٣٠: قسم الكيمياء - الخطط الدراسية لبرامج الدراسات العليا.

البرنامج	الكود		الدرجة	
	ع	E	ع	E
١. الكيمياء التحليلية ٢. الكيمياء الحيوية ٣. البتروكيماويات ٤. علوم النانو تكنولوجي	٥٠٠ك	C500	دبلوم	Diploma
١. الكيمياء اللاعضوية ٢. الكيمياء العضوية	٦٠٠ك	C600	ماجستير	M.Sc.
١. الكيمياء اللاعضوية ٢. الكيمياء العضوية	٧٠٠ك	C700	دكتوراه	Ph.D.

أولاً: الخطة الدراسية لبرامج الدبلوم.

الكود		عدد المقررات	نوع المقرر	الساعات المعتمدة
ع	E			
٥٠٠ك	C500	٥	إجباري	١٠
		٥	اختياري	١٠
العدد الكلي للساعات المعتمدة				٢٠

١. الساعات الإجبارية: يدرس الطالب ١٠ساعات معتمدة موزعة على فصلين دراسيين بواقع ٦ساعات معتمدة في الفصل الدرلسي الأول و ٤ساعات معتمدة في الفصل الدرلسي الثاني.
٢. الساعات الاختيارية: يختار الطالب ١٠ ساعات معتمدة موزعة على فصلين دراسيين بواقع ٤ساعات معتمدة في الفصل الدرلسي الأول و ٦ساعات معتمدة في الفصل الدرلسي الثاني.

١. المقررات الدراسية لدرجة الدبلوم تخصص الكيمياء التحليلية.

الفصل الدراسى	كود المقرر	اسم المقرر	عدد الساعات			حالة المقرر	
			نظري	عملي	معتمدة	إجباري	اختياري
الأول	٥٠١ك	التحاليل الكهروكيميائية والتحليل الكروماتوجرافي	٢	-	٢	√	-
	٥٠٣ك	التحليل الطيفي التطبيقي	٢	-	٢	√	-
	٥٠٥ك	التحاليل البيئية	٢	-	٢	√	-
	٥٠٧ك	تحليل ومعالجة المياه	٢	-	٢	-	√
	٥٠٩ك	النانو تكنولوجي ومعالجة المياه	٢	-	٢	-	√
	٥١١ك	الكيمياء الطبية الشرعية	٢	-	٢	-	√
الثاني	٥٠٢ك	تقنيات الفصل	٢	-	٢	√	-
	٥٠٤ك	موضوعات عملية في الكيمياء التحليلية	-	٤	٢	√	-
	٥٠٦ك	الامتصاص الذري وطرق الفصل	٢	-	٢	-	√
	٥٠٨ك	موضوعات مختارة في علوم النانو تكنولوجي	١	٢	٢	-	√
	٥١٠ك	المخاطر البيئية والصحية	٢	-	٢	-	√
	٥١٢ك	المنظفات الصناعية	1	٢	٢	-	√

٢. المقررات الدراسية لدرجة الدبلوم تخصص الكيمياء الحيوية.

الفصل الدراسى	كود المقرر	اسم المقرر	عدد الساعات			حالة المقرر	
			نظري	عملي	معتمدة	إجباري	اختياري
الأول	ك٥١٣	كيمياء الأنزيمات	١	٢	٢	√	-
	ك٥١٥	أساسيات علم المناعة	١	٢	٢	√	-
	ك٥١٧	الاضطرابات الكيميائية الحيوية	١	٢	٢	√	-
	ك٥٠٣	التحليل الطيفي التطبيقي	٢	-	٢	-	√
	ك٥١١	الكيمياء الطبية الشرعية	٢	-	٢	-	√
	ك٥١٩	الطفيليات	٢	-	٢	-	√
الثاني	ك٥١٤	الأيض والعيوب الوراثية	١	٢	٢	√	-
	ك٥١٦	أيض البورفرين	١	٢	٢	√	-
	ك٥١٠	المخاطر البيئية والصحية	١	٢	٢	-	√
	ك٥١٨	كيمياء المضادات الحيوية	٢	-	٢	-	√
	ك٥٢٠	التكنولوجيا الحيوية	١	٢	٢	-	√
	ك٥٢٢	تكنولوجيا DNA	٢	-	٢	-	√

٣. المقررات الدراسية لدرجة الدبلوم تخصص البتروكيماويات.

