

Course Description

Chemistry

1- Diploma

٢- 501 ك: التحليل الكهروكيميائية والتحليل الكروماتوجرافي

3- C501: Electrochemical analysis and chromatographic analysis

- 4- Potentiometry: Electrodes (Reference, Metallic, Enzyme Membrane, Ion Selective), Field effect, Transistor electrode, Solid state sensors, Gas sensing and enzyme electrodes, Biosensors and molecular selective electrode, Potentiometric titration and its applications. Voltammetry and Polarography: Modified Polarography; Alternating-current Polarography, Differential-pulsed Polarography, Rapid scan Polarography, Cyclic-voltammetry, Stripping voltammetry, Voltammetry at solid electrodes, Amperometric titration. Other Related Techniques: Conductance Methods, Amperometry, Electrogravimetry and Coulometry. Advanced methods in separation chromatographic methods.

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C502: Separation Techniques

502ك: تقنيات الفصل

6- Solvent extractions: Introduction, principles and applications. Chromatographic Analysis: Fundamentals, Instrumentations and Applications of Chromatographic technique. Types of the chromatographic analysis, Gas Chromatography (GC), Liquid Chromatography (LC), Thin Layer (TLC) Chromatography, High Performance Liquid Chromatography (HPLC), Electrophoresis Chromatography, and Gas Chromatography connected with mass spectrometer and Ion exchange Chromatography.

C503: Applied spectral analysis

503ك: التحليل الطيفي التطبيقي

7- Fundamentals, Instrumentations and Applications of Molecular Spectroscopy: Ultraviolet, Visible, Infra red and Raman Spectroscopy, Fluorescence and phosphorescence, Nuclear spectroscopy, NMR, X-ray structural analysis, ESR and Laser Spectroscopy. Fundamentals, Instrumentations and Applications of Atomic absorption methods: Flame, Arc and Spark atomic emission spectroscopy, Inductive coupled plasma; Inductive coupled plasma-mass spectrometry, Atomic absorption spectroscopy by Laser technique.

C504: Experimental topic of analytical chemistry

504ك: موضوعات عملية في الكيمياء التحليلية

8- Selected experiments: Direct potentiometry and potentiometric titration voltammetry and paleography, ultraviolet and visible absorption spectroscopy, Nuclear magnetic resonance, planar chromatography, other spectroscopic techniques.

C505: Environmental Analysis

505ك: التحاليل البيئية

9- Introduction, sampling and instrumentation of: Aquatic systems: Classification of aquatic systems, chemical composition of natural water (rain, lakes, rivers, oceans and underground water....etc), Sources of pollution, water analysis. Atmosphere: Nature and composition, Air analysis, Identification and determination of the organic and inorganic pollutants. Soil: Nature, composition and various soil types of pollutants, monitoring and determination of major components of soil and pollutants. (1) Water Analysis: Spectrophotometric analysis, Atomic absorption analysis, pH measurements, direct potentiometry and potentiometric titrations, Polarography, chromatographic techniques. (2) Atmosphere Monitoring: Some experiments based on sample collection, analysis of the atmosphere, qualitative and quantitative analysis of some organic and particles, inorganic pollutants in some soil samples.

C506: Atomic absorption and separation methods

506ك: الامتصاص الذري وطرق الفصل

10- Absorption and emission spectrometers, Atomic Absorption Spectrometer (AAS), Flame atomic absorption spectrometer (Direct Aspiration method), Flameless Atomic Absorption, Graphite furnace method, Hydride generation method, Cold vapor method, Single beam AAS, Double beam AAS, Monochromator, A common way to estimate the atomic absorption spectrometer, Wet ashing, dry ashing.

C507: Microscopic characterization of nanomaterials

507ك: التوصيف الميكروسكوبي للمواد متناهية الصغر - 11

12- Characterization of Nanomaterials Using Transmission Electron Microscopy, Introduction, Imaging, Transmission Electron Microscopy: Standard Operating Mode, High-Resolution Electron Microscopy, Basis of High-resolution Imaging, Resolution Limits, Lattice Imaging or Atomic Imaging, Instrumental Parameters, Survey of Applications, Developments in

HREM, Small Particles and Precipitates, Two-dimensional Objects, One-dimensional Objects, Zero-dimensional Objects, Interfaces and Surfaces, Emerging Trends and Practical Concerns, Atomic Location and Quantitative Imaging, Detection and Correction of Aberrations, Stobbs Factor, Radiation Damage. Atomic force microscope AFM and scanning electron microscope.

