

جداول المقررات ومحتوياتها

الباب الثامن : مقررات برامج قسم الدراسات البيئية

أولاً: برنامج الدبلوم المهني في ترشيد الطاقة 21 ساعة معتمدة (15 مقررات + 6 مشروع في مجال ترشيد الطاقة) مقررات درجة الدبلوم المهنية في ترشيد الطاقة.
يختار الطالب عدد 15 ساعة معتمدة منها 3 مقررات أساسية ويستكمل الباقي من المقررات الاختيارية وذلك من الجدول التالي بالإضافة إلى المشروع البحثي بـ 6 ساعات معتمدة (1401609-6) ساعات معتمدة

م	كود المقرر	اسم المقرر	عدد الساعات الأسبوعية		
			نظري	عملي	مجموع الساعات
المقررات الأساسية					
1	1401601	مصادر الطاقة - فاقد الطاقة والعزل الحراري Energy resources- heat insulation and heat transfer	2	2	3
2	1401602	تكنولوجيا ترشيد الطاقة Energy conservation technology	2	2	3
3	1401603	تكنولوجيا استخدام الطاقة وعلم الاحتراق Energy utilization technology and science of combustion	2	2	3
المقررات الاختيارية					
4	1401604	الإعلام والوعي البيئي Media and environmental awareness	3	-	3
5	1401605	الاحصاء التطبيقي (1) Applied statistics (1)	2	2	3
6	1401606	بحوث العمليات وتنميط الطاقة Operations research and energy modeling	2	2	3
7	1401607	اقتصاديات وإدارة الطاقة Energy management and economics	3	-	3
8	1401608	أجهزة قياس الطاقة Energy measurement instrumentation	2	2	3
المشروع البحثي					
9	1401609	المشروع Project	-	-	6

Energy resources- heat insulation and heat transfer (1401601) 3 CR مصادر الطاقة - فاقد الطاقة
والعزل الحراري

- Applications on methods of heat transfer and thermal insulation
- Introduction to fuel types
- Non-renewable energy sources and renewable energy sources
- Combustion gases and their effects on the environment.
- Introduction to the principles of heat transfer
- Methods of heat transfer (conduction - convection - radiation)
- General equations for heat transfer by conduction, convection and radiation
- Total heat transfer coefficient
- Heat exchanger and its types,
- Advantages and disadvantages of each type
- Types of thermal insulation

Energy conservation technology (1401602) 3CR تكنولوجيا ترشيد الطاقة

- Methods of energy conservation through the use of biomass and waste sources
- Wastes in the Egyptian environment (agriculture - industry - municipal)
- Methods of converting organic materials into clean sources of energy
- Scientific use of wastes in energy production and related technology
- Comparison between different technologies in terms of cost and energy resulting from them
- Integrated systems for the production of energy from organic sources
- Energy audit and calculations
- Energy audit (preparation for energy audit)
- Electrical energy audit, mechanical energy audit and steam systems energy audit
- Yield from energy audit.

Energy utilization technology and science of combustion (1401603) 3CR تكنولوجيا استخدام
الطاقة وعلم الاحتراق

- Energy saving opportunities (electrical energy saving opportunities)
- Electricity distribution networks
- Electrical loads - types of lamps - types of transformers
- Energy saving opportunities in steam systems and types of steam traps
- Applications on energy saving opportunities.
Calculating the thermal efficiency of the boiler by the direct and indirect method
- Fuel combustion process (equations, balance of matter and energy, air excess , combustion efficiency)
- Steam tables and types of boilers (flame tube boilers - water tube boilers - advantages and disadvantages of each type)

Media and environmental awareness (1401604) 3CR الإعلام والوعي البيئي

- Principles of environmental awareness
- Environmental awareness goals and main environmental problems
- Principles of human communication
- Principles of designing awareness materials
- Models of environmental activities
- Positive effects of increasing environmental awareness
- Environmental ethics and ethics of sustainable development
- Environmental concerns that have a global and local impact

Applied statistics (1) (1401605) 3CR (1) الإحصاء التطبيقي

- Data types
- Sampling
- Probability theory
- Primary statistics
- Binary and normal distribution
- Multivariate analysis of variance
- Statistical inference
- Bayesian theory
- Z - T - F test
- Simple and multivariate regression analysis, time series analysis and multivariate analysis.

Operations research and energy modeling (1401606) 3CR بحوث العمليات وتمييط الطاقة

- Introduction to the science of operations research
- Graphic solution to linear programming models
- Sensitivity analysis by graphic method
- Algebraic solution to linear programming models
- Sensitivity analysis to linear programming
- Some practical and environmental applications of linear programming
- Adding transport and network models to linear programming
- Energy systems analysis
- Network models
- Models and statistical analysis for energy data
- Price elasticity and income elasticity of energy demand
- Economic operating models for electric power plants.

Energy management and economics (1401607) 3CR إقتصاديات و إداره الطاقة

- Energy demand
- Energy supply
- Energy markets and their determinants
- Oil markets (supply, demand and role of OPEC)

- Natural gas markets (basic concepts)
- General objectives of energy policies and energy policy in Egypt (objectives and tools)
- Environmental dimension of energy management –
- Other related topics.

Energy measurement instrumentation (1401608) 3CR أجهزة قياس الطاقة

- Theoretical basis and operating theory
- Complete description of the components for measuring devices for air pollutants resulting from fuel Combustion (sulfur dioxide gas - nitrogen oxides - mono and carbon dioxide)
- The theoretical basis and method of operation and a full description of the measuring devices (total suspended dust - dust less than 1 micron – volatile organic hydrocarbons)
- The practical basis for measuring the performance of solar panels connected in series and parallel Measuring the power factor and the charge controller for photovoltaic systems
- The effect of radiation intensity on the performance of photovoltaic panels

Project (1401609) 3CR المشروع التطبيقي

يتم اختيار الموضوع التطبيقي للمشروع بتوجيه من السادة المشرفين طبقاً لخطة القسم وبموافقة مجلس القسم.

ثانياً: برنامج الماجستير في الدراسات البيئية (وله ثلاث مسارات)

❖ مقررات الماجستير في الدراسات البيئية:

يتم تحديد المسار الذي يلتحق به الطالب (مسار العلوم البيولوجية والصحية – مسار العلوم الفيزيائية والتكنولوجية – مسار العلوم الإدارية والاقتصادية) لبرنامج ماجستير الدراسات البيئية (الأكاديمي والمهني) بناءً على تخصصه بالدرجة الجامعية الأولى (ليسانس/بكالوريوس) ووفقاً لسياسة القبول المعتمدة من مجلس القسم في حينه ويلتزم الطالب بدراسة المقررات المخصصة لكل مسار.

- طالب الماجستير الأكاديمي يدرس 24 ساعة معتمدة مقررات بالإضافة إلى 12 ساعات معتمدة للرسالة

المقررات الأساسية لدرجة الماجستير						
يدرس الطالب أربعة مقررات دراسية بأجمالي ١٢ ساعة معتمدة						
تبعاً لكل مسار						
م	كود المقرر	اسم المقرر	مسار			المتطلب السابق
			العلوم البيولوجية والصحية	العلوم الفيزيائية والتكنولوجية	العلوم الإدارية والاقتصادية	
1	1401701	النظم البيئية والبيئة الفيزيائية Environmental systems and Physical Environment		X		-----
2	1401702	البيئة وديناميكيات السكان Ecology and Population Dynamics	X	X	X	-----
3	1401703	إدارة البيئة واقتصادياتها Environmental Management and Economics			X	-----
4	1401704	الموارد الطبيعية Natural Resources	X	X		-----
5	1401705	التلوث البيئي Environmental Pollution				-----
6	1401706	الإحصاء التطبيقي Applied Statistic	X	X		-----
7	1401707	المخاطر الصحية البيئية Environmetal Health Hazards	X			-----

المقررات الاختيارية لدرجة الماجستير لجميع المسارات
يختار طالب الماجستير أربعة مقررات باجمالي 12 ساعة معتمدة