الفصل الدراسى	كود المقرر	اسم المقرر	عدد الساعات			حالة المقرر	
			نظري	عملي	معتمدة	إجباري	اختياري
الأول	ك٥٢١	الصناعات البتروكيميائية	١	٢	٢	√	-
	ك٥٢٣	المنظفات الصناعية	١	٢	٢	√	-
	ك٥٢٥	البويات	٢	-	٢	√	-
	ك٥٠٣	التحليل الطيفي التطبيقي	٢	-	٢	-	√
	ك٥٠٧	تحليل ومعالجة المياه	٢	-	٢	-	√
	ك٥٠٩	النانو تكنولوجي ومعالجة المياه	٢	-	٢	-	√
الثاني	ك٥٢٤	تكرير البترول والإضافات البترولية	٢	-	٢	√	-
	ك٥٢٦	صناعة الزيوت والدهون والبروتينات	١	٢	٢	√	-
	ك٥٠٦	أحبار الطباعة	٢	-	٢	-	√
	ك٥٠٨	موضوعات مختارة في علوم النانو تكنولوجي	٢	-	٢	-	√
	ك٥١٠	المخاطر البيئية والصحية	٢	-	٢	-	√
	ك٥٢٨	التطبيقات الصناعية للبلمرات	٢	-	٢	-	√

٤. المقررات الدراسية لدرجة الدبلوم تخصص علوم النانو تكنولوجي.

الفصل الدراسى	كود المقرر	اسم المقرر	عدد الساعات			حالة المقرر	
			نظري	عملي	معتمدة	إجباري	اختياري
الأول	ك٥٢٧	مقدمه في علوم النانو	٢	-	٢	√	-
	ك٥٢٩	تصنيع المواد النانو مترية	٢	-	٢	√	-
	ك٥٣١	توصيف المواد النانو مترية	١	٢	٢	√	-
	ك٥٠٣	التحليل الطيفي التطبيقي	٢	-	٢	-	√
	ك٥٠٧	التوصيف الميكروسكوبي للمواد متناهية الصغر	٢	-	٢	-	√
	ك٥٠٩	النانو تكنولوجي ومعالجة المياه	٢	-	٢	-	√
الثاني	ك٥٣٠	تطبيقات الحفز لأنظمه النانو	١	٢	٢	√	-
	ك٥٣٢	تطبيقات النانو تكنولوجي في الطاقة والبيئة	٢	-	٢	√	-
	ك٥٠٢	تقنيات الفصل	٢	-	٢	-	√
	ك٥٠٨	موضوعات مختارة في علوم النانو تكنولوجي	٢	-	٢	-	√

	ك٥١٠	الخواص الضوئية للمواد متناهية الصغر	٢	-	٢	-	√
	ك٥٢٨	تطبيقات تكنولوجيا النانو	٢	-	٢	-	√

المحتوى العلمي للمقررات الدراسية لبرامج الدبلوم

ك٥٠١: التحاليل الكهروكيميائية والتحليل الكروماتوجرافي
C501: Electrochemical analysis and chromatographic analysis

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 it's applications. Voltammetry and Paleography: 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.

C502: Separation Techniques ك٥٠٢: تقنيات الفصل

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 ك٥٠٣: التحليل الطيفي التطبيقي

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 ك٥٠٤: موضوعات عملية في الكيمياء التحليلية

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 ك٥٠٥: التحاليل البيئية

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: Spectrophotometeric 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 **٥٠٦ك: الامتصاص الذري وطرق الفصل**

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.

٥٠٧ك: التوصيف الميكروسكوبي للمواد متناهية الصغر

C507: Microscopic characterization of nanomaterials

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 **٥٠٨ك: 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.