C508: Topics on nanotechnology science 508ك: موضوعات مختارة في علوم النانو

13- This course is tailored to introduce students to the latest advances in various fields of nanotechnology, and/or to focus on a specific area of particular interest to the discipline. Contents of the course may vary from one semester to another.

C509: Nanotechnology and water treatment 509ك: النانو تكنولوجيا ومعالجة المياه

14- Water purification using nanotechnology exploits nanoscopic materials such as carbon nanotubes and alumina fibers for nanofiltration, it also utilizes the existence of nanoscopic pores in zeolite filtration membranes, as well as nanocatalysts and magnetic nanoparticles. Nanosensors, such as those based on titanium oxide nanowires or palladium nanoparticles are used for analytical detection of contaminants in water samples.

C510: Optical properties of nanomaterials 510ك: الخواص الضوئية للمواد متناهية الصغر

15- Introduction, Spectroscopic Techniques for Studying Optical Properties of Nanomaterials, Optical Properties of Semiconductor Nanomaterials, Optical Properties of Metal Oxide Nanomaterials , Optical Properties of Metal Nanomaterials, Optical Properties of Composite Nanostructures, Charge Carrier Dynamics in Nanomaterials, Applications of Optical Properties of Nanomaterials.

C511: Forensic medical chemistry 511ك: الكيمياء الطبية الشرعية

16- Chemical analysis of trace amount of materials including: Explosives, Drugs, Toxicants, Fibers, Textiles, Paints, Cements, Inks, Building materials, etc.

C512: Synthetic Detergence 512ك: المنظفات الصناعية

17- Detergency process, Effect of surfactant on dirt removal, Builders, Soaps and soap products, Synthetic surfactants, Anionic surfactants, Non-ionic surfactants ethoxylation reaction, Cationic surfactants, Household detergent products based on synthetic surfactants, Fabric washing products, Fabric softening products, Dishwashing liquids.

C513: Enzymes 513ك: كيمياء الأنزيمات

18- General properties of enzymes and methods for preparation and separation. Structure and function of enzymes and their catalytic roles during the chemical reactions. Methods of measuring enzyme activity of some important enzymes. The role of enzymes in diagnosis of some diseases. The role of enzymes in molecular biology and their role in some areas of biotechnology. Practical part: Determination of the level of total CK enzyme in blood. Determination of the level of CK-MB enzyme in the blood. Determination of the level of LDH enzyme. Analysis of the components of the spinal cord (CSF). Some of the various enzymatic experiments.

C514: Metabolism and genetic errors 514ك: الأيض والعيوب الوراثية

19- Study some errors that occur during metabolism of food and their relationship with some genetic diseases. The role of genetic mutation in induction of many diseases. Study of some diseases produced from defect in metabolism of some amino acids. The problems that occur in the kidney and its relationship with some pathological phenomena.

C515: Fundamentals of immunology 515ك: أساسيات علم المناعة

20- Fundamentals of immunology and structure of immune system. Physiology of immune system. Natural and acquired immunity. Immune deficiency diseases. Practical part: Determination of total CRP. Determination of ASOT titer. Determination of Typhoid and Paratyphoid titer. Determination of VDRL titer.

C516: Porphyrins metabolism

516ك: أيض البورفيرينات

21- Hematology, hemoglobin synthesis, structure and porphyrin metabolism. Anemia, causes, types and role of some vitamins specially vitamin B₁₂. Practical part: Fundamentals of blood sampling and manipulation, preparation of different staining. Complete blood picture, hemoglobin content estimation, WBCs counting and differentiation, platelets counting. Blood group and RH typing, bleeding and coagulation time estimation. Blood parasites diagnosis through blood film preparation and staining. Tumor and viruses markers detection. Mastering all experiments in use in blood bank.