م	كود المقرر	اسم المقرر	المسار		
			البيولوجية والصحية	الفيزيائية والتكنولوجية	الإدارية والأقتصادية
8	1401708	السمية البيئية Environmental Toxicology	X		
9	1401709	الكيمياء الحيوية والمخاطر البيئية Biochemistry and Environmental Hazards	X		
10	1401710	النباتات الطبية والصحة البيئية Medicinal Plants, Health and Environment	X		
11	1401711	الصحة العامة والبيئة Public Health And Environment	X		
12	1401712	الإجهاد البيئي والفسولوجي Environmental and Physiological Stress	X		
13	1401713	الطرق الحيوية لمعالجة التدهور البيئي Biological Methods for Environmental Deterioration Treatment	X		
14	1401714	طرق القياس والرصد البيئي Measurement Methods and Environmental Monitoring	X	X	
15	1401715	الكتلة الحيوية والطاقة Biomass and Energy	X	X	
16	1401716	الوعي البيئي Environmental Awareness	X	X	X
17	1401717	تلوث الهواء والنمذجة Air Pollution and Modeling	X	X	X
18	1401718	تقييم الأثر البيئي والمراجعة البيئية Environmental Impact Assessment and Auditing	X	X	X

	X	X		نظم المعلومات الجغرافية Geographic Information Systems	1401719	19
	X	X		الاستشعار عن بعد Remote Sensing	1401720	20
	X	X		بحوث العمليات وتتميط البيئة Operational research and Environmental Modelling	1401721	21
		X		فيزياء البيئة Environmental Physics	1401722	22
		X		الإشعاع والنشاط الإشعاعي البيئي Radiation and Environmental Radioactivity	1401723	23
	X			التقييم الاقتصادي للبيئة Environmental Economic Assessment	1401724	24
	X			الأدوات الاقتصادية لإدارة البيئة Economic Tools for Environmental Managment	1401725	25
	X			البيئة الحضرية Urban Environment	1401726	26
			X	التقنية الحيوية البيئية Environmental Biotechnology	1401727	27
			X	النظم الغذائية و البيئة Food Systems and Environment	1401728	28

الساعات المعتمدة للمقررات الأساسية للماجستير :

- يشترط أن يجتاز طالب الماجستير الأكاديمي 24 ساعة معتمدة من المقررات منها 12 ساعات معتمدة من المقررات الأساسية.

المقررات الأساسية لدرجة الماجستير						
يدرس الطالب مقررات بإجمالي 12 ساعة معتمدة						
المتطلب السابق	عدد الساعات الأسبوعية			اسم المقرر	كود المقرر	م
	معتمدة	عملي	نظري			
----	3	-	3	النظم البيئية والبيئة الفيزيائية Environmental systems and Physical Environment	1401701	1
----	3	-	3	البيئة وديناميكيات السكان Ecology and Population Dynamics	1401702	2
----	3	-	3	إدارة البيئة واقتصادياتها Environmental Management and Economics	1401703	3
----	3	-	3	الموارد الطبيعية Natural Resources	1401704	4
----	3	2	2	التلوث البيئي Environmental Pollution	1401705	5
----	3	2	2	الإحصاء التطبيقي Applied Statistic	1401706	6
----	3	-	3	المخاطر الصحية البيئية Environmetal Health Hazards	1401707	7

الساعات المعتمدة للمقررات الاختيارية لدرجة الماجستير
يشترط على الطالب أن يجتاز بنجاح 12 ساعة معتمدة من المقررات الاختيارية

المقررات الاختيارية لدرجة الماجستير لمسار العلوم البيولوجية والصحية						
المتطلب السابق	عدد الساعات الأسبوعية			اسم المقرر	كود المقرر	م
	معتمدة	عملي	نظري			
----	3	2	2	السمية البيئية Environmental Toxicology	1401708	1
----	3	-	3	الكيمياء الحيوية والمخاطر البيئية Biochemistry and Environmental Hazards	1401709	2
----	3	2	2	النباتات الطبية والصحة والبيئة Medicinal Plants, Health and Environment	1401710	3
----	3	-	3	الصحة العامة والبيئة Public Health And Environment	1401711	4
----	3	-	3	الإجهاد البيئي والفسولوجي Environmental and Physiological Stress	1401712	5
----	3	-	3	الطرق الحيوية لمعالجة التدهور البيئي Biological Methods for Environmental Deterioration Treatment	1401713	6
----	3	2	2	طرق القياس والرصد البيئي Measurement Methods and Environmental Monitoring	1401714	7
----	3	2	2	الكتلة الحيوية والطاقة Biomass and Energy	1401715	8
----	3	-	3	الوعي البيئي Environmental Awareness	1401716	9
----	3	2	2	التقنية الحيوية البيئية Environmental Biotechnology	1401727	10
----	3	-	3	النظم الغذائية و البيئة Food Systems and Environment	1401728	11

المقررات الاختيارية لدرجة الماجستير لمسار العلوم الفيزيائية والتكنولوجية						
المتطلب السابق	عدد الساعات الأسبوعية			اسم المقرر	كود المقرر	م
	معمدة	عملى	نظري			
----	3	2	2	طرق القياس والرصد البيئي Measurement Methods and Environmental Monitoring	1401714	1
----	3	-	3	الكتلة الحيوية والطاقة Biomass and Energy	1401715	2
----				الوعي البيئي Environmental Awareness	1401716	3
----	3	-	3	تلوث الهواء والنمذجة Air Pollution and Modeling	1401717	4
----	3	-	3	تقييم الأثر البيئي والمراجعة البيئية Environmental Impact Assessment and Auditing	1401718	5
----	3	2	2	نظم المعلومات الجغرافية Giographic Information Systems	1401719	6
----	3	2	2	الاستشعار عن بعد Remote Sensing	1401720	7
----	3	-	3	بحوث العمليات وتنميط البيئة Operational research and Environmental Modelling	1401721	8
----	3	-	3	فيزياء البيئة Environmental Physics	1401722	9
----	3	2	2	الإشعاع والنشاط الإشعاعي البيئي Radiation and Environmental Radioactivity	1401723	10

المقررات الاختيارية لدرجة الماجستير لمسار العلوم الإدارية والاقتصادية

المتطلب السابق	عدد الساعات الأسبوعية			اسم المقرر	كود المقرر	م
	معتمدة	عملى	نظري			
----	3	-	3	الوعي البيئي Environmental Awareness	1401716	1
----	3	-	3	تلوث الهواء والنمذجة Air Pollution and Modeling	1401717	2
----	3	-	3	تقييم الأثر البيئي والمراجعة البيئية Environmental Impact Assessment and Auditing	1401718	3
----	3	2	2	نظم المعلومات الجغرافية Geographic Information Systems	1401719	4
----	3	2	2	الاستشعار عن بعد Remote Sensing	1401720	5
----	3	-	3	بحوث العمليات وتنميط البيئة Operational research and Environmental Modelling	1401721	6
----	3	-	3	التقييم الاقتصادي للبيئة Environmental Economic Assessment	1401724	7
----	3	-	3	الأدوات الاقتصادية لإدارة البيئة Economic Tools for Environmental Management	1401725	8
----	3	-	3	البيئة الحضرية Urban Environment	1401726	9

المقررات الأساسية

Environmental System and Physical Environment (1401701) 3 CR **النظم البيئية والبيئة الفيزيائية**

- Earth structure
- Tectonic process
- Mechanical and chemical weathering process
- Coastal classifications
- Hydrosphere and water cycle
- Atmosphere composition, Greenhouse gases and global warming
- Ozone layer depletion
- Energy budget
- Energy sources (Fossil fuels, nuclear energy and renewable energy sources)

Ecology and Population Dynamics (1401702) 3 CR **البيئة وديناميكيات السكان**

- Environment: definitions, structure, types and Functions.
- Population and alleles frequencies
- Population density
- Population size and effective population size
- Casual factors affecting deviation of absolute population size from effective population size
- Ecosystems: concepts and principles
- Population dynamics
- Reproductive strategies
- Desertification and desert ecosystems

Environmental Management and Economics (1401703) 3 CR **إدارة البيئة واقتصادياتها**

- Economics and the environment: an introduction
- Environmental problems from an economic perspective
- Environmental management and sustainable development
- Environmental management systems
- Environmental policy instruments
- Environmental laws

Natural Resources (1401704) 3 CR **الموارد الطبيعية**

- Fresh water resources and conservation
- Marine sources of minerals and petroleum
- Biodiversity and genetic resources.

