaluation at the end of training.
- 1203561 Clinical Pharmacy Practice (1 Cr. Hrs.) (Prerequisite 1203429)**  
Participating in the clinical rounds in hospital wards as a member of the medical team.
- 1201515 Medicinal Chemistry (3) (3 Cr. Hrs.) (Prerequisite 1201401)**  
The study of the various classes of pharmacodynamic drugs. Their chemistry, mechanisms of action, pharmacological - clinical uses and structure-activity relationships.
- 1203562 Toxicology (2 Cr. Hrs.) (Prerequisite 1203364)**  
Introduction into epidemic, physiologic and symptoms of poisoning. In addition to treatment procedures of main toxic materials that human would be exposed to.
- 1203513 Pharmaceutical Promotion and Marketing (1) (3 Cr. Hrs.) (Prerequisite 1203401)**  
Principles of marketing and marketing concepts. Needs, exchange and communication process. Modern concept of marketing and influence of environment. Pharmaceutical marketing aspects and its applications in Jordan market emphasizing on sales call steps, selling skills and techniques.
- 1202517 Pharmacy Regulations and Ethics (2 Cr. Hrs.) (Prerequisite 1203364)**  
Introduction to existing laws and regulations governing the practice and ethics of pharmacy.
- 1203563 Nonprescription Drugs (2 Cr. Hrs.) (Prerequisite 1203363)**  
Study how to assist the patient with optimal use of non-prescription drugs. Patients counseling regarding the proper and safe usage of drugs will be also discussed.
- 1201521 Poisonous and Hallucinogenic Plants (2 Cr. Hrs.) (Prerequisite 1203364)**  
Identification and study of poisonous and hallucinogenic plants. In addition to symptoms, prophylactics and treatment. Emphasis is given on plants found in Jordan.
- 1201522 Selected Topics in Phytochemistry (2 Cr. Hrs.) (Prerequisite 1201425)**

This course includes the study of natural products arising from plants, animals and minerals, with certain pharmaceutical and medicinal applications. Up to date aspects in phytotherapy.

- 1201524 Applied Chromatography (2 Cr. Hrs.)**  
**(Prerequisite 1201315)**  
Advanced study of the modern methods of chromatography used in separation & purification of pharmaceutical compounds such as:-  
PC, TLC, GC, HPLC and other techniques.
- 1201535 Pharmaceutical Biotechnology (2 Cr. Hrs.)**  
**(Prerequisite 1201401 )**  
An introduction to replication and gene expression of prokaryotic and eukaryotic systems. In addition progress to cover recombinant ( DNA) technology and cloning for the production of pharmaceuticals, followed by the application of (DNA) biotechnology including disease treatment, in vitro fertilization, and gene transfer.
- 1202532 Selected Topics in Physical Pharmacy (2 Cr. Hrs.)**  
**(Prerequisite 1202235 )**  
Covers in detail concepts related to physiochemical properties of drug molecules, surfactants, colloids, factors affecting it and its applications in pharmaceutical industry.
- 1202533 Pharmaceutical Radioisotopes (2 Cr. Hrs.)**  
**(Prerequisite 1201401 )**  
Brief discussion of radioactivity. The use of radioisotopes in medicine and pharmacy with precautions in their handling and storage.
- 1202538 Selected Topics in Pharmaceutical Technology (2 Cr. Hrs.)**  
**(Prerequisite 1202333)**  
The course will cover non-conventional dosage forms (microspheres microcapsules nanospheres and liposomes). Physicochemical factors which influence their formulation, and stability will be covered.
- 1202536 Cosmetics Science (2 Cr. Hrs.)**  
**(Prerequisite 1202231 )**  
Covers the basics of cosmetic preparations, contents and their actions. (e.g. skin, hair and nail preparations) .
- 1202541 Selected Topics in Pharmaceutical Microbiology (2 Cr. Hrs.)**  
**(Prerequisite 1202441 )**  
Application of microbiology in different field of pharmacy practice. Microbial resistance and policies used to control hospital acquired infections. Microbial quality control and its application in pharmaceutical industry. Application of microorganisms in fermentation and genetic engineering.

- 1203552 Parapharmaceuticals (2 Cr. Hrs.)**  
**(Prerequisite 1203364)**  
 Basic knowledge to advise patients on medical/surgical appliances and devices, durable medical equipment, and prescription accessories, concerning their selection, use, and storage (e.g. cuts and burns products, thermometers, contraceptives, diabetic supplies, diagnostics, and lens preparations).
- 1203563 Selected Topics in Clinical Toxicology (2Cr. Hrs.)**  
**(Prerequisite 1203562)**  
 Deals with different types of human intoxication's . It will focus on the standard procedures undertaken in different cases of intoxication, identification of poisons, signs and symptoms, and their clinical manifestations.
- 1203514 Pharmaceutical Promotion and Marketing (2) (2Cr. Hrs.)**  
**(Prerequisite 1203513)**  
 Marketing strategy and marketing management. Environmental forces anticipation and contingency planning. Marketing plan development. Team work, time and stress management briefing. Some consumer behavior aspects.
- 1203515 Pharmaceutical Intellectual Property (2Cr. Hrs.)**  
**(Prerequisite 1203401)**  
 General background of drug product life cycle, history, types and principles of intellectual property (IP) with an emphasis on the application of these principles within the pharmaceutical industry (PI), importance of intellectual property to the PI , research and development (R &D) issues internationally and locally. The world trading system, data exclusivity, patent protection, trade marks, Trade Related Aspects of Intellectual Property Rights (TRIPs) for pharmaceutical products and antitrust will be defined with case studies. Identifying potential commercial intellectual property: recording, ownership and registration of IP, strategies, planning and commercialization of IP, current and future impact of IP on the marketing strategies of Jordanian PI.
- 1201571 Seminar in Pharmaceutical Sciences (1 Cr. Hrs.)**  
**(Prerequisite 1201401+ 1201425)**  
 Preparation of a research project in pharmaceutical sciences under supervision of faculty member. Presentation and oral discussion are required.
- 1202572 Seminar in Pharmaceutics and Pharmaceutical Technology (1 Cr. Hrs.)**  
**(Prerequisite 1202333+ 1202341)**  
 Preparation of a research project in pharmaceutics and pharmaceutical technology under supervision of faculty member. Presentation and oral discussion are required.
- 1203573 Seminar in Biopharmaceutics and Clinical Pharmacy (1 Cr. Hrs.)**  
**(Prerequisite 1203429)**  
 Preparation of a research project in biopharmaceutics and clinical pharmacy under supervision of faculty member. Presentation and oral discussion are required.