C517: Biochemical errors

517ك: الاضطرابات الكيميائية الحيوية

22- Studying biochemical errors in pancreas like diabetes with its two major types insulin dependant and insulin independent. Studying biochemical errors in liver like fatty liver and viral hepatitis or obstructive hepatitis through screening of different liver enzyme levels. Studying biochemical errors in kidney like renal failure and renal calculi. Studying biochemical error in brain like Parkinson syndrome and dopamine deficiency. Practical Part: Determination of the level of glucose, creatinine, uric acid in blood and urine. Study kidney efficiency and glucose curve. Determination of lipid profile like cholesterol, triglycerides, HDL, LDL. Liver function testes like GPT, GOT, bilirubin alkaline phosphatase and albumin Determination of some blood electrolytes like sodium, magnesium, and potas.

C518: Chemistry of antibiotics

518ك: كيمياء المضادات الحيوية

23- Classification and mode of action. Cell wall inhibitors and cell membrane inhibitors. Antimicrobials which interfere with DNA. Antimicrobials which interfere with protein synthesis. Antimetabolites. Mechanisms of resistance and antibiotics evaluation.

C519: Parasitology

519ك:

الطفيليات

24- This course deals with the major concepts of parasites/animal associations and definitions of parasitology terms. Also, parasites that infect human body, taxonomy, morphology, anatomy, life cycle, diagnosis, pathogenicity, distribution, immune responses, pathology, and pharmacology to decrease parasitic disease. Control and treatment of various parasitic examples in the different phyla and classes. Practical part: Identification of different parasites eggs and whole parasite in urine and stool samples. Urine analysis composition, collection, preservation, gross examination, interfering factors, chemical examination. Significance of sugar in urine, ketone bodies in urine, bile pigments, hematuria, uric acid, microscopic examination of the urinary sediment, Stool examination: Specimen collection, inspection of faeces, odor, pH and interfering substance. Test for occult blood, faecal fat, microscopic examination of stool specimen.

C520: Biotechnology

520ك: التكنولوجيا الحيوية

25- Study the techniques used in production of Genetically modified organisms including animal, plant or microbes. The use of biotechnology in different manner of life including environment, animal production, plant production. Practical part: Bacteriology preparation of growth media for studying microorganisms. Preparation of cultures for aerobic and anaerobic organisms.

C521: Petrochemicals Industries**521ك: الصناعات البتروكيميائية**

26- Petrochemicals raw materials, Basic building block processes, Petrochemical process technology, Ethylene and co-products, Ethylene derivatives, Propylene derivatives, Butadiene and butanes, Benzene, Toluene and Xylenes production, Steam reforming and related processes.

C522: DNA Technology**522ك: تكنولوجيا DNA**

27- Study of the central dogma including DNA, RNA and protein. Gene cloning techniques that used in gene cloning. Study the role of transcriptional factors in regulation gene expression. Role of advanced biotechnology techniques in manipulation of DNA and RNA.

C521: Synthetic Detergence**523ك: المنظفات الصناعية**

28- Detergency process, Effect of surfactant on dirt removal, Builders, Soaps and soap products, Synthetic surfactants, Anionic surfactants, Non-ionic surfactants ethoxylation reaction, Cationic surfactants, Household detergent products based on synthetic surfactants, Fabric washing products, Fabric softening products, Dishwashing liquids.

C524: Petroleum Refining and petroleum additives**524ك: تكرير البترول والإضافات البترولية**

29- Chemistry of crude oil and petroleum products, Refining process, Fractional distillation, Catalytic reforming, Alkylolation, Isomerisation, Cracking and hydrotreating processes, Lubricating oil production, Additives technology. Experiments relevant to the aforementioned topics.

C525: Paints**525ك:****البيوتات**

30- Paint Fundamentals, Paint system, Basic paint formation, Paint component functions, Types and application of paints.

C526: Industry of oil, fats and proteins**526ك: صناعة الزيوت والدهون والبروتينات**

31- Classification and chemical structures, hydrolysis products of fats and oils, drying oils, phosphor glycosides. Peptide synthesis and protein sequencing.

C525: Introduction of Nano Science**527ك: مقدمه في علوم النانو**

32- The goal of the course is to give students an overview of what nanotechnology is all about, and how it is transforming the scientific research landscape and agenda. Students will learn how science is meeting at the nanoscale, overriding the traditional departmental boundaries between physics, chemistry and biology. In this course, students will gain the core competencies needed to utilize advanced technologies to visualized, analyze and manipulate Nano-structures across disciplines, from bioinspired engineering principles to new phenomena in advanced physics. The latest exciting state of the art nanoscale discoveries will be presented and framed within the wider scope of the implications of these discoveries for science and society.