Environmental Pollution (1401705) 3 CR **التلوث البيئي**

- Soil pollution: sources, fate and impacts
- Air pollution: principles, sources and control
- Water pollution: sources, monitoring and waste water treatment
- Effect of pollution on humans, animals and environment

Applied Statistics (1401706) 3 CR **الإحصاء التطبيقي**

- Data collection methods and tools

- Descriptive and inferential statistics
- Probability concepts and hypothesis testing
- Multiple correlation and regression analysis
- Time series analysis

Environmental Health Hazards (1401707) 3 CR المخاطر الصحية البيئية

- Environmental health hazards: Biological, Chemical and Physical hazards
- Principles of some health problems, such as: Smoking, Cancer
- Reproductive toxicity and teratogenesis
- Risk assessment and management of environmental health hazards

المقررات الاختيارية

Environmental Toxicology (1401708) 3 CR السمية البيئية

- Toxicology fundamentals
- Toxicity testing and environmental toxicants
- Routes of exposure and modes of action of environmental toxicants
- Fate of chemicals in the environment
- Biotransformation, detoxification and biodegradation of toxicants

Biochemistry and Environmental Hazards (1401709) 3 CR الكيمياء الحيوية والمخاطر البيئية

- Carbohydrates biosynthesis
- Lipid biosynthesis
- Nucleic acids metabolism
- Protein structure, function and metabolism
- Enzymes (mechanism, function, regulation and essential groups for catalysis)
- Oxidative phosphorylation
- Endocrinology (overview, metabolism and environmental endocrine disruption)
- Metabolic biotransformation
- Bio-signaling
- Genes and chromosomes

Medicinal Plants, Health and Environment (1401710) 3 CR النباتات الطبية و الصحة والبيئة

يهدف هذا المقرر إلى تعريف الطلاب بالمفاهيم الأساسية المتعلقة بالنباتات الطبية كجزء من الموروث البيئي للمجتمع وأهميتها للإنسان وإستخداماتها، بالإضافة إلى تأثير العوامل البيئية عليها. و يتضمن المقرر الموضوعات الأساسية التالية:

- Medicinal plants: historical overview
- Bioactive secondary plant metabolites
- Phytochemical and bioactivity screening of medicinal plants
- Medicinal plants in health and disease
- Medicinal plants and environment interconnectedness

Public Health and Environment (1401711) 3 CR الصحة العامة و البيئة

- Public health and environment interaction
- Pathological effects of environmental and occupational exposures
- Effect of lifestyle on quality of environment and public health
- WHO-chemicals of major public health concern: exposure and impacts
- Communicable diseases: epidemiological basis and significance in developing countries
- Airborne, food borne and waterborne diseases
- Approaches for prevention and control of communicable diseases

Environmental and Physiological Stress (1401712) 3 CR الإجهاد البيئي والفيولوجي

- Introduction.
- From Heat Tolerance to Heat Stress Relief.
- Physiological Basics of Temperature Regulation in Domestic Animals.
- Effects of Environment on Animal productivity: Mechanisms and Regulatory Inputs.
- Effect of hot climate on livestock performance.
- Strategies to alleviate heat stress in farm animals.

Biological Methods for Environmental Deterioration Treatment (1401713) 3 CR الطرق

الحيوية لمعالجة التدهور البيئي

- Natural environment and biotechnology
- Fermentation technology
- Roles of microbes in environmental balance
- Biofilms
- Biotechnological products from wastes

Measurement Methods and Environmental Monitoring (1401714) 3 CR طرق القياس والرصد

البيئي

- Environmental sampling
- Methods of environmental measurements
- Instrumentation in environmental measurements
- Case studies (organic and inorganic pollutants)
- Air, water and soil quality analyses
- Method validation

Biomass and Energy (1401715) 3 CR الكتلة الحيوية والطاقة

- Biomass sources
- Utilization of biomass as energy source
- Technologies of biomass utilization
- Environmental and technical precautions of biomass utilization
- Economic benefits of biomass utilization

Environmental Awareness (1401716) 3 CR الوعي البيئي

- Principles of environmental awareness
- Environmental awareness goals
- Main environmental problems
- Principles of human communication
- Foundations of communication strategies
- Foundations of designing awareness materials
- Models of environmental activities

- Environmental ethics and ethics of sustainable development
- Environmental concerns that have a global and local impact
- Preserving vital systems
- Practical applications.

Air pollution and Modeling (1401717) 3 CR تلوث الهواء والنمذجة

- Air pollution: an overview
- Organic and inorganic air pollutants
- Air pollution monitoring: significance and techniques
- Mathematical modeling of air pollutants
- Air quality standards
- Environmental management of air pollution

Environmental Impacts assessment and environmental auditing (1401718) 3 CR تقييم الأثر البيئي والمراجعة البيئية

- Basic principles of EIA and environmental auditing
- EIA process
- Public participation in EIA
- Socioeconomic component of EIA
- Environmental monitoring and auditing
- Case studies

Geographical Information Systems (1401719) 3 CR نظم المعلومات الجغرافية

- Spatial and non-spatial data
- Steps of developing a GIS
- Spatial Analysis: Theory and practices
- Vector and raster data Analysis
- Cartographic function of GIS

Remote sensing (1401720) 3 CR الاستشعار عن بعد

- Remote sensing: theoretical background.
- Image enhancement methodologies.
- Image processing techniques.
- Change detection techniques
- Environmental applications of remote sensing techniques.

Operation Research and Environmental Modeling (1401721) 3 CR بحوث العمليات وتنميط البيئة

- Operations research: principles and framework
- Linear programming: formulation and graphical solutions
- Algebraic solutions and sensitivity analysis of linear programming models
- Methodology and basic tools of environmental modeling

Environmental Physics (1401722) 3 CR فيزياء البيئة

- Residence time and deposition velocity
- Interactions of solar radiation with atmosphere
- Atmospheric aerosol and Photochemical pollutants
- Atmospheric pressure and Escape velocity

- Zeroth law of thermodynamic and thermal isolation
- Thermodynamic systems and thermal dynamic processes
- Earth as a black body and Terrestrial radiation
- Energy transfers, conduction, and convection and thermal insulation
- Newton's law of cooling, radiation, evaporation, survival in cold climates and survival in hot climates.
- Heat loss in buildings
- Sound pollution: levels, sources, effects and control
- Electromagnetic pollution: sources, effects and regulations

Radiation and Environmental Radioactivity (1401723) 3 CR الأشعاع والنشاط الإشعاعي البيئي

- Sources of environmental radioactivity (natural and manmade sources)
- Modes of radiation exposure
- Environmental radiation dosimetry
- Biological and health effects of radiation exposure.
- Radiological assessment (for public and occupational exposures)
- International standards of radiation protection and radiation safety
- Radioecology protection criteria
- Radioactive waste management
- Modeling of radiation transport, biota and human exposure, and risk assessment

Economic Valuation of Environment (1401724) 3 CR التقييم الاقتصادي للبيئة

- Economic valuation techniques: An Overview
- Principles of economic assessment
- Public goods and market failure
- Economic value and economic valuation
- Environment and development

Economic Tools for Environmental Management (1401725) 3 CR الأدوات الاقتصادية لإدارة البيئة

- Environmental management and policy: Conceptual Framework
- Integrated environmental management
- Regulatory policy tools
- Economic policy tools
- Egyptian environmental policy; A case study

Urban Environment (1401726) 3 CR البيئة الحضرية

- Elements of urban environment
- Urbanization process
- Urban land use patterns
- Urban transportation
- Municipal solid waste management
- Urban planning
- Urban sustainability and Eco-cities.

Environmental Biotechnology (1401727) 3 CR التقنية الحيوية البيئية

- Introduction to the natural environment and environmental biotechnology.
- Introduction to the different disciplines of biotechnology.
- Role of biotechnology in enhancing environmental processes that uses microorganisms.

- Bases of microbial utilization for the production of beneficial products.
- Various applications of bioremediation and bioenergy.

