Courses Description (*New Subjects)

***000 101 Isarn Cultural Landscape 3(1-6-3)**

Prerequisite: None

Basic knowledge of culture, geographical habitation, geographical landscape, history of Isarn local area that is the basic of ideal, philosophy of life, records, Isarn custom (Ja-Reet-Heet-Krong), Isarn poetry, tales, legends, literary works, traditions, art works, architecture, art of acting, ethnic folk show, life style of the specific area for transferring and innovating of unity, Thai culture specification and dynamic of evolution, distribution and connection to international culture and sustainability of Isarn culture.

213 110 General Psychology 2(2-0-4)

Prerequisite: None

History and scope of psychology, source of human behavior, by studying the biological condition individual differences, development and maturation, sensation, perception, motive, emotion, intelligence, learning, memory and forgetting, thinking, personality and assessment of personality, adjustment and mental health, abnormal behavior and social behavior of humans.

300 102 Science in Everyday Life 3(3-0-6)

Prerequisite: None

Basic science knowledge concerning human everyday life, scientific phenomena at the present time and explanation of the phenomena with scientific methodology.

311 101 Biology I 3(3-0-6)

Prerequisite: None

Principles of biology, structure and function of cells, energy and life, cellular reproduction and genetics, structure and physiology of animals, ecology and environmental science.

311 102 Biology Laboratory I **1(0-3-0)**

Prerequisite: must enroll simultaneously with 311 101

Biology laboratory, microscopes, cells, cell division, animal tissues, anatomy of vertebrates, cellular respiration, physiology of animals, reproduction and growth of animals, probability and genetics, nervous system, behavior of animals, and ecosystems.

312 112 Basic Organic Chemistry **3(3-0-0)**

Prerequisite: None

Atomic structure, chemical bonding and organic bonding polarity status, functional groups, chemical structure drawing of alkane, cycloalkane, alkanediene, polyene, alkyne, benzene, aromatic compounds, alcohol, phenol, ether, epoxide, stereo-chemistry, organic halide, aldehyde and ketone, carboxylic acid and derivative of carboxylic acid, amine compounds.

312 113 Basic Organic Chemistry Laboratory **1(0-3-0)**

Prerequisite: 312 112 or must enroll simultaneously with 312 112

Crystallization, determination of melting point, and boiling point, distillation, elemental analysis of organic compounds, chromatography, saturated and unsaturated hydrocarbons, aromatic hydrocarbons, alcohols, phenols, aldehydes, ketones, carboxylic acids, and amines

312 234 Biophysical Chemistry **3(2-3-0)**

Prerequisite: None

Thermodynamics in biology, application of phase diagrams and the phase law in biology, ionic equilibrium and application, chemical kinetics in living system, physicochemical properties of large molecules.

315 106 Introductory Physics **3(3-0-0)**

Prerequisite: None

Theories and applications of mechanics, fluid mechanics, heat and thermodynamics, electric current and electronics, acoustics, optics, atomic physics, and radioactivity.

315 181 General Physics Laboratory I **1(0-3-0)**

Prerequisite: None

Ten to twelve experiments on basic physics.

320 101 Microcomputers and Applications **2(2-0-1)**

Prerequisite: None

Introduces computer systems; hardware, software and architecture of microcomputer, linkage of microcomputer in a network, discussion and practice of microcomputer on the following topics: operating system programming (emphasizing logic and style), use of common packages on microcomputers, word processing, spreadsheets, graphics and database management.

320 102 Computer Usage in Scientific Methods **3(2-2-0)**

Prerequisite: None

Functions and components of computer systems, storage devices, data systems, data types, data representations, variables and arrays, files and processing, database systems, computer applications in scientific methods, data processing, steps in solving scientific problems, principles of computer programming, program development tools, operating systems and usage, hands-on practice with software packages such as word processing, database management systems, spreadsheet, statistics and graphics programs.

321 102 General Mathematics **3(3-0-0)**

Prerequisite: None

Geometric analysis in planes, vectors, limits and continuation of function, derivative of function, application of derivatives and differentiation, integration, application of integration, first order differential equations and application.

361 216 Human Anatomy **4(3-4-0)**

Prerequisite: None

Cells, body tissues, integument system, skeletal systems, muscular system, nervous system, respiratory system, digestive system, urinary system, reproductive system, and the endocrine system. Emphasis on gross anatomy.

362 216 Microbiology for Pharmaceutical Science Students **4(3-3-1)**

Prerequisite: 311 101, 311 102

Basic knowledge in microbiology, immunology, microbial growth control, pathogenic microorganisms including bacteria, fungi and viruses, mechanisms of pathogenesis, infectious diseases, correlation of microbiology to environment, industrial and pharmacy.

363 216 Biochemistry for Pharmaceutical Science Students **4(3-3-2)**

Prerequisite: 311 101#, 311 102#, 312 112#, 312 113#

Chemical composition of living cells, biological buffer system, chemical structure, properties and functions of biomolecules such as carbohydrates, lipids, amino acid, proteins, enzymes, vitamins, coenzymes, hormones, nucleic acid and porphyrins, the metabolism of these biomolecules, the regulation of metabolic processes, the flow of genetic information, regulation of gene expression, biochemistry of blood, certain principles and techniques commonly used in biochemistry.

364 216 Parasitology for Pharmaceutical Science Students **2(1.5-2-0)**

Prerequisite: Second Year Pharmaceutical Sciences Student or above

Geographical distribution, morphology, life cycle, epidemiology, pathogenesis, pathology, symptomatology, diagnosis, treatment, prevention and control of medical parasites that cause or transmit important diseases in Thailand. Demonstration of various stages of parasites and their intermediate hosts. Practical techniques on collection, preservation and examination of parasitological specimens.

***365 316 Pathology for Pharmaceutical Science Students 3(3-0-0)**

Prerequisite: 361 216, 362 216, 363 216, 364 216, 367 216

Pathologic principles of human diseases, causes and mechanisms of disease processes, pathophysiology of the affected systems.