33-

528ك: المواد متناهية الصغر لتحويل الطاقة وتطبيقات التخزين**35- C528: Nanomaterials for energy conversion and storage applications**

36- Nanostructured materials are advantageous in offering huge surface to volume ratios, favorable transport properties, altered physical properties, and confinement effects resulting from the nanoscale dimensions, and have been extensively studied for energy-related applications such as solar cells, catalysts, thermoelectrics, lithium ion batteries,

supercapacitors, and hydrogen storage systems. This review focuses on a few select aspects regarding these topics, demonstrating that nanostructured materials benefit these applications by (1) providing a large surface area to boost the electrochemical reaction or molecular adsorption occurring at the solid–liquid or solid–gas interface, (2) generating optical effects to improve optical absorption in solar cells, and (3) giving rise to high crystallinity and/or porous structure to facilitate the electron or ion transport and electrolyte diffusion, so as to ensure the electrochemical process occurs with high efficiency. It is emphasized that, to further enhance the capability of nanostructured materials for energy conversion and storage, new mechanisms and structures are anticipated. In addition to highlighting the obvious advantages of nanostructured materials, the limitations and challenges of nanostructured materials while being used for solar cells, lithium ion batteries, supercapacitors, and hydrogen storage systems have also been addressed in this review.

C529: Synthesis of nanomaterials

529ك: تصنيع المواد النانومترية

37- Synthesis of nanomaterials such as quantum dot, nanotubes and nanowires, nanocomposites, magnetic materials. Size control, structure, shape and functionality.

C530: Applications of nanocatalysis systems

530ك: تطبيقات الحفز لأنظمة النانو

38- What is photocatalysis, mechanism of photocatalysis, History of photocatalysis, kind of light necessary for photocatalysis, semiconductors photocatalysis and heterogeneous photocatalysis?

C531: Characterizations of nanomaterials

531ك: توصيف المواد النانومترية

39- Techniques used include: Transmission electron microscopy (TEM), Optical spectroscopy, Diffraction/Spectroscopy/Microscopy. Photonic Characterization of Nanomaterials, X-ray Scattering & Crystallography for Nanoscale Materials and Structures. This course discusses the principles of each of these techniques and compares their relative advantages and disadvantages for both surface analysis and depth profiling. Many examples will be given to illustrate the applications of each technique for solving surface-related problems. A discussion of typical instrumentation is also included.

C532: Applications of nanotechnology for energy and environment

532ك: تطبيقات النانو تكنولوجي في الطاقة والبيئة

40- Topics includes nanotechnology's role in improving photovoltaic, fuel-cell, batteries, energy transmission and conversion of renewable (green) sources, nanophotocatalysis for environmental remediation, and nanotitania for air purification.

2- Master

3- C601: Advanced Analytical Chemistry

601ك: كيمياء تحليلية متقدمة

Validation of the analytical method: accuracy, precision, dynamic range, LOD, LOQ, selectivity, specificity, robustness and ruggedness. Determinate, indeterminate errors and the normal distribution curve. Significant figures and rounding off. Calibration curve and standard addition methods: slope, intercept and coefficient of determination. The least squares or best-fit line. Student's distribution t Test and the F statistic. Potentiometry, stripping voltammetry and electrochemical sensors.

C602: Instrumental Analysis

602ك: التحليل الآلي

Fundamentals, instrumentations and applications of molecular spectroscopy: UV-Vis absorption, IR, FTIR, raman spectroscopy, fluorescence and phosphorescence, NMR and mass spectroscopy. X-ray method and ESR spectroscopy, absorption methods and LASER spectroscopy, fundamentals, instrumentations and applications of atomic spectroscopy: Flame, Graphite furnace atomic absorption/emission spectroscopy and ICP.

C603: Advanced inorganic chemistry

603ك: كيمياء غير عضوية متقدمة

Symmetry: Elements and operations, point group, matrices, applications to molecular vibrations, applications to chemical bonding, ligand field theory. Nuclear magnetic resonance spectroscopy: elementary aspects, principles and applications, nuclear magnetic resonance spectra of paramagnetic transition metal ion complexes. Electron paramagnetic resonance spectroscopy: electron paramagnetic resonance spectra of transition metal ion complexes.