C509: Nanotechnology and water treatment **٥٠٩ك: النانو تكنولوجي ومعالجة المياه**

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 **٥١٠ك: الخواص الضوئية للمواد متناهية الصغر**

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 — ٥١١ك: الكيمياء الطبية الشرعية

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

C512: Synthetic Detergence — ٥١٢ك: المنظفات الصناعية

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 — ٥١٣ك: كيمياء الأنزيمات

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 — ٥١٤ك: الأيض والعيوب الوراثية

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 — ٥١٥ك: أساسيات علم المناعة

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 — ٥١٦ك: أيض البورفرينات

Hematology, hemoglobin synthesis, structure and porphyrin metabolism. Anemia, causes, types and role of some vitamins specially vitamin B_{12}. 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 ك٥١٧: الاضطرابات الكيميائية الحيوية

Studying biochemical errors in pancreas like diabetes with its two major types insulin dependant and insulin independent. Studding 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 ك٥١٨: كيمياء المضادات الحيوية

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 ك٥١٩: الطفيليات

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 ك٥٢٠: التكنولوجيا الحيوية

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 ك٥٢١: الصناعات البتروكيميائية

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 ك٥٢٢: تكنولوجيا DNA

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 **٥٢٣ك: المنظفات الصناعية**

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 **٥٢٤ك: تكرير البترول والإضافات البترولية**

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

C525: Paints **٥٢٥ك: البويات**

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

C526: Industry of oil, fats and proteins **٥٢٦ك: صناعة الزيوت والدهون والبروتينات**

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

C525: Introduction of Nano Science **٥٢٧ك: مقدمه في علوم النانو**

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.

٥٢٨ك: المواد متناهية الصغر لتحويل الطاقة وتطبيقات التخزين

C528: Nanomaterials for energy conversion and storage applications

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 **٥٢٩ك: تصنيع المواد النانومترية**

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

C530: Applications of nanocatalysis systems **٥٣٠ك: تطبيقات الحفز لأنظمه النانو**

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

C531: Characterizations of nanomaterials **٥٣١ك: توصيف المواد النانومترية**

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 **٥٣٢ك: تطبيقات النانو تكنولوجي فى الطاقة والبيئة**

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.

ثانياً: الخطة الدراسية لبرامج الماجستير.

الكود		عدد المقررات	نوع المقرر	الساعات المعتمدة
ع	E			
٦٠٠ك	C600	٥	إجباري	١٠
		٥	اختياري	١٠
		بحث الرسالة	إجباري	٢٢
العدد الكلي للساعات المعتمدة				٤٢

١. الساعات الإجبارية ١٠ ساعات معتمدة موزعة على فصلين دراسيين بواقع ٦ساعات معتمدة في الفصل الدراسي الأول و ٤ساعات معتمدة في الفصل الدراسي الثاني.
٢. الساعات الاختيارية ١٠ساعات معتمدة موزعة على فصلين دراسيين بواقع ٤ساعات معتمدة في الفصل الدراسي الأول و ٦ساعات معتمدة في الفصل الدراسي الثاني.
٣. بحث الرسالة مقرر إجباري (٦٠٠ك – C600) بواقع ٢٢ساعة معتمدة يبدأ بعد الانتهاء من إجراءات التسجيل لدرجة الماجستير.

١. المقررات الدراسية لدرجة الماجستير تخصص الكيمياء اللاعضوية.

الفصل الدراسي	كود المقرر	اسم المقرر	عدد الساعات			حالة المقرر	
			نظري	عملي	المعتمدة	إجباري	اختياري
الأول	٦٠١ك	كيمياء تحليلية متقدمة	٢	-	٢	√	-
	٦٠٣ك	كيمياء غير عضوية متقدمة	٢	-	٢	√	-
	٦٠٥ك	الطرق الضوئية في التحليل الطيفي	٢	-	٢	√	-
	٦٠٧ك	أساسيات وتصميم الأنظمة النانو مترية	٢	-	٢	-	√
	٦٠٩ك	كيمياء حركية تطبيقية	٢	-	٢	-	√
	٦١١ك	تقنيات فصل متقدمة	٢	-	٢	-	√
الثاني	٦٠٢ك	التحليل الآلي	٢	-	٢	√	-
	٦٠٤ك	كيمياء كهربية تطبيقية	٢	-	٢	√	-
	٦٠٦ك	التقنيات المتقدمة لتعيين التراكيب غير العضوية	٢	-	٢	-	√
	٦٠٨ك	كيمياء غير عضوية حيوية	٢	-	٢	-	√
	٦١٠ك	طرق طيفية حديثة	٢	-	٢	-	√
	٦١٢ك	كيمياء السطوح والغرويات والحفز	٢	-	٢	-	√

