Course Description

Chemistry

C701: Molecular photochemistry — 701ك: الكيمياء الضوئية الجزيئية

Energies of photochemical conversation, reaction and molecular orbits, thoritical organic photochemistry, mechanism of photochemical reaction, photo addation, substituation, photofragmentation reaction, isomerisation and rearrangements.

C702: Process and applications of nonmaterial — 702ك: معالجة وتطبيقات الأنظمة النانو مترية المركبة

Introduction to nanocomposites, materials sciences of nanocomposites, properties of nanocomposites, structures and characterization, applications of nanocomposites.

C703: Applied coordination chemistry — 703ك: كيمياء تناسقية تطبيقية

Coordination compounds in medicinal chemistry, Coordination compounds as catalysts, Coordination chemistry in microelectronics.

C704: Selected topic in physical chemistry — 704ك: موضوعات خاصة في الكيمياء الفيزيائية

Selected topics depend on the availability and discussions of some topics from the recent literature will be chosen to reflect the current research interests of the staff.

C705: Technical chemistry — 705ك: كيمياء تقنية

Introduction, History of Industrial Biotransformations, Dreams and Realities, Basics of Bioreaction Engineering, Biosynthesis and immobilization of biocatalysts, Characteristics of the different catalyst classes, Basic reactor types and their mode of operation.

C706: The coordination chemistry of macrocyclic ligands — 706ك: الكيمياء التناسقية لليجاندات الحلقية

What is different about macrocyclic ligand complexes? Synthetic procedures. Macrocyclic with pendant functional groups, the catenands, binucleating macrocyclics, the cage macrocyclic. Host – guest chemistry: macrocyclic hosts and non-metallic guests. Kinetic and mechanistic considrations. Redox properties. The natural macrocycles.

C707: Advanced physical organic chemistry — 707ك: كيمياء عضوية فيزيائية متقدمة

New mechanisms of organic reactions – rearrangements and neighboring group effects – applications of the Hammett equation and its extended forms – approaches to molecular orbital theory – Woodward-Hoffmann rule – computational chemistry and the modem concepts in organic chemistry.

C708: Advanced reaction mechanism — 708ك: ميكانيكية التفاعلات العضوية المتقدمة

(a) Nucleophilic C-C bond formation: Henry reaction, Wittig reaction and Horner-WordwothEmmons reaction and their selectivities; Chemistry of enolates – *E, Z* geometry of enolates, kinetic *vs* thermodynamic control of enolates, stereoselective enolate reactions, alkylation, aldol condensation (Zimmerman and Evans models), Mukaiyama reaction. (b) Electrophilic C-C bond formation: Nazarov cyclization, Prins reaction, Vilsmeier-Hack reaction, Pictet-Sprengler

reaction, reactions of π-allyl palladium complexes, Heck reaction, Stille coupling, Noyori reaction, reactions of allylsilane. (c) Arynes: Generation, structure and stability of arynes; Benzyne mechanism for aromatic nucleophilic substitution; Direction of aryne bond formation and of nucleophilic addition; Rearrangement and cyclo-addition reactions of arynes; Trapping of arynes.

C709: Advanced chemistry of natural products **709ك: كيمياء النواتج الطبيعية المتقدمة** Familiarity with methods of structure elucidation (chemical & spectroscopical methods), biosynthesis, synthesis and biological activity of the alkaloids – nicotine, atropine, coniine and papavarine. Techniques of extraction including supercritical fluid extraction and other advanced technology. Terpenoides: classification, structures and syntheses. Steroids: sterols, structure, synthesis; vitamin D, bile acids, steroid sex hormones, corticoids (Adrinocortical Hormones), flavones, anthocyanins and prophyrins. Plant pigments**:** occurrence, nomenclature and general methods of structure determination. Isolation and synthesis of anthocyanins, flavones, flavonols and isoflavones. Biosynthesis of flavonoids: acetate pathway and shikimic acid pathway.

C710: Advanced chemistry of nucleosides **710ك: كيمياء متقدمة فى النيكليوزيدات**

Classification, definitions, general methods of their synthesis – structure and synthesis of the naturally occurring biologically active C-nucleosides – showdomycin, pyrazofurin, antibiotic CV-1, pseudouridine, ezomycine, oxazinomycin – selected examples of synthetic C-nucleosides – methods used for assignment of anomeric configuration.

C711: Advanced Chemistry in Applied Polymer **711ك: كيمياء متقدمة في البوليمرات التطبيقية**

Introduction to polymer applications (conducting polymers), film applications, molding applications, pipe applications, synthesis of types of polymers and morphology structures, structure control of polymer chains. Formation, characterization and applications of polymeric nanoparticles. The water soluble charged polymers and their applications. Ionomers (ion containing polymers) conducting polymers solid polymer electrolytes, mechanism of conductivity, polymer colloids and their applications in commercial and industrial formulations (adhesives, coating, paper, pharmaceutical and medical applications), polymer microgels, biomedical polymers. Polymers in combating environmental pollution and as chemical reagents. Preparation and applications of plastics (thermosetting and thermosoftening). Fabrics and rubbers (natural and synthetic).

C712: Modern concepts of green chemistry **712ك: المفاهيم الحديثة للكيمياء الخضراء**

This course intends to take the students through the newer, environment friendly products and procedures and incite them to take a more holistic view of different chemical processes. Introduction to alternative approaches. Goals of green chemistry (Introduction, principles, limitations, and different approaches to green synthesis). Prevention of waste/by products–minimization of hazardous/toxic products–prevention of chemical accidents. Green reaction conditions (green catalysis, ionic liquids, supercritical fluids, flourous phase reactions, heterogeneous catalysis). Microwave and ultrasound assisted organic synthesis. Microwave technology (microwave equipment, activation-benefits, limitations, and effects). Microwave assisted reactions under PTC conditions. Solid phase and aqueous phase organic synthesis. Solvent free reactions–principle, scope, utility of solvent free condition reactions.

C713: Advanced synthetic organic chemistry **713ك: كيمياء عضوية تخليقية متقدمة**

New Techniques and concepts in organic synthesis. i) Metal mediated C-C and C-X coupling reactions: Suzuki, Heck, Stille, Sonogishira cross coupling, Buchwald-Hartwig and

NegishiKumada coupling reactions. ii) C=C Formation Reactions: Shapiro, Bamford-Stevens, McMurrey reactions, Julia-Lythgoe olefination and Peterson's stereoselective olefination. iii) Multicomponent Reactions: Ugi, Passerini, Biginelli, Hantzsch and Mannich reactions; iv) Ring formation reactions: Pausan-Khand reaction, Bergman cyclisation, Nazerov Cyclisation; v) Click chemistry: Criteria for Click reaction, Sharpless azides cycloadditions.

C714: Chemistry of enzymes **كيمياء الإنزيمات :ك714** 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.

C715: Forensic medicinal chemistry **ك715: الكيمياء الطبية الشرعية**

Definition and scope of forensic science, physical properties, composition and identification of glass and soils, structure and identification of hair and fibers, identification of ink, paint and plastic, classification and identification of drugs, controlled and toxic substances. Principles and identification of fingerprints, chemistry of fires and fuels. Types and analysis of explosives.

C716: Bionanotechnology **ك716: بايونانوتكنولوجى**

The objectives of this course involve nanotools to relevant medical/biological problems. Developing new tools such as peptide nanosheets, for medical and biological purposes new medical technologies involving nanoparticles including nanorobots and biological machines as well as cancer treatment.