C604: Applied Electrochemistry

604ك: الكيمياء الكهربية التطبيقية

Introduction and overview of electrode processes. Basic potential step methods. Potential sweep methods; cyclic voltammetry. Polarography and pulse voltammetry: polarography, normal pulse voltammetry, differential pulse voltammetry, square wave voltammetry. Controlled-current techniques. Bulk electrolysis methods.

C605: Optical spectroscopy

605ك: الطرق الضوئية في التحليل الطيفي

The aim of the course is to give advanced knowledge of optical spectroscopy including steady state absorption and emission spectroscopy as well as dynamics of the excited state using time correlated single photon counting and laser flash photolysis.

606ك: التقنيات المتقدمة لتعيين التراكيب غير العضوية

C606: Advanced techniques for determination of the structures of inorganic structures

Proton magnetic resonance spectra of paramagnetic inorganic compounds, Magnetochemical methods, Electro-spray mass spectra and related techniques, X-ray crystal analysis and molecular structure.

C607: Principals and designs of nanoscale systems

607ك: أساسيات وتصميم الأنظمة النانومترية

This course addresses the fabrication, characterization and applications of nanomaterials.

Theoretical models for describing physical and chemical properties of nanostructure are presented.

C608: Bioinorganic chemistry

608ك: كيمياء غير عضوية حيوية

Role of metal ions in biology – four basic principles in the biological selection of elements – brief survey of metal ions in biological system – effect of metal ion concentration and physiological effect. Metalloproteins, Metal atoms in enzymatic catalysis, Binding of metal ions and complexes to bimolecular active centers, Electron transfer proteins, Substrate binding and activation by nonredox mechanisms, Atom and group transfer chemistry. Models of metalloproteins, Studying and discussion of different examples from current inorganic literature (primary journals and review journals). *Physical effects of metal complex*: DNA binding, unwinding, shortening and bending of the doublehelix. Biological consequences of platinum, DNA binding. Transition metal complexes as donor acceptor pairs. Non classical platinum antitumour agents.

C609: Applied kinetic chemistry

609ك: كيمياء حركية تطبيقية

Experimental methods of fast techniques (stopped-flow), theories of reaction dynamics, mechanism of inorganic reactions and energy transfer.

C610: Modern spectroscopy610ك: طرق طيفية
حديثة

Modern spectroscopy for identification of organic reaction mechanism. Principles of different spectroscopic methods (theoretical quantum mechanics studies). Different spectroscopic techniques for kinetics investigations of organic reaction mechanism (kinetics and spectroscopy).

C611: Advanced separation techniques

611ك: تقنيات فصل متقدمة

Solvent extractions: Introduction, principles and applications. Chromatographic Analysis: Fundamentals, Instrumentations and Applications of Chromatographic technique Types of the chromatographic analysis, Gas Chromatography (GC), Liquid Chromatography (LC), Thin Layer (TLC) Chromatography, High Performance Liquid Chromatography (HPLC), Electrophoresis Chromatography, and Gas Chromatography connected with mass spectrometer and ion exchange chromatography.

C612: Chemistry of surface, colloids and catalysis

612ك: كيمياء السطوح والغرويات والحفز

Structure of the solid-liquid interface, interaction between colloidal particles and electrophoresis, polymer adsorption and steric stabilization, flocculation, emulsion stability, classification of emulsion break down process, creaming and sedimentation, flocculation, coalescence, Ostwald ripening, phase inversion), experimental methods for study of emulsion stability, surfactants and its industrial applications. Catalysis, Homogenous and heterogeneous catalysis, catalytic action (initiate reactions, stabilize intermediates, block side reactions, donate and accept electrons, efficient means for energy transfer), catalysis by metals, adsorption, surface area and porosity, kinetics of surface reactions, some industrial applications. Experiments relevant to the aforementioned topics.