٢. المقررات الدراسية لدرجة الماجستير تخصص الكيمياء العضوية.

الفصل الدراسي	كود المقرر	اسم المقرر	عدد الساعات			حالة المقرر	
			نظري	عملي	معتمدة	إجباري	اختياري
الأول	٦١٣ك	كيمياء عضوية متقدمة	٢	-	٢	√	-
	٦١٥ك	كيمياء حلقية غير متجانسة متقدمة	٢	-	٢	√	-
	٦١٧ك	كيمياء عضوية فراغية متقدمة	٢	-	٢	√	-
	٦١١ك	تقنيات فصل متقدمة	٢	-	٢	-	√
	٦١٩ك	علوم وهندسة البوليمرات العضوية	٢	-	٢	-	√
	٦٢١ك	تصميم الأدوية وأنظمة التدفق	٢	-	٢	-	√
	٦٢٣ك	موضوعات مختارة في علوم النانو تكنولوجي	٢	-	٢	-	√
الثاني	٦١٤ك	كيمياء عضوية فلزية متقدمة	٢	-	٢	√	-
	٦١٦ك	كيمياء تفاعلات التحلقن	٢	-	٢	√	-
	٦١٠ك	طرق طيفية حديثة	٢	-	٢	-	√
	٦١٨ك	موضوعات خاصة في الكيمياء الحيوية	٢	-	٢	-	√
	٦٢٠ك	موضوعات مختارة في الكيمياء العضوية التطبيقية	٢	-	٢	-	√
	٦٢٢ك	التطبيقات الصناعية للبلمرات	٢	-	٢	-	√
	٦٢٤ك	المخاطر البيئية والصحية	٢	-	٢	-	√

المحتوى العلمي للمقررات الدراسية لبرامج الماجستير

C601: Advanced Analytical Chemistry ٦٠١ك: 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 ٦٠٢ك: 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 ٦٠٣ك: 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 ٦٠٤ك: 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 ٦٠٥ك: الطرق الضوئية فى التحليل الطيفى

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.

٦٠٦ك: 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, Magnetochmical methods, Electro-spray mass spectra and related techniques, X-ray crystal analysis and molecular structure.

C607: Principals and designs of nanoscal systems **٦٠٧ك: أساسيات وتصميم الأنظمة النانو مترية**

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 **٦٠٨ك: 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 non-redox 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 **٦٠٩ك: كيمياء حركية تطبيقية**

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

C610: Modern spectroscopy **٦١٠ك: 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 **٦١١ك: 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 **٦١٢ك: 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 ٦١٣ك: 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 sulpher 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 ٦١٤ك: كيمياء عضوية فلزية متقدمة

Some applications for organometallic compounds. Homogeneous and heterogeneous catalytic organometalic reactions: Definition and comparison. Homogeneous catalysis: Hydrogenation and asymmetric hydrogenation, hydrofornrylation 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 ٦١٥ك: كيمياء حلقية 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 ٦١٦ك: كيمياء تفاعلات التحلقن

Main features of per cyclic reactions, M.Os of conjugated pi-systems. Eelectrocyclic 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 ك٦١٧: 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 ك٦١٨: 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 ك٦١٩: 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 ك٦٢٠: موضوعات مختارة فى 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. Detergants: 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 **٦٢١ك: 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 **٦٢٢ك: التطبيقات الصناعية للبلمرات**

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 **٦٢٣ك: 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 **٦٢٤ك: 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.

ثالثاً: الخطة الدراسية لبرامج دكتوراه الفلسفة.