Food System and Environment (1401728) 3 CR النظم الغذائية و البيئة

- Food systems overview.
- Food Production and its environmental impacts.
- Food Processing and food wastes.
- Food consumption and food safety in relation to human health.
- Food eating patterns and sustainable food systems.
- Problem based learning activity related to food eating pattern and climate changes

❖ مقررات درجة الماجستير في الابتكار البيئي وريادة الأعمال البيئية (GIEP) Green Innovation & Entrepreneurship

- يشترط أن يجتاز الطالب 24 ساعة معتمدة من المقررات الأساسية والإختيارية على أن يجتاز الطالب 12 ساعة معتمدة من المقررات الأساسية و 12 ساعة معتمدة من المقررات الاختيارية بالإضافة الى 12 ساعات معتمدة للرسالة و يضم البرنامج مسارين:

التقنيات الخضراء	Green Technologies	1
المدن المستدامة	Sustainable Cities	2

❖ جدول مقررات الماجستير لمسار Green Technologies

قبول الطلبة في هذا المسار من خريجي كليات الهندسة والعلوم والصيدلة والزراعة

#	الكود	اسم المقرر	عدد الساعات الاسبوعية		
			نظري	علمي	معتمدة
المقررات الأساسية لمسار Green Technologies					
1	1401741	Sustainable Development Climate Change and Energy التنمية المستدامة وتغير المناخ والطاقة	3		3
2	1401742	Lifecycle Assessment تقييم دورة الحياة	3		3
3	1401743	Innovation Management and Entrepreneurship ادارة الابتكار وريادة الاعمال	3		3
4	1401744	Energy conservation ترشيد الطاقة	3		3

المقررات الاختيارية لمسار Green Technologies					
3		3	Innovation, Sectorial Applications الإبتكار والتطبيقات القطاعية	1401745	5
3		3	Renewable Energy Resources مصادر الطاقة المتجددة	1401746	6
3		3	Biological treatment of waste المعالجة البيولوجية للمخلفات	1401747	7
3		3	Air Pollution تلوث الهواء	1401748	8
3		3	Natural resources المصادر الطبيعية	1401749	9
3		3	Environmental impact assessment for projects تقييم الأثر البيئي للمشروعات	1401750	10
3		3	The Environmental laws and policies and management & economic قوانين وسياسات البيئة وإدارتها واقتصادياتها	1401751	11
3		3	Environment measurement & methodology طرق القياسات البيئية	1401752	12
3		3	Economic assessment of environmental project التقييم الاقتصادي للمشروع البيئي	1401753	13
3		3	Establishing a New Business انشاء عمل تجارى جديد	1401754	14
8			Thesis on a topic of Green Technology & Thesis on a topic of Green Technology رسالة علمية على التكنولوجيا الخضراء	-----	15

Sustainable Development Climate Change and Energy (1401741) 3 CR

التنمية المستدامة وتغير المناخ والطاقة

- Principles and concepts of sustainable development
- Human consumption,
- Footprints and indicators,
- Local data sources, large scale.
- Measurements, natural disasters and sustainable development.
- Basic principles of climate changes and implications software and checklist estimation

Lifecycle Assessment (1401742) 3 CR تقييم دورة الحياة

- Definition, concepts and principles,
- Methodologies and techniques of implementation
- Environmental impact assessment.
- Estimation example software

Innovation Management and Entrepreneurship (1401743) 3 CR ادارة الابتكار وريادة الاعمال

- Analysis of key issues surrounding innovation management
- Entrepreneurship from the perspective of firms, governments and the global economy,
- The concept of innovation and entrepreneur,
- Developing new ideas to successful products,
- Overcome the practical challenges associated with creating a new entrepreneurial venture

Energy Conservation (1401744) 3 CR ترشيد الطاقة

- Energy conservation concepts,
- Alternative energy resources,
- Testing and energy auditing of buildings and industry

Innovation, Sectorial Applications (1401745) 3 CR الإبتكار والتطبيقات القطاعية

- Advanced knowledge in innovation
- Practical applications in main sectors of the economy, such as renewable energy, water desalination, construction and community development
- Develop the students' entrepreneurial attitudes and their abilities in evaluating entrepreneurial business opportunities and challenges
- An overview of challenges and options in sustaining entrepreneurship and innovation in selected sectors of the economy.

Renewable Energy Resources (1401746) 3 CR مصادر الطاقة المتجددة

- Definition, components impacts, natural risks , vulnerable community
- Solar energy efficiency
- Renewable energy resources
- Photovoltaic panel technologies and consumption
- Green areas
- Energy supply
- Water supply
- Transportation systems,
- Waste recycling

Biological treatment of waste (1401747) 3 CR المعالجة البيولوجية للمخلفات

- The nature of agricultural wastes municipal and industrial:
- Sources, quantities, classification, trading and environmental problems
- Treatment, including: the production of compost - biogas production –
- Biodegradation
- The production of industrial vehicles with an economic value
- Bioaccumulation of inorganic elements in remnants

Air Pollution (1401748) 3 CR تلوث الهواء

- Sources of air pollution
- Methods division of air pollutants
- Atmospheric chemistry
- Meteorological and air pollution
- Methods of collection and analysis of air pollutants (solid and gaseous)
- The theoretical basis for measuring devices
- The importance of monitoring air pollution
- The maximum limits for air pollutants
- Air pollution control
- Environmental management of air pollutants

Natural resources (1401749) 3 CR المصادر الطبيعية

- Freshwater sources: existing resources: surface water - the development of existing resources: the projects of developing the Nile River - ways of rationalizing the sources of fresh water, irrigation, drainage and river navigation - the role of industry in maintaining fresh water, drinking water and methods of treatment and methods of preservation.
- Marine resources, minerals and petroleum: marine resources of metals - the exploitation and development of marine resources - the continental shelves - sources of crude oil - methods of rationalization and preservation of energy resources.
- Genetic Resources: the importance of genetic resources for food and agriculture - the case of plant genetic resources and livestock for food and agriculture - determine the genetic diversity - Methods of maintenance and protection of plant genetic resources and animal - the international conventions that govern the exchange of genetic resources and their sustainable use and sharing of benefits arising from the use of those resources equitably.

Environmental impact assessment for projects (1401750) 3 CR

تقييم الأثر البيئي للمشروعات

- The need to assess the environmental impact
- Divisions and objectives of EIA projects
- Control measurements - alternatives - reducing effects - initial measurements
- Environmental conditions
- Methods described processes
- Steps EIA
- Techniques advanced systems - checklists - analysis matrices overlap - networking
- Environmental review and environmental audit objectives
- Applications and realistic environmental impact assessment and environmental audit
- Steps conduct environmental review

The Environmental laws and policies & management & economics (1401751) 3 CR

قوانين وسياسات البيئة وإدارتها واقتصادياتها

- Study of environmental laws - Law No. (4) for the year 1994
- Environmental Management - the costs of waste disposal
- The role of science and law in the protection of the environment
- Methods of Environmental Impact Assessment and economic theories
- Plans strategies for pollution control
- Environmental education - the external effects and its relationship to market forces.

Environmental measurement & methodology (1401752) 3 CR

طرق القياسات البيئية

- Introduction to the modern methods used in environmental measurements –
- Measurement of water and air pollutants using modern techniques –
- Measurement of heavy elements and environmental pollutants –
- Methods of measuring the physical and chemical properties of the soil –
- Harsh methods of organic pollutants

Economic assessment of environmental project (1401753) 3 CR

التقييم الاقتصادي للمشروع البيئي

- Introduction to the analysis of the cost / benefit
- Methods of determining the costs and benefits
- Costs and benefits in the face of public costs and benefits -and its relationship to the principle of discount benefits and costs
- The proportion of benefits / costs
- Prioritization assess the positive effects of the economic to environmental projects

Establishing a New Business (1401754) 3 CR

انشاء عمل تجارى جديد

- The concept of personal motivators and implementation issues in setting up a new business,
- Options and types of new businesses,
- Legal requirements and operational regulations for new business,
- The impact of regulations on the operational structure of the new business, personal compromises that will be required in establishing new business.