366 316 Pharmacology I for Pharmaceutical Science Students 4 (3-3-6)

Prerequisite: 367 216#

General aspects of drugs, routes of administration, principles of drug disposition and pharmacokinetic factors influencing drug disposition, drug action in term of pharmacodynamics, mechanism of actions at biomolecular levels, pharmacology regarding the mechanisms of action based on pathophysiology of diseases, pharmacokinetics, clinical uses and adverse effects of drugs in various classes : drugs acting on peripheral synapses, urinary, cardiovascular, endocrine, reproductive, blood, gastrointestinal and respiratory systems.

366 326 Pharmacology II for Pharmaceutical Science Students 4 (3-3-6)

Prerequisite: 366 316#

Pharmacology regarding the mechanisms of action based on pathophysiology of diseases, pharmacokinetics, clinical uses and adverse effects of drugs in various classes: chemotherapeutic, analgesic-antipyretics, antiinflammatory agents, drugs acting on the central nervous system, immunomodulators, pharmacogenetics, drug interactions and alternative drug therapy.

367 216 Physiology for Pharmaceutical Science Students 4(3-4-0)

Prerequisite: None

A detailed study of mammalian and particularly of human physiology emphasizes on the interrelationship between large populations of cells, tissues, organs and organ systems of the body. The nerve cells and synapses, muscle, reflexes, autonomic nervous system, blood, cardiovascular system, respiratory, digestion, urinary system and body fluids, endocrine system, reproductive system, central nervous system, special senses, energy and metabolism as well as temperature regulation are also included. This course is accomplished by means of lectures and laboratory experiments. The laboratory sections are designed for students to understand the fundamental physiological principles and to provide them for training in physiological techniques.

400 100 Man, Society and Culture **3(3-0-3)**

Prerequisite: None

Foundation and development of human society and culture, social organization, human relationship with in social institutions, communication in society, socio-cultural changes, the establishment of peaceful relationships, conflict-resolution in society, ideal society.

400 101 Man and Nature **3(3-0-3)**

Prerequisite: None

The evolution and interaction between human society and nature. The change and tendency of the natural system. The sustainable and peaceful existence with nature at personnel, local population, and global population levels.

400 102 Human and the Self **3(3-0-6)**

Prerequisite: None

Evolution of the body and the mind; the impact of cultural, political, and economical system on the idea of self and meanings of life; religious doctrines on the nature of the true self and the purpose of life; philosophical doctrines on values and meanings of life; the relationship between psychological needs and values of life; the concept of Thai-identity; East meets West.

411 106 English for Health Sciences 1 **3(3-0-2)**

Prerequisite: None

The development of abilities in the use of English: writing, listening, speaking, and especially reading, so that students can use the language in their study of other subjects and in everyday life.

411 206 English for Health Sciences II **3(3-0-2)**

Prerequisite: 411 106 #

The development of abilities in the use of English: writing, listening, speaking, and especially reading, at a higher level. Continuation of English for Health Sciences I.

411 236 Technical English for Pharmaceutical Sciences 2(2-0-2)

Prerequisite: 411 206#

Listening, reading and writing English in the field of pharmaceutical sciences: drug information, drug labels, medical instructions, effective practice for pharmacists and study of grammar used in the content.

***411 xxx Professional English for Pharmacist 4(4-0-8)**

Prerequisite: None

Essential English components and skills for effective communication and professional pharmacy work in modern time. Listening experience to business and academic presentation. Reading research articles and relevant health-related documents. Writing for a job, proposal, reports. Presentation of pharmaceutical products or research work such as printed papers, posters or other means of information. Speaking in public.

412 102 Information Literacy 2(2-0-2)

Prerequisite: None

Importance of information literacy; processes of the development of information literacy skills including: determining information requirements; selecting information sources and resources; searching and retrieving information by using technological tools; analyzing, synthesizing and evaluating the information; writing and communicating the information in effective and appropriate formats.

414 151 Introduction to Law 3(3-0-0)

Prerequisite: None

Basic principles of law, introduction, general knowledge of law, classification of law, use of law, interpretation of law, concept and vocabulary, justification process of law, constitution, human right and freedom.

414 340 Leadership **3(3-0-0)**

Prerequisite: None

Study and analyse the meaning and characteristics of leader, concepts of leadership, roles and abilities of leaders, types of leaders, leadership forces, success components of leadership, leader and groups, leader and community development activities, and evaluation techniques of leadership and social participation activities.

416 216 Public Speaking **2(1-2-2)**

Prerequisite: None

Types of speaking; components, principles and techniques of speaking; content preparation and thought organization; script analysis; script writing and various types of public speaking

419 110 Introduction to Philosophy **(2-0-2)**

Prerequisite: None

Philosophically significant problems such as human nature, human knowledge, and human morality in order to understand the world in different ways.

419 122 Religions and Society and Culture **3(3-0-3)**

Prerequisite: None

Roles of major religions in present society and culture and their necessity for the society and culture in detail.

419 124 Buddhism and Thai Society and Culture **3(3-0-3)**

Prerequisite: None

The Buddha's teachings which are necessary for Thai society and culture, general survey, analysis of the applied Dharma with the relationships to Thai custom and culture influencing the ways of life of Thai people.

419 125 Buddhism and Daily Life 2(2-0-2)

Prerequisite: None

The Buddha's teachings, application of those teachings to the daily life. An analytical survey of Buddhism's influences upon the Buddhists' daily lives in terms of economy, society, politics and ethics; and the applicability of those teachings in solving problems.

***610 311 Source of medicines 3(2-3-4)**

Prerequisite: 311 101#, 312 112#

Drug discovery from natural source and chemical synthesis. Primary and secondary metabolites from nature. Natural product constituents used as traditional and modern medicines. Strategic approaches for new drug discovery from medicinal plants. Organic and inorganic synthetic compounds for medicinal use.

***610 312 Quality Assurance of Pharmaceutical Products 4(3-3-6)**

Prerequisite: 613 351#, 615 254 #

Quality assurance for pharmaceutical products in total quality management, good manufacturing practice, good laboratory practice in accordance to the regulations of the Ministry of Public Health and International Guidelines.