C613: Advanced organic chemistry

613ك: كيمياء عضوية متقدمة

Base catalyzed condensation: Condensation of carbanions with aldehydes, ketones and esters – alkylation of carbanions – addition of carbanions to activated olefins. Acid catalyzed condensations: Self condensation of olefins – Mannich reaction. Enolates: Control of extent of alkylation – Michael reactions – Robinson annelation. Carbanions stabilized by second row elements: Use of sulphur and phosphorus stabilized nucleophilic species in C–C bond formation, especially olefination (Wittig and Julia olefinations reactions) – concept and use of umpolung-type reagents.

C614: Advanced organometallic chemistry

614ك: كيمياء عضوية فلزية متقدمة

Some applications for organometallic compounds. Homogeneous and heterogeneous catalytic organometallic reactions: Definition and comparison. Homogeneous catalysis: Hydrogenation and

asymmetric hydrogenation, hydroformylation reactions containing hydrogen and carbon monoxide, Heterogeneous catalysis: Ring closure metathesis reactions, heterocyclization reactions of alkenes, allenes, and alkynes bearing hydroxyl, imino, carbonyl, and cyano groups, heterocycloaddition reactions, carbonylation reactions, heteroannulation reactions.

C615: Advanced heterocyclic chemistry

615ك: كيمياء حلقيّة غير متجانسة متقدمة

Nonaromatic heterocyclics: Different types of strains, interactions and conformational aspects of nonaromatic heterocycles. Synthesis, reactivity and importance of some nonaromatic heterocyclics such as azirines, aziridines, axiranes, thiiranes, diazirenes, diaziridines, oxaziridines, azetidines, oxetanes and thietanes. Five and six membered heterocyclics with two hetero atoms: Synthesis, reactivity, aromatic character and importance of some heterocycles such as pyrazole, imidazole, oxazole, thiazole, isoxazole, isothiazole, pyridazine, pyrimidine, pyrazine, oxazine, thiazine, benzimidazole, benzoxazole and benzthiazole. Heterocyclics with more than two hetero atoms: Synthesis, reactivity, aromatic character and importance of some heterocycles such as triazoles, tetrazoles, oxadiazoles, thiadiazoles, triazines, tetrazines. Synthesis and reactions of some larger and fused heterocyclic compounds.

C616: Chemistry of per cyclic reactions

616ك: كيمياء تفاعلات التحلقن

Main features of per cyclic reactions, M.Os of conjugated pi-systems. Electrocyclic reactions: mode of rotations, analysis of odd and even number of electron pair(s) systems with FMO method. Cycloaddition reaction: modes of addition, Diels-Alder reaction, analysis with FMO method, sigmatropic rearrangement, [1,3] and [1,5] rearrangements, Cope and Claisen rearrangements. Pericyclic reactions in human body: Vitamin D from cholesterol; Sigmatropic $[i,j]$ shifts of C-H and C-C bonds – Sommelet-Hauser, Claisen, thio-Claisen, Cope and aza-Cope rearrangements. Approaches for the interpretation of mechanism of pericyclic reactions-aromatic transition states (ATS)/perturbation molecular orbitals (PMO) approach – concept of Huckel–mobius aromatic and antiaromatic transition states. Framing Woodward-Hofmann selection rules for all the pericyclic reactions by ATS approach. Solving problems based on ATS approach.

C617: Advanced organic stereochemistry

617ك: كيمياء عضوية فراغية متقدمة

Introduction, terminology and basic principles of stereoselective synthesis, strategies for stereo control in diastereoselective synthesis, principle and categories with specific examples of asymmetric synthesis including newer methods involving enzymatic and catalytic nexus reactions, enantio- and diastereoselective synthesis, racemic modification and optical purity, conformational analysis of acyclic, cyclic, heterocyclic and steroidal systems, effects of conformation on reactivity, regioselectivity, stereospecificity and stereoselectivity.

C618: Special topics in biochemistry

618ك: موضوعات خاصة في الكيمياء الحيوية

Topics are determined by the instructor depending on interest and expertise. Subjects covered include: protein analysis, mechanistic enzymology, nucleic acid research, protein/nucleic acid interactions, and spectroscopic methods. Biochemical and molecular analysis of selected human diseases, atherosclerosis and lipid metabolism, cancer and oncogenes, apoptosis and the cell cycle, human immunodeficiency virus replication, and AIDS. Protein sequences determination and evolution. Comprehensive study of the molecular organization, structure function and bio-energetic principles of biomolecules amino acids, proteins, enzymes, carbohydrates, lipids and nucleic acids. Emphasis on the structure-function relationships, solution behavior and metabolism of biomolecules. Amino acid degradation (C3, C4, C5 family), urea cycle, uric acid and ammonia formation; Enzymatic hydrolysis of proteins to peptides; Amino acid sequencing; amino acid metabolism (biosynthesis and degradation).