Thesis on a topic of Green Technologies To be arranged with supervisor

❖ **جدول مقررات الماجستير لمسار: المدن المستدامة Sustainable Cities**

قبول الطلبة في هذا المسار من خريجي كليات الهندسة والعلوم والفنون الجميلة قسم عمارة وتجارة قسم اقتصاد

عدد الساعات الاسبوعية			اسم المقرر	الكود	#
معمدة	علمي	نظري			
المقررات الأساسية لمسار Sustainable Cities					
3		3	Sustainable Development, Climate Change and Energy التنمية المستدامة وتغير المناخ والطاقة	1401741	1
3		3	Lifecycle Assessment تقييم دورة الحياة	1401742	2
3		3	Innovation Management and Entrepreneurship ادارة الابتكار وريادة الاعمال	1401743	3
3		3	Project management إدارة المشروعات	1401755	4

المقررات الاختيارية لمسار Sustainable Cities					
3		3	Introductory Remote Sensing مدخل للاستشعار عن بعد	1401756	5
3		3	Risk Assessment تقييم المخاطر	1401757	6
3		3	Geographic information system نظم المعلومات الجغرافية	1401768	7
3		3	Environmental design Buildings التصميم البيئي للمباني	1401759	8
3		3	Sustainable urban design التصميم الحضري المستدام	1401760	9
3		3	Sustainable architecture العمارة المستدامة	1401761	10
3		3	Water & environment in landscape المياه والبيئة في المناظر الطبيعية	1401762	11
3		3	Energy Measurement devices أجهزة قياس الطاقة	1401763	12
3		3	Development of urban environment تنمية البيئة الحضرية	1401764	13
3		3	The Environmental laws and policies and management & economic قوانين وسياسات البيئة وادارتها واقتصادياتها	1401765	14

3		3	Economic assessment of environmental project التقييم الإقتصادي للمشروعات البيئية	1401766	15
8			Thesis on a topic of sustainble cities رسالة علمية عن المدن المستدامة	-----	16

Sustainable Development Climate Change and Energy (1401741) 3 CR التنمية المستدامة وتغير المناخ والطاقة

- Principles and concepts of sustainable development
- Human consumption
- Footprints and Indicators,
- Local data sources,
- large scale measurements,
- Natural disasters and sustainable development.
- Basic principles of climate changes and implications
- Software and checklist estimation

Lifecycle Assessment (1401742) 3 CR تقييم دورة الحياة

- Definition, concepts
- Principles
- methodologies and techniques of implementation
- environmental impact assessment,
- Estimation exampleSoftware

Innovation Management and Entrepreneurship(1401743) 3 CR ادارة الابتكار وريادة الاعمال

- The analysis of key issues surrounding innovation management and entrepreneurship
- Innovation Management and Entrepreneurship from the perspective of firms, governments and the global economy
- Developing the concept of innovative and entrepreneur,
- Converting new ideas to successful products,
- Overcome the practical challenges associated with creating a new entrepreneurial venture

Project management (1401755) 3 CR إدارة المشروعات

- Principles of project management, knowledge
- Skills and techniques to effectively participate in and manage projects
- Apply project management tools to different project situations
- The process of developing new product
- Apply project management tools and methodologies
- Apply the knowledge gained during the course in a live project

Introductory Remote Sensing (1401756) 3 CR مدخل للاستشعار عن بعد

- History basic on the principles and types of space technology and satellite orbits multispectral sensors Initial operations for image analysis examples and applications.
- Design principles maps
- Structures GIS data - collecting, managing and analyzing geographic information systems
- Installation and functions and uses of geographic information systems
- Examples and applications

Risk Assessment (1401757) 3 CR تقييم المخاطر

- Hazards and risks and sensitivity
- characteristics of disasters and dimensions
- Methods of measuring the sensitivity of the risks to individuals and communities
- Environmental indicators of significance and importance
- Methods of quantifying environmental risks
- Analyzing extreme cases
- Transaction risk and the hot zone
- Different ways to assess the risks and the suitability of each of the data

Geographic information system (1401758) 3 CR نظم المعلومات الجغرافية

- Introduction to Geographic Information Systems
- Principles of Information Systems
- Geographic data types
- Maps projection systems
- Data entry
- Building topological audit
- Uses and applications of advanced systems in building GIS
- Applied Studies of geographic information systems (case studies)

Environmental design Buildings (1401759) 3 CR التصميم البيئي للمباني

- Current issues facing environmental designers
- How the profession may be impacted by climate change
- Methods of architectural design that respect the usage of available or suitable construction materials for climatic situation of the surrounding environment

Sustainable urban design (1401760) 3 CR التصميم الحضري المستدام

- Methods and basics of sustainable in the field of urban design in material selection
- Methods and strategies of saving resources through the urban design applications

Sustainable architecture (1401761) 3 CR العمارة المستدامة

- Theoretical and practical basics of sustainability,
- Applying sustainability in different architectural design,
- Guarantee special nature architecture to protect sustainability of resources of future generations

Water & environmental landscape (1401762) 3 CR المياه والبيئة في المناظر الطبيعية

- The importance of water as a one of the major elements in landscape
- The impacts on water on general image and perception of the place
- The surrounding environment and its climatic and physical conditions
- Practical techniques which participate in saving water in places with rare resources of water

Energy Measurement devices (1401763) 3 CR أجهزة قياس الطاقة

- Energy measurement devices
- Theoretical foundation and the theory of operation and full description of the hardware components measuring air pollutants resulting from the combustion of fuel (sulfur dioxide gas - nitrogen oxides and carbon dioxide)
- Theoretical basis and method of operation and full description of the measuring devices

- Foundation practical to measure the performance of solar panels connected respectively and parallelism Measurement of power factor and the remote control in the shipping of photoelectric systems
- Effect radiation intensity on the performance of photoelectric panel.

Development of urban environmental (1401764) 3 CR تنمية البيئة الحضرية

- Study theoretical basics of urban environment from shelter
- Local economy and urban basic services
- Infrastructure, and services
- How to develop these major areas with intoconsideration the cross cutting areas from environmentvulnerable groups, gender, and governance to this environment

The Environmental laws and policies &management &economics (1401765) 3 CR

قوانين وسياسات البيئة وادارتها واقتصادياتها

- Definition of Science & law role in environment protection,
- Impact factors in the emission of environmental laws,
- the Egyptian perspective toward environmental laws,
- development of environment management goals,
- definition & principles of environmental economics,
- reasons of environmental deterioration from economic perspective,
- economic assessment for the environment,
- sustainable development,
- food safety & Egyptian laws

Economic assessment of environmental project (1401766) 3 CR

التقييم الإقتصادي للمشروعات البيئية

- Introduction to the analysis of the cost - benefit
- Methods of determining the costs and benefits
- Costs and benefits in the face of public costs and benefits - and its relationship to the principle of discount
- The proportion of benefits / costs
- Prioritization assess the positive effects of the economic to environmental projects

Thesis on a topic of Sustainable Citiesرسالة علمية عن المدن المستدامة

- Related Topic to be agreed upon with supervisors

رابعاً: برنامج الماجستير فى البيئة و الطاقة

❖ جدول مقررات درجة الماجستير فى البيئة و الطاقة:

- يشترط أن يجتاز طالب الماجستير 24 ساعة معتمدة من المقررات منها 12 ساعة معتمدة من المقررات الأساسية و 12 ساعة معتمدة من المقررات الاختيارية بالإضافة الى 12 ساعات معتمدة للرسالة.