***610 313 Drug Development 2(2-0-4)**

Prerequisite: 613 251, 610 311#

Methods and processes of raw material development. Concept of drug design and development. Methods and techniques for drug design such as quantitative structure and activity relationship, combinatorial chemistry, high throughput screening methods. Clinical studies and law process. Case studies.

***610 315 Pharmaceutical Biotechnology 3(2-3-4)**

Prerequisite: None

Molecular biotechnology, fermentation technology and formulation of biotechnology. Pharmaceutical biotechnology -derived products and application of biotechnology for therapy.

***610 481 Professional Practice in Pharmacy 3(0-18-18)**

Prerequisite: Must receive the Permission from the Pharmaceutical Sciences Committee

Professional practice in pharmacy to understand the profession of a pharmacist by in hospitals, drug factories, drug stores and others in order to understand duties and responsibilities of pharmacists in different areas.

***610 491 Seminar in Pharmaceutical Care and Administration 1(1-0-2)**

Prerequisite: None

Principle and method of retrieving information, evaluation and citation, report writing and presentation, student's presentation in pharmaceutical care and administration.

***610 492 Seminar in Pharmaceutical Sciences 1(1-0-2)**

Prerequisite: None

Principle and method of retrieving information, evaluation and citation, report writing and presentation, student's presentation in pharmaceutical sciences.

***610 581 Professional Practice in Pharmaceutical Sciences 3(0-18-18)**

Prerequisite: None

Professional practice in research and development of drug and natural products, research in pharmacology and toxicology analysis of drug and toxic substance in laboratories or clinics in government or private sectors, drug manufacturers, cosmetics manufacturers, other manufacturers or research and development unit in pharmaceutical sciences in institutes or universies.

611 311 Biopharmaceutics 3(3-0-6)

Prerequisite: 615 253 #

Introduction to biopharmaceutics, absorption, distribution, metabolism and elimination of drugs in the body, mathematics in biopharmaceutics, pharmacokinetic and pharmacodynamic data analysis, clinical application of pharmacokinetics, bioavailability, drug and food-drug interaction, pharmacokinetic/ pharmacodynamic/ biopharmaceutic concepts in design of new drugs, formulation for therapeutic optimization.

611 313 Pharmaceutical Care 3(2-3-4)

Prerequisite: None

Role of the pharmacist in pharmaceutical care, pharmaceutical care processes, systematic approach and skills in clinical pharmacy practice, medical records and patient's drug profile, clinical pharmacy activities, hospital accreditation.

611 314 Pharmacotherapeutics 1 3 (2-3-4)

Prerequisite: 365 316#, 366 316#, 611 313#

Aetiology, clinical features, management, management of pharmaceutical products available in the market, dispensing techniques and patient's counseling, drug treatment, clinical pharmacokinetics and diet therapy, adverse drug reaction monitoring and drug use evaluation in gastrointestinal disorders, cardiovascular disorders, nutritional disorders, used of biological products.

611 315 Pharmacotherapeutics 2 3(2-3-4)

Prerequisite: 365 316#, 366 316#, 611 313#

Aetiology, clinical features, management, management of pharmaceutical products available in the market, dispensing techniques and patient's counseling, drug treatment, clinical pharmacokinetics and diet therapy, adverse drug reaction monitoring and drug use evaluation in gynecologic disorders, respiratory disorders, skin disease, endocrine disorders, diseases of EENT, drug used in pediatrics and geriatrics.

611 316 Pharmacotherapeutics 3 3(2-3-4)

Prerequisite: 365 316#, 366 326#, 611 313#

Aetiology, clinical features, management, management of pharmaceutical products available in the market, dispensing techniques and patient's counseling, drug treatment, clinical pharmacokinetics and diet therapy, adverse drug reaction monitoring and drug use evaluation in infectious diseases, immunologic disorders, gastrointestinal disorders(cont.), renal diseases, drug-induced diseases.

611 317 Pharmacotherapeutics 4 **3 (2-3-4)**

Prerequisite: 365 316#, 366 326#, 611 313#

Aetiology, clinical features, management, management of pharmaceutical products available in the market, dispensing techniques and patient's counseling, drug treatment, clinical pharmacokinetics and diet therapy, adverse drug reaction monitoring and drug use evaluation in hematologic disorders, oncologic disorders, neurologic disorders, psychiatric disorders, bone and joint disorders.

611 591 Special Project in Clinical Pharmacy **3(0-9-9)**

Prerequisite: None

A research work of a selected topic in clinical pharmacy to develop abilities and skills in: searching information, research planning, proposal writing, data collection, data analysis, applying biostatistics in research work, report writing and presentation.

611 616 Current Knowledge in Pharmacotherapy **2(2-0-4)**

Prerequisite: None

Update in drug therapies in the following areas: respiratory, gastrointestinal, cardiovascular, endocrine, neurology, psychiatry, urinary tract, obstetric-gynecology, hematology, ear-nose-throat, eye, immunology, oncology, dermatology, infectious diseases etc. Emphasis on rational drug use and evidence-based medicine. Drug therapy planning and monitoring, adverse drug reaction monitoring, patient counseling on drug therapy.

611 617 Current Knowledge in Pharmaceutical Care **2(2-0-4)**

Prerequisite: None

Update in pharmaceutical care. Emphasis on the role of the pharmacist in the systematic approach of pharmaceutical care by using problem-oriented medical record. Essential skills for pharmaceutical care, i.e., communication skill, patient interview, patient medical history review, interpretation of laboratory data and physical examination, clinical documentation, nutritional preparation for individual patient, patient counseling, drug information service, and clinical drug use evaluation.

611 651 Clinical Drug Information Services 2(1-3-2)

Prerequisite: 611 313

Classification of questions, analysis of the background of the questions, drug database and evaluation of information sources, answering and giving information, situations and problem in preparing drug information, drug databases on computer, management of drug information services.

611 653 Drug Use Evaluation 2(1-3-2)

Prerequisite: 611 314, 611 315, 611 316, 611 317

Concept, principle and methodologies of drug use evaluation in rational therapy and economics, assessment of adverse drug reaction and factors affecting efficacy of drug therapy. Students will practice in the evaluation of drugs used by patient.