C619: Science and engineering of organic polymers**619ك: علوم وهندسة البوليمرات العضوية**

Brief emphasize on classification and naming of polymers, polymerization techniques, polymer solubility, concepts of amorphous and crystalline straitens. Introduction to plastics and rubbers and overview of polymer processing. Significance of stereoregularity, morphology and order in crystalline polymers configurations of polymer chains, relation between polymer structures and physical properties. Measurement of molecular weights (End group, viscosity, light scattering, osmotic and ultra centrifugation methods). Effect of molecular weight, diluents, chemical structure, chain topology, branching and cross linking. Possible analytical and testing methods of polymers (chemical analyses, spectroscopic methods, thermal analysis, GPC, XRD, TEM and SEM).

C620: Selected topics in applied organic chemistry**620ك: موضوعات مختارة في الكيمياء العضوية التطبيقية**

The selected topic is determined by the instructor depending on interest and expertise. Fats and oils: Classification and chemical structures of fats and oils. Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Hydrolysis products of fats and oils, drying oils, phosphor glycosides. Synthetic dyes: Colour and constitution (electronic concept), classification of dyes, chemistry and synthesis of different dyes. Technical azo dyes for wool, silk, leather and cellulose fibers, azoic dyes, vat dyes, disperse dyes, intermediates used for the preparation of dyes, dyes with mixed chromophores, mechanism of dyeing, reactive dyes. Chemistry of natural and synthetic fibers, pretreatments of textiles and finishing methods, auxiliaries and their uses, relation between fiber structures and their properties. Porphyrins: Porphyrins structures, aromaticity of porphyrins, synthesis of porphyrins, related natural porphyrin compounds, application of porphyrins as PDT, organic photochemistry, using of porphyrins as solar cells, cytochrome C and its synthesis, porphyrin derivatives and their biological applications. Detergents: Detergency process, effect of surfactant on dirt removal, builders, soaps and soap products, synthetic surfactants, anionic surfactants, non-ionic surfactants ethoxylation reaction, cationic surfactants, household detergent products based on synthetic surfactants, fabric washing products, fabric softening products, dishwashing liquids. Saponification value, iodine value, acid value, soaps, synthetic detergents, alkyl and aryl sulphonates. Paints: Paint fundamentals, paint system, basic paint formation, paint component functions, types and application of paints.

C621: Drug design and delivery systems**621ك: تصميم الأدوية وأنظمة التدفق**

A rational approach, introduction, analogues and prodrugs, concept of "lead", factors governing drug design, molecular connectivity, linear free-energy approaches. Method of variation, drug design through disjunction and conjunction, receptor theories, tailoring of drugs. Types of drug delivery systems, introduction to gene therapy, types of gene delivery systems, introduction to targeting, passive and active targeting, liposomes, strategies for brain drug delivery, bio-distribution, evaluation and applications, time release systems, osmotic systems.

C622: Industrial Application of Polymers**622ك: التطبيقات الصناعية للبوليمرات**

Introduction to polymer applications, Properties of polyethylene and its applications, Film applications, Moulding applications, Pipe applications, Additives for polyethylene Experiments relevant to the aforementioned topics.

C623: Topics on nanotechnology science**623ك: موضوعات مختارة في علوم النانو**

This course is tailored to introduce students to the latest advances in various fields of nanotechnology, and/or to focus on a specific area of particular interest to the discipline. Contents of the course may vary from one semester to another.

C624: Risks of the environment and health**624ك: المخاطر البيئية والصحية**

This course introduces the environmental and health aspects of nanotechnology. An overview to nanotechnology along with characterization and properties of Nano materials that are of concern to the environment and health. The course covers the biotoxicity and ecotoxicity of Nano materials. A sizable part of the course is devoted to discussions about fate and the application of Nano technology for environmental remediation along with discussions about fate and transport of Nano materials. Special emphasis is given to risk assessment and risk management of Nano materials.