م	كود المقرر	اسم المقرر	عدد الساعات الأسبوعية		
			نظري	عملي	معتمدة
المقررات الأساسية					
1	1401771	Energy and Environment الطاقة والبيئة	3	-	3
2	1401772	Energy Audit and conservation مراجعة و ترشيد الطاقة	2	2	3
3	1401773	Energy Policy, Planning and Economics سياسات و تخطيط الطاقة واقصادياتها	3	-	3
4	1401774	Thermodynamics, energy losses and thermal insulation الديناميكا الحرارية و فاقد الطاقة والعزل الحراري	2	2	3
المقررات الاختيارية					
1	1401763	Energy measurements devices أجهزة قياس الطاقة	2	2	3
2	1401775	Fuel and combustion الوقود و الإحتراق	2	2	3
3	1401776	Operations Research and Energy Modelling بحوث العمليات و تميط الطاقة	2	2	3
4	1401715	Biomass and Energy الكتلة الحيوية و الطاقة	2	2	3
5	1402752	Materials for Storage and Transport of Energy مواد لتخزين و نقل الطاقة	2	2	3
6	1402754	Technologies of Photovoltaic Systems تقنيات النظم الفوتوفولطية	2	2	3
7	1402755	تقنيات نظم الطاقة الشمسية الحرارية	2	2	3
8	1402735	Tools for Sustainability أدوات الاستدامة	2	2	3

Energy and Environment (1401771) 3 CR الطاقة والبيئة

- Introduction to environment, energy and environmental sciences
- Energy and matter in ecosystem and thermodynamics, radiation, atmosphere
- Major environmental problems, population, environment and sustainability
- Modeling energy-related environmental risks
- Carbon capture and storage
- Radiative aspects of fossil fuels
- Introduction to energetics, energy and industry
- Non-renewable energy sources (coal - petroleum - natural gas) and renewable energy sources (hydroelectric energy - dam and root energy - wind energy - underground energy - biomass Energy - nuclear energy - solar energy)
- Energy and means of transportation
- The impact of energy on environment (air pollution - global warming - acid rain - ozone problem)
- Seminars.

Energy Audit and conservation (1401772) 3 CR مراجعة و ترشيد الطاقة

- Introduction to energy management systems
- Energy audit processes and stages
- Evaluation of energy consumption bills
- Economic evaluation and costs of the consumption cycle
- Certified energy management systems
- ISO 50001 energy consumption quality system
- Energy audit stages, benefits and energy saving possibilities
- Lighting systems, electrical equipment
- Building systems and technology
- Green buildings specifications, carbon sequestration
- Thermal systems, processing systems, heat exchangers
- Mass and energy balance
- Compressed air, enhancing energy opportunities
- Energy demand management
- Energy review in the field of motor systems
- Energy review in the field of air conditioning systems
- Review energy in pump and cooling systems

Energy Policy, Planning and Economics (1401763) 3 CR سياسات وتخطيط الطاقة واقتصاديات

- Various energy policies, planning and future prospects for energy resources
- Introduction to economics and its relationship to energy
- Economic feasibility of energy projects
- Calculations of energy costs and recovery
- Energy pricing policy
- An economic comparison between different energy resources
- Energy markets
- Conomic dimensions of the future of energy in Egypt and the world

Thermodynamics, energy losses and thermal insulation (1401774) 3 CR

الديناميكا الحرارية و فاقد الطاقة والعزل الحراري

- Introduction to the thermal system
- Internal energy and the first law of thermodynamics
- Various thermal processes, ideal fluids and steam systems
- Calculations in thermal processes
- The second law of thermodynamics
- Heat engine, entropy diagram, thermal energy efficiency, heat engine
- Heat pumps and gas turbines
- Heat transfer, convection and radiation
- Heat transfer through different shapes
- Thermal insulation and material properties and thermal insulation applications for pipes and buildings
- HVAC systems and energy efficiency evaluation of boilers and furnaces

Energy measurement devices (1401775) 3 CR أجهزة قياس الطاقة

- Fundamentals, operating theory, and a complete description of instrument components
- Data processing and management reporting
- Illumination measurement and evaluation, temperature and humidity
- Infrared tomography
- Measurements in combustion systems
- Measurement of ventilation and performance of air conditioning systems
- Air velocity meters, pressure gauges, meters noise levels, evaluation and social noise
- Mechanical vibrations
- Measurements of electric and magnetic fields, measurement of loads in engines
- Measurement of air pollutants resulting from fuel combustion (sulfur dioxide - nitrogen oxides - gas monoxide and carbon dioxide)
- Theoretical basis, method of operation and full description of measuring devices (Suspended Aggregate dust, chest dust less than 1 micron, volatile organic hydrocarbons)
- The practical basis for measuring the performance of solar panels connected in series and parallel
- Measuring the power factor and the charge control device for photovoltaic systems
- The effect of radiation intensity on the performance of photovoltaic panels

Fuel and combustion (1401776) 3 CR الوقود والاحتراق

- Definition of fuel and its different image,
- Introduction to fuel, characteristics of fuel,
- Storage of fuel, handling and preparation of fuel,
- Principles of the combustion process, combustion reactions,
- Calculating the proportions of flue gas components,
- Calculating the theoretical amount of oxygen required for combustion of different types of Fuel, problems, wet and dry flue gases,
- Calculation of excess air required for the combustion process,
- Calculation of the theoretical and real air-fuel ratio,
- Calculation of the heat energy for the formation of combustion products,

- Calculation of the heat energy of combustion, calculation of the calorific value of fuel, Calculations for the combustion process in a thermally insulated medium,
- Heat recovery, dew point calculations and empirical formula problems.

Operations Research and Energy Modelling (1401777) 3 CR بحوث العمليات وتنميط الطاقة

- Introduction to the science of operations research
- Graphic solution to linear programming models
- Sensitivity analysis by graphic method
- Algebraic solution to linear programming models
- Sensitivity analysis to linear programming
- Some practical and environmental applications of linear programming
- Adding transport and network models to linear programming
- Energy systems analysis, network models
- Models and statistical analysis for energy data
- Price elasticity and income elasticity of energy demand
- Economic operating models for electric power plants

Biomass and Energy (1401715) 3 CR الكتلة الحيوية والطاقة

- Sources of energy in the world, problems of fossil fuels
- Importance of biofuels
- The process of photosynthesis for the production of organic matter
- Direct and indirect sources of biomass, introduction to techniques for converting organic matter into different types of energy sources
- Biomethane production, technologies and applications in the world
- Bioethanol production from molasses
- Methods for hydrolysis of complex organic materials and biodiesel production from multiple Sources including algae
- Techniques for liquefaction of organic matter for the production of organic oils
- Gasification and cambering techniques
- Biohydrogen production and microbial fuel cells
- Discussing the status of biomass energy in Egypt (sources, appropriate technologies
- Decisions and regulating laws)
- Biomass sources, technologies of biomass utilization
- Environmental and technical precautions of biomass utilization
- Economic benefits of biomass utilization

Materials for Storage and Transport of Energy (1401752) 3 CR مواد لتخزين و نقل الطاقة

- Introduction to materials science for energy
- Materials for thermal energy storage and transfer
- Hydrogen storage, materials for electrical energy storage
- Materials for thermal energy transfer, batteries
- Capacitors and supercapacitors for electrical energy storage
- Hydrogen storage materials
- Electric energy transmission technologies and electricity grid connection

Technologies of Photovoltaic Systems (1401754) 3 CR تقنيات النظم الفوتوفولتية

- Photovoltaic cell technologies, testing their durability, basics and connections
- Designing photovoltaic energy systems, system size, cost

- Connection to the electricity network and examples for study
- The effect of weather factors on the performance of photovoltaic energy systems
- Durability tests for components of photovoltaic energy systems
- Performance evaluation of components of photovoltaic energy systems
- Performance analysis maintenance, security and troubleshooting

Technologies for Thermal Systems of Solar Energy (1401755) 3 CR

تقنيات نظم الطاقة الشمسية الحرارية

- Introduction to solar thermal system components
- Solar energy conversion systems into thermal and electrical energy
- Evacuated solar tube technology
- Measuring the performance of materials and components of solar thermal systems
- Applications of solar thermal systems
- Aging tests for solar thermal systems
- Case study and model systems

Tools for Sustainability (1401735) 3 CR أدوات الاستدامة

- Introduction to sustainable development,
- Basic concepts of ecosystems and the relationship of ecosystems to development,
- Presentation and analysis of the concept of sustainability and sustainable development and studying examples thereof,
- Renewable energy economics and policies,
- Criteria for evaluating development sustainability,
- Renewable energy and development sustainability,
- Tools used to assess the extent to which the concept of sustainable development is applied
- Evaluate the effects of the various steps of industrial production such as the selection of materials,
- Manufacturing methods and energy systems,
- Renewable energy for industrial applications,
- Renewable energy for agricultural applications,
- The use of renewable energy for transportation,
- Smart building technologies,
- Renewable energy and new urban communities,
- Case studies.