611 655 Adverse Drug Reaction Evaluation 2(1-3-2)

Prerequisite: 611 313

Classification of adverse drug reactions, adverse drug reaction monitoring system, monitoring design, recording and reporting, assessment of guidelines in regulation of adverse drug reactions, drug-induced specific disorders.

611 681 Clinical Pharmacy Clerkship in Therapeutic Drug Monitoring 2(0-10-10)

Prerequisite: 611 314#, 611 315#, 611 316#, 611317#

Professional practices in therapeutic drug monitoring, pharmacokinetics parameters calculation in specific patient, dosage regimen adjustment, interpretation and recommendation, patient monitoring.

611 682 Clinical Pharmacy Clerkship in Drug Information Services 2(0-10-10)

Prerequisite: 611 313

Professional practice in drug information unit, question identification, basic information assessment, systematic approach in retrieving information, evaluation of quality and sources of information, data processing and monitoring.

611 683 Clinical Pharmacy Clerkship in Ambulatory Care 2(0-10-10)

Prerequisite: 611 314#, 611 315#, 611 316#, 611317#

Professional practice in ambulatory care, drug distribution systems, dispensing, patient counseling, medication history review, patient assessment and drug therapy monitoring, identifying, preventing and solving drug related problems with healthcare professionals and patients.

611 684 Clinical Pharmacy Clerkship in Acute Care 2(0-10-10)

Prerequisite: 611 314#, 611 315#, 611 316#, 611317#

Professional practice in acute care, medication history review, patient assessment and drug therapy monitoring, identifying, preventing and solving drug related problems with healthcare professionals or patients, discharge counseling.

611 685 Clinical Clerkship in Community Pharmacy 2(0-10-10)

Prerequisite: 611 314#, 611 315#, 611 316#, 611317#

Professional practice in community pharmacy, medical history review, drug selection, dispensing, patient counseling, patient assessment and drug therapy monitoring, identifying, preventing and solving drug related problems.

612 354 Natural Health Products 4(3-3-6)

Prerequisite: 613 311

Classification and regulation of natural health products. Raw materials for minor ingredients of natural health products. Natural products in modern medicine, Thai traditional medical products, health food supplements, medical cosmetics, biological products, nutraceuticals, and products used in other alternative therapies.

612 5 Special Project in Pharmacognosy 3(0-9-9)

Prerequisite: 610 311 # and 612 354 #

Literature review, research proposal writing and research work in Pharmacognosy and related sciences, compilations and evaluation of information. Reported writing and presentation including active participation.

612 611 Chemistry of Pharmaceutical Natural Products I 3(3-0-6)

Prerequisite: 610 311

Chemistry of pharmaceutical natural products, techniques for studying biosynthetic pathways, polypetide pathways, acetate-mevalonate pathways, shikimic pathways, and natural product derived from mixed- biosynthetic pathway, amino acid, glucosinelate, alkaloids. Quantitative and qualitative analysis of corresponding pharmaceutical natural products.

612 612 Chemistry of Pharmaceutical Natural Products 2 3(3-0-6)

Prerequisite: 610 311

Analysis and structure elucidation of carbohydrates, proteins, lipids, volatile oils, alkaloids, flavonoids, coumarins, iridoids, tannins, polyphenols, steroids, terpenoids and glycosides.

612 614 Selected Topics in Pharmacognosy 2(2-0-4)

Prerequisite: 610 311, 612 354

Current views in traditional medicine, herbarium, new information in herbal databases, case studies of synthesis and biosynthesis of natural products and industrial production from medicinal plant. Recent technologies for standardization and quality control of herbal medicine and bioproduct development for prevention and treatment.

612 616 Thai Traditional Pharmacy 2(2-0-4)

Prerequisite: None

Concept of Thai traditional pharmacy and medicine, importance of moral and ethic in Thai traditional pharmacy practice, pharmaceutical ingredient, and their use, set of pharmaceutical ingredients, principle concepts and composition of Thai traditional pharmacy, Thai traditional household preparations, corresponding law and application procedure for Thai traditional pharmacy license, traditional drug development.

612 617 Marine Pharmacognosy 2(2-0-4)

Prerequisite: 610 311, 612 354

Basic knowledge of marine ecology, pharmaceutical natural products of marine origin for drug development, taxonomy and biology of marine organisms, chemistry and source of marine natural products, marine toxins, research and development of marine natural products, industrial impact and application to medical sciences.

612 618 Medicinal and Poisonous Mushroom and Fungi 1(1-0-2)

Prerequisite: None

Taxonomy of mushrooms and fungi, including edible, poisonous and medicinal mushroom and fungi, with an emphasis on the uses and toxicity of individual mushrooms and fungi.

612 619 Medicinal Plants in Daily Life 2(2-0-4)

Prerequisite: None

Medicinal plants in daily life, use for treatment, foods, beverages, aromatic medicinal plants coloring and flavoring agents including medicinal plants employed as cosmetics, ornamental, fiber, primary health care culture and beliefs.

612 621 Poisonous Plants and Animals 2(2-0-4)

Prerequisite: None

Poisonous plants acting on the central nervous system, poisonous plants with hallucinogenic effect, poisonous plants irritating the gastrointestinal system, poisonous plants acting on the respiratory system, circulatory system, liver and kidney, poisonous plants acting on the reproductive system, poisonous plants causing irritation of skin poisonous snakes and insects.

612 622 Forestry for Pharmacy Students 1(1-0-2)

Prerequisite: None

General knowledge plant ecology, environmental and biological factor affecting to distribution of medicinal plant. Replacement and replacement process of plant. Plant social and

world forest, forest in Thailand, biodiversity of medicinal plants. Forest management and conservation effects of deforestation on environment and afforestration.

612 651 Tissue Culture of Medicinal Plants 3(2-3-4)

Prerequisite: 612 354

Historical and technical terms in plants tissue culture. Organization of plant tissue culture laboratory and laboratory equipment. Plant tissue culture media and preparation, medicinal plant cell culture including application of plant tissue culture for secondary metabolite production.