الكود		عدد المقررات	نوع المقرر	الساعات المعتمدة
ع	E			
٧٠٠ك	C700	٣	إجباري	٦
		٢	إختياري	٤

		بحث الرسالة	إجباري	٤٨
العدد الكلي للساعات المعتمدة				٥٨

١. الساعات الإجبارية: يدرس الطالب ٦ساعات معتمدة من المقررات الإجبارية.
٢. الساعات الاختيارية: يختار الطالب ٤ساعات معتمدة من المقررات الاختيارية.
٣. بحث الرسالة مقرر إجباري (٧٠٠ك – C700) بواقع ٤٨ساعة معتمدة يبدأ بعد الانتهاء من إجراءات التسجيل لدرجة دكتوراه الفلسفة.

١. المقررات الدراسية لدرجة دكتوراه الفلسفة تخصص الكيمياء اللاعضوية.

كود المقرر	اسم المقرر	عدد الساعات			حالة المقرر	
		نظري	عملي	معتمدة	إجباري	اختياري
٧٠١ك	كيمياء ضوئية جزيئية	٢	-	٢	√	-
٧٠٢ك	معالجة و تطبيقات الأنظمة النانو مترية المركبة	٢	-	٢	√	-
٧٠٣ك	كيمياء تناسقية تطبيقية	٢	-	٢	√	-
٧٠٤ك	موضوعات خاصة في الكيمياء الفيزيائية	٢	-	٢	-	√
٧٠٥ك	كيمياء تقنية	٢	-	٢	-	√
٧٠٦ك	الكيمياء التناسقية لليجاندات الحلقية	٢	-	٢	-	√

٢. المقررات الدراسية لدرجة دكتوراه الفلسفة تخصص الكيمياء العضوية.

كود المقرر	اسم المقرر	عدد الساعات			حالة المقرر	
		نظري	عملي	معتمدة	إجباري	اختياري
٧٠٧ك	كيمياء عضوية فيزيائية متقدمة	٢	-	٢	√	-
٧٠٨ك	ميكانيكية التفاعلات العضوية المتقدمة	٢	-	٢	√	-
٧٠٩ك	كيمياء النواتج الطبيعية المتقدمة	٢	-	٢	√	-
٧١٠ك	كيمياء متقدمة فى النيكليوزيدات	٢	-	٢	-	√
٧١١ك	كيمياء متقدمة في البوليمرات التطبيقية	٢	-	٢	-	√
٧١٢ك	المفاهيم الحديثة للكيمياء الخضراء	٢	-	٢	-	√
٧١٣ك	كيمياء عضوية تخليقية متقدمة	٢	-	٢	-	√
٧١٤ك	علم كيمياء الإنزيمات	٢	-	٢	-	√
٧١٥ك	الكيمياء الطبية الشرعية	٢	-	٢	-	√
٧١٦ك	بايونانوتكنولوجي	٢	-	٢	-	√

المحتوى العلمي للمقررات الدراسية لبرامج دكتوراه الفلسفة

٧٠١ك: الكيمياء الضوئية الجزيئية C701: Molecular photochemistry

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

٧٠٢ك: معالجة وتطبيقات الأنظمة النانو مترية المركبة C702: Process and applications of nonmaterial

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

C703: Applied coordination chemistry **٧٠٣ك: كيمياء تناسقية تطبيقية**

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

C704: Selected topic in physical chemistry **٧٠٤ك: 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 **٧٠٥ك: 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 **٧٠٦ك: 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 **٧٠٧ك: 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 **٧٠٨ك: ميكانيكية التفاعلات العضوية المتقدمة**

(a) Nucleophilic C-C bond formation: Henry reaction, Wittig reaction and Horner-Wordwoth-Emmons 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 **٧٠٩ك: 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 — ك٧١٠: 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 — ك٧١١: 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 — ك٧١٢: 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 — ك٧١٣: 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 Negishi-Kumada 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 — ٧١٤ك: كيمياء الإنزيمات

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 — ٧١٥ك: 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 — ٧١٦ك: 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.