خامساً: برنامج الماجستير في تغير المناخ و التنمية المستدامة

❖ **جدول** مقررات برنامج الماجستير الأكاديمي في تغير المناخ والتنمية المستدامة:

- يشترط أن يجتاز الطالب 24 ساعة معتمدة من المقررات الأساسية والاختيارية على أن يجتاز 12 ساعة معتمدة من المقررات الأساسية قبل تسجيل أي مقررات إختيارية. بالإضافة الى 12 ساعات معتمدة للرسالة.

م	كود المقرر	اسم المقرر	عدد الساعات الأسبوعية		عدد الساعات المعتمدة
			نظري	عملي	
المقررات الأساسية					
1	1401781	Fundamentals of environmental sciences أساسيات العلوم البيئية	2	-	2
2	1401782	Sustainable development التنمية المستدامة	2	-	2
3	1401783	Climate dynamics ديناميكيات المناخ	2	-	2
4	1401784	Climate change mitigation, vulnerability and adaptation الحد من التغيرات المناخية وتأثيراتها والتأقلم معها	2	-	2
5	1401785	Environmental economics and management إقتصاديات وإدارة البيئة	2	-	2
6	1401786	Statistical analysis in climate research التحليل الإحصائي في مجال بحوث المناخ	1	2	2

المقررات الإختيارية					
2	2	1	Economic valuation and climate change التقييم الاقتصادي وتغير المناخ	1401787	7
2	-	2	Green economy الإقتصاد الأخضر	1401788	8
2	2	1	Geographical information systems applications in climate change تطبيقات نظم المعلومات الجغرافية في مجال تغير المناخ	1401789	9
2	2	1	Remote sensing and environmental change الإستشعار عن بعد والتغيرات البيئية	1401790	10
2	2	1	Environmental risk assessment and management تقييم وإدارة المخاطر البيئية	1401791	11
2	-	2	Community engagement for sustainable development المشاركة المجتمعية لتحقيق التنمية المستدامة	1401792	12
2	-	2	Climate change, biodiversity and ecosystems functions تغير المناخ والتنوع الحيوي ووظائف النظم البيئية	1401793	13
2	-	2	Climate change and health تغير المناخ والصحة	1401794	14
2	-	2	Urban environment البيئة الحضرية	1401795	15
2	-	2	Geopolitics of climate change الجغرافيا السياسية لتغير المناخ	1401796	16

المقررات الأساسية

Fundamentals of environmental sciences (1401781) 3 CR أساسيات العلوم البيئية

- Ecology, human population and natural resources.
- Energy resources and consumption.
- Human activities and the environment (pollution of the environment, degradation and depletion of natural resources).
- Global environmental change.
- Conservation and restoration of environmental systems.

Sustainable development (1401782) 3 CR التنمية المستدامة

- The environment and development.
- Evolution of sustainable development.
- Dimensions and levels of sustainability.
- Water-energy-food nexus.

Climate dynamics (1401783) 3 CR ديناميكيات المناخ

- Climate system: an introduction.
- Components of the climate system and their interaction.
- Atmospheric chemistry and climate (Ozone, CFCs, Nitrogen oxides and green house effect).
- Water in the earth's system and climatologic effects.
- Land-climate dynamics.
- Climate simulation models.

Climate change mitigation, vulnerability and adaptation (1401784) 3 CR

الحد من التغيرات المناخية وتأثيراتها والتأقلم معها

- Climate change impacts.
- Sensitivity and exposure.
- Adaptive capacities to climate change.
- Vulnerability assessment.
- Mitigation measures.
- Adaptation options.
- Resilience to climate change.

Environmental economics and management (1401785) 3 CR إقتصاديات وإدارة البيئة

- Economics and the environment: an introduction.
- Environmental problems from an economic perspective.
- Environmental policy instruments.
- Resource analysis (price and quantity of paths of environmental resources).

Statistical analysis in climate research (1401786) 3 CR التحليل الإحصائي في مجال بحوث المناخ

- Data collection methods and tools.
- Descriptive statistics & inferential statistics.
- Probability concepts & hypothesis testing.
- Multiple correlation and regression analysis.
- Time series analysis.
- Statistical methods in climate research.

المقررات الاختيارية

Economic valuation and climate change (1401787) 3 CR التقييم الإقتصادي وتغير المناخ

- Principles of economic valuation.
- Public goods and market failure.
- Economic value and economic valuation.
- Ecosystem functions: services and goods.

Green economy (1401788) 3 CR الإقتصاد الأخضر

- Green economy: definitions, concepts and approaches.
- Conditions advancing green economy.
- Green development policy and key economic sectors.
- Opportunities, challenges and constraints confronting transformation towards green economy.
- Green economy and climate change.

Geographical information systems applications in climate change (1401789) 3 CR

تطبيقات نظم المعلومات الجغرافية في مجال تغير المناخ

- Spatial Analysis: Theory and practices.
- Geographical Information Systems: A conceptual framework.
- Spatial and non-spatial data.
- Steps of developing a GIS.
- Vector and raster data handling.
- Applications of GIS in climate change.

Remote sensing and environmental change (1401790) 3 CR الإستشعار عن بعد والتغيرات البيئية

- Remote sensing: theoretical background.
- Image pre-processing and enhancement methodologies.
- Image processing techniques.
- Land use change syndromes.
- Applications of remote sensing techniques in climate change.

Environmental risk assessment and management (1401791) 3 CR تقييم وإدارة المخاطر البيئية

- Risk assessment concepts: hazards and risks.
- Risk assessment and risk management.
- Primary and secondary risk control mechanisms.
- Application to human and environmental risk assessment.
- Risk communication.

Community engagement for sustainable development (1401792) 3 CR

المشاركة المجتمعية لتحقيق التنمية المستدامة

- Defining the community concept.
- Approaches to community work in sustainable development.
- Community empowerment.
- Techniques for effective community participation and engagement.
- Asset based community development.
- Case studies of global community development approaches.

Climate change, biodiversity and ecosystems functions (1401793) 3 CR

تغير المناخ ، التنوع الحيوي ووظائف النظم البيئية

- Ecosystem processes and dynamics.
- Mechanisms by which climate change impacts biodiversity and ecosystems.
- Ecosystems resistance and resilience capacity to different changes including climate change.
- Mitigating and adaptive solutions to climate driven biodiversity loss.

Climate change and health (1401794) 3 CR

تغير المناخ والصحة

- Climate change and health interrelationship.
- Global burden of diseases attributable to climate change.
- Assessment of health impacts of climate change (methods and tools).
- Developing responses in the health sector to climate change.

Urban environment (1401795) 3 CR

البيئة الحضرية

- Elements of urban environment.
- Urbanization process.
- Urban land use patterns.
- Urban transportation.
- Municipal solid waste management.
- Urban planning.
- Urban sustainability and Eco cities.

Geopolitics of climate change (1401796) 3 CR

الجغرافيا السياسية لتغير المناخ

- Population, resources and political conflict.
- Geopolitics elements of national power/international relations.
- Implications of climate change on resources scarcity and security.
- Climate change negotiation process and global climate change agreements

سادساً: برنامج دكتوراه الفلسفة في الدراسات البيئية

❖ جدول مقررات درجة دكتوراه الفلسفة في الدراسات البيئية:

يتم تحديد المسار الذي يلتحق به الطالب (العلوم البيولوجية والصحية – العلوم الفيزيائية والتكنولوجية – العلوم الإدارية والاقتصادية) لبرنامج الدكتوراه في الدراسات البيئية على النحو التالي:

- بالنسبة للطلاب الحاصلين على ماجستير الدراسات البيئية يلتزم الطالب بمسار الماجستير الحاصل عليه.
 - بالنسبة للطلاب الحاصلين على ماجستير من خارج التخصص يتم تحديد المسار بما يتناسب مع موضوع رسالة الماجستير الخاصة به وبناء على موافقة مجلس القسم.
- يجب على الطالب أن يجتاز بنجاح عدد 6 ساعات معتمدة من المقررات الأساسية وعدد 12 ساعات معتمدة من المقررات الاختيارية بالإضافة الى 30 ساعة معتمدة للرسالة العلمية.