613 251 Basic Pharmaceutical Chemistry 3(2-3-4)

Prerequisite: 312 112

Basics of pharmaceutical chemistry, chemical bonding, molecular drug structure, stereochemistry, acidity-basicity, polarity, solubility, types of chemical reactions classified by the mechanisms of reaction, including the basics of heterocyclic chemistry. In laboratory, the students will practice basic chemical reactions and molecular modeling.

613 252 Pharmaceutical Analysis I 3(2-3-4)

Prerequisite: None

Principles and quality control techniques for pharmaceutical and chemical products, quantitative analysis using titrimetric methods, acid-base titration in aqueous and non-aqueous media, complexometric titration, oxidation-reduction titration, precipitation titration, potentiometric titration and gravimetric analysis.

613 351 Pharmaceutical Analysis II 4(3-3-6)

Prerequisite: 613 252 #

Principles and quality control techniques for pharmaceutical and chemical products using high technology analytical instruments; UV-spectrophotometer, infrared spectrophotometer, atomic absorption spectrophotometer, spectrofluorometer, electrophoresis, thin layer chromatography, polarimeter, refractometer, gas chromatography and high performance liquid chromatography.

613 352 Pharmaceutical Chemistry **3(3-0-6)**

Prerequisite: 610 311

Influence of chemical structure and physico-chemical properties on drug action and pharmacokinetic character. Structure activity relationship of some prototype groups. Case studies.

613 511 Structure Elucidation **3(3-0-6)**

Prerequisite: 613 351

Chemical structure of organic drugs and other organic compounds by using spectroscopy such as uv-visible spectrophotometry, IR-spectrophotometry, mass spectroscopy, NMR and C-13 spectroscopy. Students will learn how to interpret spectra.

613 512 Advanced Pharmaceutical Chemistry **3(3-0-6)**

Prerequisite: 613 352

Chemical properties that have an effect on drug activity and drug toxicity. The problems and the solution of drug development and structure activity relationship of drug in term of bioactivity and quality are also the topic in this course.

613 513 Drug Design **3(3-0-6)**

Prerequisite: 613 352

Basic principle of drug design and drug development using methods of chemistry, immunology, x-ray crystallography and by using microcomputer, quantitative structure-activity relationship (QSAR) in drug design and the case studies of drug development.

613 551 Drug Extraction and Separation **3(2-3-4)**

Prerequisite: 613 351

Principles and techniques of drug isolation and purification. Study of drug separation by using various phases of chromatographic techniques eg. liquid-liquid, liquid-solid, solid-solid, gas-liquid, gas-solid that used for drug identification and determination.

613 552 Drug Synthesis **4(3-3-6)**

Prerequisite: 613 352

Principles, procedures and techniques of drug synthesis from common chemical substances, mechanisms of reactions and yield from kinetic and thermodynamic processes.

613 554 Advanced Pharmaceutical Analysis **3(2-3-4)**

Prerequisite: 613 351

Analysis of various drug group in detail by using new technologies, including the analytical methods for development and sample preparation, pretreatment of samples in biological fluids and in various types of dosage form.

613 555 Techniques in the Application of Analytical Instruments **3(1-6-2)**

Prerequisite: 613 351

Principles and procedures for using instruments for drug analysis, such as spectrophotometry (spectrofluorometer, atomic absorption spectrophotometer), and chromatography. This course considers techniques, procedures, precautions and maintenance of instruments.

613 591 Special Project in Research and Development in Pharmaceutical Sciences

Prerequisite: None **3(0-9-9)**

Students are assigned to conduct a research work of a selected topic in the area of research and development in Pharmaceutical Sciences. Students work under the close supervision of an advisor to develop ability and skill in: searching information from various sources, research planning, proposal writing, study design, techniques in laboratory, data collection, data analysis, applying biostatistics to research work, report writing and research work presentation.

613 651 Quality Control of Cosmetics 3(2-3-4)

Prerequisite: 613 351

Quality control of cosmetic preparations such as powders, lotions, shampoos, hair-styling preparations, lipsticks, soap, etc., stability of products and quality control of ingredients used in preparations.

613 652 Quality Control of Ethnomedicine 2(2-0-4)

Prerequisite: 613 351

Quality control of Ethnomedicine base on scientific information regarding the amount of active ingredients, regulation of the chemical and physical properties of ethnomedicine plant, and contamination such as insecticide, fungi, bacteria, heavy metal etc..

613 653 Quality Control of Food-product 3(2-3-4)

Prerequisite: 613 351

Quality control of both fresh foods and finished food-products with an emphasis on food additives and contaminants, including regulations involved.

613 654 Food Chemistry 3(2-3-4)

Prerequisite: 613 351

Constituents of foods such as natural food, finished food-products, supplement food-products. The content also includes food nutrients eg. protein, carbohydrate, fat, vitamin, mineral and specific components.

614 351 Toxicology 4(3-3-6)

Prerequisite: 366 316

Basic principles of toxicology and mechanisms by which drugs and chemicals cause adverse effects and damage to living organisms. Body responses of both non-organ directed and specific target organ systems following exposure to various classes of toxicants. Major classes of compounds that affect organ systems and primary mechanisms of toxicity of these agents. A practical foundation for analysis of toxic responses and toxicants in biological samples.

614 551 Clinical Toxicology **3(2-3-4)**

Prerequisite: 614 351

Apply the basic knowledge of toxicology in clinical use. Learn and understand the clinical symptoms of poisoned patients with various toxicants. Practical sessions include case studies either from hospitals or simulated cases in order to gain problem-solving skill and experiences of the management of poisoned patients.

614 552 Food Toxicology **3(2-3-4)**

Prerequisite: 614 351

Toxicity from various foods including intentional additives and contaminants. To study symptoms of toxicity resulting from food contamination, excessive vitamins, bacterial food-borne disease, mycotoxins, and toxicity from consumable plants and treatments. In practical work, students will be trained in analyzing for quality and quantity of food contaminated by toxic substances.

614 553 Techniques in Pharmacology and Toxicology **3(1-6-2)**

Prerequisite: 366 326, 614 351

Advanced techniques used in pharmacology and toxicology, such as isotropic technique for the study of drug distribution, radio immunoassay for trace amount analysis, techniques for the determination of receptors and subtype receptors, and test-animal operation techniques will be also studied.

614 572 Current Concepts in Pharmacology and Toxicology **1(1-0-2)**

Prerequisite: None

Searching any current concepts in Pharmacology and Toxicology. Various information retrieving techniques, systematical review, compilation and presentation.

614 582 Clinical Pharmacology and Toxicology Clerkship **2(0-12-12)**

Prerequisite: 366 316 และ 614 351

Practical professional skills relevant to clinical pharmacology and toxicology service in hospitals or other health care centers. Drug and poison information service, clinical pharmacokinetics, emergency toxicology and poison management, antidote preparation and health care team in hospital.

614 591 Special Project in Pharmacology and Toxicology 3(0-9-9)

Prerequisite: None

An independent research study on a selected topic in pharmacology and toxicology under a close supervision of an advisor to develop abilities and skill in searching information from documents and various database sources, research planning, research operation, proposal writing, report writing and presentation.

614 612 Molecular Toxicology 3(3-0-6)

Prerequisite: 614 351, 366 326

Receptors channels intracellular signaling and interaction of drugs and toxicants at cellular and molecular level. Application for toxicity assessment therapy and drug development.

614 651 Environmental Toxicology 3(2-3-4)

Prerequisite**: 614 351**

Problems caused by toxic agents contaminating in the environment, ie. air, water, soil and from industrial factories. To study methods to diminish environmental pollutants and to replenish the balance of the environment. In practical study, students will practice the laboratory analyses of chemical contaminants in the environment by collecting samples of water, soil and air to analyse for types and amounts of these causative substances.

614 653 Addicted and Psychoactive Substances 2(2-0-4)

Prerequisite: 366 326

Pharmacological and toxicological effects of various addicted substances and psychoactive agents including opioids, and central nervous system stimulants and depressants.

The contents also cover health and socioeconomic problems related to usage of these substances.

615 253 Basic Principle in Pharmaceutical Technology 4(3-3-6)

Prerequisite: 312 234#

Theory and physicochemical principles applicable for drug formulations, routes of administrations, pharmaceutical calculations, terminology in prescription and pharmacopoeia, basic technique in preparation, states of matter, solubility, complexation, interfacial phenomena, colloids, polymers, rheology, microneritics, incompatibility and chemical stability.

615 254 Pharmaceutical Technology I 4(3-3-6)

Prerequisite: 615 253#

Theory and technology related to formulation of liquid dosage forms e.g. solutions, suspension, emulsions, sterile dosage forms and extemporaneous preparation dosage form, definitions, pharmaceutical components and properties of formulations, techniques and problems in preparation, labeling and packaging, physicochemical evaluations.

615 354 Pharmaceutical Technology II 3(2-3-4)

Prerequisite: 615 253#

Theory and technology related to formulation of semisolid dosage forms, solid dosage forms. Drug absorption and release of drug into the body.

615 511 Unit Operation 2 (2-0-4)

Prerequisite: 615 254#, 615 354#

Concepts and processes for drug manufacturing, the processes of raw material preparation, mixing, granulation, drying, compression, coating, filtration, filling and sterilization, Cases studies of using appropriate equipment in drug production.

615 551 Advanced Pharmaceutics 3 (3-0-6)

Prerequisite: 615 254#, 615 354#

Controlled release and drug delivery technology, the new technologies for drug delivery for the gastrointestinal tract, skin, mucosa and target organ delivery, biotechnology.

615 552 Drug Formulation Sciences 4 (2-6-4)

Prerequisite: 615 254#, 615 354#

The application of pharmaceutics and technology in the formulation of liquid, semi-solid and solid dosage forms. The capability of comparative analysis of drug formulations, the skills of drug formulation development and evaluation.

615 553 Good Manufacturing Practice in Industrial Pharmacy 2 (2-0-4)

Prerequisite: 610 312#

Principle of good manufacturing practice; law related to drug manufacturers; plant layout and environmental control; waste water treatment; industrial safety.

615 591 Special Project in Pharmaceutics 3(0-9-9)

Prerequisite: None

Investigate and perform and experiment of a selected topic in pharmaceutics under special supervision of advisors. This course is aimed to improve self-learning skill, literature searching from textbooks, articles, journals as well as from various databases, research planning, data analysis, an application of biostatistics to research methodology, report writing and oral presentation.

615 612 Macromolecules in Pharmacy 2(2-0-4)

Prerequisite: 615 254#, 615 354#

Definitions, types, characteristics and properties of macromolecules used in pharmacy; key processes in the preparation of macromolecules; medical and pharmacy application of macromolecules.

615 651 Cosmetic Sciences 3(2-3-4)

Prerequisite: 615 552#

Roles and considerations in cosmetic development; laws, regulations and cosmetic registrations; skin products, hair products, fragrant products, oral hygienic products, nail products; types and considerations of cosmetic packaging, packaging design; evaluation of cosmetic product; development of natural cosmetic products; use of cosmetics in daily life.

615 652 Veterinary Pharmaceutics 2 (1-3-2)

Prerequisite: 615254#, 615 354#

The principles and concepts of physicochemical properties involving pharmaceutical formulation of drug used in animals, uses of medicine for treatment in large animals such as buffalo, cow and small animals such as dog and cat.

615 653 Packaging in Pharmaceutical Sciences 2(2-0-4)

Prerequisite: 615 254#, 615 354#

Types, properties and test procedures of packaging materials used in the pharmaceutical industries; models; chemical, physical and commercial suitability.

616 212 Pharmacy Profession and Its Ethics 2(2-0-4)

Prerequisite: None

Concept of pharmacy profession; pharmacy education and the pharmacy profession in Thailand and internationally; roles of pharmacists in the health system context; ethics for pharmacists in professional practice; internal and external factors related to pharmacy profession.

616 312 Public Health Pharmacy 2(1-3-4)

Prerequisite: None

Diagnosis of health problems and drug use in populations; planning for solving pharmacy-related public health problems; assessment of public policies and projects affecting public health and society.

616 313 Pharmacy Jurisprudence 2(2-0-4)

Prerequisite: None

Principles of laws and the legislation process; law enforcement related to pharmaceuticals, food, cosmetics and health products, the practice of pharmacy profession and health

616 315 Health Behavior and Communication in Pharmacy 2(2-0-4)

Prerequisite: None

Concepts and theories of main stream medicine and alternative medicine; health care seeking behavior and behavior of drug use; health communication and pharmacy counseling

616 316 Introduction to Pharmaceutical Management 2(2-0-4)

Prerequisite: None

Processes in general management; concepts of human resource management in health organizations; organization behaviors; basic principles of financial management; health products management; application of information system for pharmaceutical management.

616 317 Research Methods in Pharmaceutical Sciences I 3(2-3-4)

Prerequisite: None

Fundamentals of conducting research in pharmaceutical sciences; characteristics of data and variables; validity and reliability of measurement; basic statistics for data analysis; sample size estimation; use of computer programs for data management.

616 318 Research Methods in Pharmaceutical Sciences II 3(3-0-6)

Prerequisite: 616 317

Research designs in pharmaceutical sciences; experimental research; survey research; outcomes research; qualitative research, ethical consideration in research.

616 511 Introduction to Pharmacoeconomics 2(2-0-4)

Prerequisite: None

Drug utilization and health care services under economic perspective; pharmaceutical marketing system; health care financing and drug cost-containment; economic evaluation of production and utilization of pharmaceuticals.

616 514 Introduction to Pharmacoepidemiology 2(2-0-4)

Prerequisite: None

Principle of epidemiology in pharmacy; measures of magnitude of the problems; assessment of association between risk factors and the problem; application of knowledge in pharmacoepidemiology in consumer protection and public health pharmacy.

616 583 Professional Practice in Pharmaceutical Care and Administration 2(0-10-10)

Prerequisite: None

Professional practice as related to responsibilities of pharmacists in drug system and health care systems, roles of pharmaceutical care and administration in hospitals, health care facilities, drug stores, pharmaceutical companies, and other health-related organizations.

616 591 Special Project in Social and Administrative Pharmacy 3(3-0-3)

Prerequisite: None

Design, measurement, data collection and analysis as in a research project development in order to solve a special problem in social and administrative pharmacy.

618 712 Financial Management in Health Organization 3(3-0-3)

Prerequisite: None

Principles of accounting and finance; financial system in the private sector; public financing; capital and operating budgets; financial analysis; application of financial management to health organizations.

618 713 Quantitative Analysis in Health Product Management 3(3-0-3)

Prerequisite: None

Methods in quantitative analysis necessary for health product management; techniques in forecasting the demands for health products and services; linear programming for optimal resource allocation; decision analysis modeling under uncertainty and risk; waiting lines and queuing theory in health care service and production; network modeling for health product management projects; drug inventory control.

618 714 Strategic Management in Health Organization 3(3-0-3)

Prerequisite: None

Definition and scope of strategic management for health organizations; vision and mission setting for organizations; external and internal environment analysis of health organizations; goals and objectives setting; strategy formulation; strategic implementation; control and evaluation strategies for health organization.

618 715 Marketing Management of Health Products 3(3-0-3)

Prerequisite: None

Philosophy and concepts of marketing management of health products, analyzing market opportunities, factors affecting the strategic marketing plan; implementing, evaluating and controlling marketing processes; ethics, laws and regulations; profession's code of conduct.

618 732 Accounting for Health Organization 3(3-0-3)

Prerequisite: None

Using accounting information to support decision making concerning planning, implementing, monitoring and evaluating health organizations in order to optimize benefits of the organizations.

618 738 Pharmacy Benefit Management in Health Insurance System 3(3-0-3)

Prerequisite: None

Theories of the demand for health and health care; theories of health insurance; health care financing as related to drug use system; pharmacy reimbursement system including cost-based contract and risk-based contract; economic efficiency in utilization and provision of drug benefits; designing pharmacy benefit packages; drug cost-containment measures including patient cost-sharing; formulary restriction, and other demand-side and supply-side interventions.

618 741 Work Study in Health Organization 3(3-0-3)

Prerequisite: None

Work method design; process analysis; multiple activity analysis; operational analysis; standardization standard practice; design time study; standardization of time study in wage incentive determination.

861 101 Art Appreciation 2(2-0-0)

Prerequisite: None

The language and functions of art in various media; a general survey of aesthetic Principles and styles in the arts of both Eastern and Western world with special emphasis on Thai Arts.

864 101 Music Appreciation 2(2-0-0)

Prerequisite: None

An introduction to the various musical styles of the western world and their Historical development, explanation of structure of classical music. Elementary Comparative studies of occidental and oriental music, with and emphasis on Thai Traditional music and its development.

961 261 Principles of Management 3(3-0-2)

Prerequisite: None

The usefulness, importance, and nature of management, and some conceptual views about the role of management. Evolution and development of management theories. Principles and processes of management: planning, organizing, staffing, actuating, directing and controlling.

962 100 Principle of Economics 2(2-0-0)

Prerequisite: None

Basic instruments in economics, mechanism of price, demand and supply, elasticity and condition of perfect competition, monopoly market analysis of easy economic problem, national income, monetary and banking, and international trade.

963 110 Preliminary Business **3(3-0-1)**

Prerequisite: None

Several types of businesses; business decisions; the functions of accounting, finance, production, purchasing, marketing, and office and personnel management in business; credit documents; the channels of purchasing, selling, import and export documents; and insurance.

963 111 Introduction to Management **2(2-0-0)**

Prerequisite: None

The study of the nature and principles of management: such as planning, organizing, authority and responsibility, and co-ordination and controlling with analyses of case studies from public and private businesses in Thailand. The aim is to provide an opportunity for students to identify problems, express, and work in groups.

18. Quality Assurance of the Program

The quality assurance of the program follows the regulation of the quality assurance for undergraduate study of Khon Kaen University.

Adherence to the following documents:

18.1 An Announcement of the Ministry of University Affairs: Subjects: Criteria Standardization of the Bachelor Study Level Program, 1999 **(see copy attached)**

18.2 The Regulation of Khon Kaen University on Graduate Level Education, 1998, or the newly Modified Regulations of Khon Kaen University **(see copy attached)**

18.3 The handbook of Quality Assurance for the Bachelor Study Programs, 1999 **(see copy attached)**

19. Reasons for program revision

The English edition is not a revised edition. The courses are similar to the new Thai Edition (2003) which has been approved by the University Council.

20. The Differences between the Previous Edition and This Revised Edition

There is not any difference between the Thai Edition and the English Edition. All details such as credits and courses of the English program follow the Thai Edition recently modified and used for the 2003 academic year.

The Reasons for Revision of Subjects

1. General Subjects

The total credits changed from 47 to 30 credits

Languages Subject Group

1. Credits for English language courses increased from 8 to 12 credits in accordance to the regulation of the ministry of education. The addition of English modules is to encourage students to have skills in effective professional communication, reading research articles and relevant health related documents, reports and scientific writing, and presentations as in conferences and international publications.
2. Add one new other language for student choice.

General Subject Group

1. Students can choose computer subject depending on student's ability.
2. Add 1 credit of Physical education to promote student health and experience sport rules.
3. For other elective modules, students can choose according to their preferences. Subjects as Esarn culture (419 131) and human and society (415 110) required revision to make it more integrated.
4. Revise Sciences and Mathematics modules to the required courses since this subject is the fundamental subject for other subjects.

2. Required subject group

Sciences and Mathematics courses

These subjects were before in general subject group, and have now decreased from 27 credits to 18 credits in which the contents are principle for professional courses.

Revise Physics subject to Basic Physics. The revised subject comprise of theories and applications of mechanics, fluid mechanics, heat and thermodynamics, electric currents and electronics, acoustics, optics, atomic physics, radioactivity. The revised subject leaves electrical magnetics, wave movement and quantum theories out and acoustic and radioactivity are added.

Delete General Chemistry and laboratory due to the repetitive content. Basic organic chemistry, Biophysical chemistry remains unchanged since they both are basis of Basic Pharmacy Chemistry and Pharmaceutical Technology.

Delete analytical chemistry subject since the content are closed to 613 352 Drug Analytical Chemistry 1 and its minimizing the complexity of the subject content.

Credits for core courses has increased from 106 to 114 credits.

Credits for basic professional modules are changed from 22 to 21 credits. This is due to the change in content of 365 330 General Pathology and 365 340 Pathophysiology courses (4 credits) to 365 316 Pathology for Pharmacy (3 credits). This course is integrated with Pharmacotherapy therefore students will be able to understand the treatment.

Credits for Professional modules are changed from 84 to 93 credits

The 610 courses is integrated from other subjects in previous edition. This is to cut off repetitive content.

Replace 612 351 Pharmaceutical Botany, some part of 613 251 (Basic Pharmaceutical Chemistry) and 613 352 (Pharmaceutical Chemistry) with 610 311 (Source of Medicines). The content is included all sources of medicine from nature and synthesis, new medicine from medicinal plants and medicine synthesized from organic and inorganic substances. The 610 313 (Drug Development) is a continuation of this course to understand method and procedure from raw materials to medicines.

610 312 Quality Assurance of Pharmaceutical products is an integrated course for both industries and laboratories. The content includes herbal, traditional and modern medicines. The aims of this course is for students to understand in all quality assurance processes in industries especially for good manufacturing practices (GMP) and good laboratory practices (GLP).

Add 610 315 Pharmaceutical Biotechnology subject in core course. It was previously the subject of Pharmacognosy. The course is involved fermentation technology, formulation and therapy of pharmaceutical biotechnology-derived products.

The 379 410 General Medicines, 611 312 Clinical Pharmacy, 611 351 Pharmaceutical Dispensing and 611 352 Pharmacotherapeutics 1, are integrated into Pharmacotherapeutics 1-4 with the addition of pharmacokinetics and diet therapy courses. The courses are integrated and met standard of pharmacy practice.

Some parts of 612 352 Pharmacognosy subject are changed and added into 610 311 Source of Medicines subject and 612 354 (Natural health products) course.

615 251 Pharmaceutics 1, 615 252 Pharmaceutics 2, 615 351 Pharmaceutics 3, 615 352 Pharmaceutics 4 and 615 353 Pharmaceutics 5 subjects are integrated into 615 253 Basic principle in Pharmaceutical Technology, 615 254 Pharmaceutical Technology 1 and 615 354 Pharmaceutical Technology 2.

616 211 Pharmaceutical orientation is changed into 616 212 Pharmaceutical Profession and its Ethics with the addition of ethics for pharmacists in professional practice.

Add 616 315 Health behavior and communication in Pharmacy to ensure that students are able to understand concepts, theories of health care seeking behaviors and health communication of patient counseling.

Revise 516 201 Biostatistics and 616 314 Basic research methodology in Pharmacy into 616 317 Research Methods in Pharmaceutical sciences 1 and 616 318 Research Methods in Pharmaceutical sciences 2. These subjects are involved in research methodology, basic statistics and the use of computer program.

616 511 Introduction to Pharmacoeconomics and 616 514 Introduction to Pharmacoepidermiology are changed from elective courses to core courses. This is due to the importance for students to understand drug utilization and health care services under economic perspective, public health evaluation and public health protection.

2.3 Special interest courses are changed from 7 to 2 groups. This is to broaden student knowledge and have opportunity to choose courses that they are interested in. These changes are in accordance to standard of practice of Pharmacy Council. The credits are changed from 30 to 18 credits since some contents are revised into professional subject groups.

The aim of the pharmaceutical sciences program of Khon Kaen University is to produce graduates with professional ability and possess good moral to pharmacy practice. The program comprises general education, professional subjects and free electives. This is to prepare to students to be qualified pharmacists. In accordance with the change of economy and the reform policy of the ministry of Health, together with the introducing of standard practice of pharmacists of the Pharmacy Council (2002), it is therefore necessary for the Faculty of Pharmaceutical Sciences, Khon Kaen University to revise the bachelor degree program. The new program will provide the graduates to meet the criteria of the professional practice of pharmacists.