المقررات الأساسية: تضم المقررات الأساسية سبعة مقررات يدرس منها الطالب مقررين بإجمالي 6 ساعات معتمدة، على أن يكون أحد المقررين (1401801) كمتطلب إجباري للبرنامج					
م	كود المقرر	اسم المقرر	المسار		
			البيولوجية والصحية	الفيزيائية والتكنولوجية	الإدارية والأقتصادية
1	1401801	العلوم والسياسات البيئية Environmental Sciences and Policies	X	X	X
2	1401802	السموم البيئية والنظم الحيوية Ecotoxicology	X		
3	1401803	إدارة الطاقة ومصادرها Energy Resources and Management		X	X
4	1401804	التقييم البيئي الاستراتيجي Strategic Environmental Assessment		X	X
5	1401805	الصحة البيئية Environmental Health	X		
6	1401806	الكيمياء البيئية التطبيقية Applied Environmental Chemistry	X		
7	1401807	الميكروبيولوجيا التطبيقية Applied Microbiology	X		

المقررات الإختيارية لجميع المسارات
يختار منها الطالب أربعة مقررات بإجمالي 12 ساعة معتمدة

المسار			اسم المقرر	كود المقرر	م
الإدارية والاقتصادية	الفيزيائية والتكنولوجية	البيولوجية والصحية			
X		X	إدارة المخلفات الصلبة Solid Wastes Management	1401808	8
		X	السرطنة الجزيئية البيئية Environmental Molecular Carcinogenesis	1401809	9
		X	الصحة المهنية والأمان البيئي Occupational Health and Environmental Safety	1401810	10
		X	الملوثات البيئية والخلل البيولوجي Environmental pollutants and biological imbalance	1401811	11
		X	التقنية النانومترية وصحة الإنسان Nanometric Toxicology	1401812	12
X		X	التحكم في التلوث الصناعي Control of Industrial Pollution	1401813	13
X		X	تحليل المخاطر البيئية Environmental Risk Analysis	1401814	14
		X	استراتيجيات تخفيف الإجهاد البيئي Strategies to Alleviate Environmental Stress	1401815	15
		X	الملوثات البيئية والأكسدة الهادمة Environmental pollutants and destructive oxidation	1401816	16
		X	التأهب للسلامة وإدارتها Safety Preparedness and Management	1401817	17
	X		تلوث الهواء متقدم Advanced Air Pollution	1401818	18
	X		تكنولوجيا تحليل المياه ومعالجة مياه الصرف الصناعي Technology of Industrial Wastewater	1401819	19

			Analysis and Treatment		
	X		تلوث التربة (النماذج و التحكم) Soil Pollution (Models and Control)	140120	20
	X		النظائر في الدراسات البيئية Isotopes in Environmental Studies	1401821	21
	X		تقنيات معالجة صور الأقمار الصناعية Satellite Images Processing Techniques	1401822	22
X	X		الإدارة المتكاملة للمناطق الساحلية Integrated Coastal Zone Management	1401823	23
X	X		إدارة المخلفات الخطرة Hazardous Wastes Management	1401824	24
X			التطبيقات البيئية لنظم المعلومات الجغرافية Environmental Applications of Geographical Information Systems	1401825	25
X			التغيرات المناخية – التأثيرات الإقليمية والتأقلم Climate Change – Regional Impacts and Adaptation	1401826	26
X			التقييم الاقتصادي للنظم البيئية ووظائفها Economic Valuation of Ecosystems and their Functions	1401827	27
		X	ميكروبيولوجيا البيئات المجهده Microbiology in extreme environment	1401828	28

الساعات المعتمدة للمقررات الأساسية لبرنامج الدكتوراه

م	كود المقرر	اسم المقرر	عدد الساعات الأسبوعية		
			نظري	عملي	معتمدة
المقررات الأساسية لبرنامج الدكتوراه تضم المقررات الأساسية سبعة مقررات يدرس منها الطالب مقررين بإجمالي 6 ساعات معتمدة على أن يكون أحد المقررين (1401801) كمتطلب أساسي للبرنامج					
1	1401801	العلوم والسياسات البيئية Environmental Sciences and Policies	3	-	3
2	1401802	السموم البيئية والنظم الحيوية Ecotoxicology	3	-	3
3	1401803	إدارة الطاقة ومصادرها Energy Resources and Management	3	-	3
4	1401804	التقييم البيئي الاستراتيجي Strategic Environmental Assessment	3	-	3
5	1401805	الصحة البيئية Environmental Health	3	-	3
6	1401806	الكيمياء البيئية التطبيقية Applied Environmental Chemistry	3	-	3
7	1401807	الميكروبيولوجيا التطبيقية Applied Microbiology	3	-	3

المقررات الاختيارية لبرنامج الدكتوراه لمسار العلوم البيولوجية و الصحية يختار الطالب أربعة مقررات بإجمالي ١٢ ساعة معتمدة					
م	كود المقرر	اسم المقرر	عدد الساعات الأسبوعية		
			نظري	عملي	معتمدة
1	1401808	إدارة المخلفات الصلبة Solid Wastes Management	3	-	3
2	1401809	السرطنة الجزيئية البيئية Environmental Molecular Carcinogenesis	3	-	3
3	1401810	الصحة المهنية والأمان البيئي Occupational Health and Environmental Safety	3	-	3
4	1401811	الملوثات البيئية والخلل البيولوجي Environmental pollutants and biological imbalance	3	-	3
5	1401812	التقنية النانومترية وصحة الإنسان Nanometric Toxicology	3	-	3
6	1401813	التحكم في التلوث الصناعي Control of Industrial Pollution	3	-	3
7	1401814	تحليل المخاطر البيئية Environmental Risk Analysis	3	-	3
8	1401815	استراتيجيات تخفيف الإجهاد البيئي	3	-	3

			Strategies to Alleviate Environmental Stress		
3	-	3	الملوثات البيئية والأكسدة الهادمة Environmental pollutants and destructive oxidation	1401816	9
3	-	3	التأهب للسلامة وإدارتها Safety Preparedness and Management	1401817	10
3		3	ميكروبيولوجيا البيئات المجهدة Microbiology in extreme environment	1401828	11

المقررات الاختيارية لبرنامج الدكتوراه لمسار العلوم الفيزيائية والتكنولوجية يختار منها الطالب أربعة مقررات بإجمالي 12 ساعة معتمدة					
م	كود المقرر	اسم المقرر	عدد الساعات الأسبوعية		
			نظري	عملي	معتمدة
1	1401818	تلوث الهواء متقدم Advanced Air Pollution	3	-	3
2	1401819	تكنولوجيا تحليل المياه ومعالجة مياه الصرف الصناعي Technology of Industrial Wastewater Analysis and Treatment	3	-	3
3	140120	تلوث التربة (النماذج و التحكم) Soil Pollution (Models and Control)	3	-	3
4	1401821	النظائر في الدراسات البيئية Isotopes in Environmental Studies	3	-	3
5	1401822	تقنيات معالجة صور الأقمار الصناعية Satellite Images Processing Techniques	3	-	3
6	1401813	التحكم في التلوث الصناعي Control of Industrial Pollution	3	-	3
7	1401814	تحليل المخاطر البيئية Environmental Risk Analysis	3	-	3
8	1401823	الإدارة المتكاملة للمناطق الساحلية Integrated Coastal Zone Management	3	-	3
9	1401824	إدارة المخلفات الخطرة Hazardous Wastes Management	3	-	3

المقررات الاختيارية لبرنامج الدكتوراه لمسار العلوم الإدارية والاقتصادية

يختار منها الطالب أربعة مقررات بإجمالي 12 ساعة معتمدة				
م	كود المقرر	اسم المقرر	عدد الساعات الأسبوعية	
			نظري	عملي
معمدة				
1	1401808	إدارة المخلفات الصلبة Solid Wastes Management	3	-
2	1401825	التطبيقات البيئية لنظم المعلومات الجغرافية Environmental Applications of Geographical Information Systems	3	-
3	1401826	التغيرات المناخية – التأثيرات الإقليمية والتأقلم Climate Change – Regional Impacts and Adaptation	3	-
4	1401827	التقييم الاقتصادي للنظم البيئية ووظائفها Economic Valuation of Ecosystems and their Functions	3	-
5	1401822	تقنيات معالجة صور الأقمار الصناعية Satellite Images Processing Techniques	3	-
6	1401813	التحكم في التلوث الصناعي Control of Industrial Pollution	3	-
7	1401814	تحليل المخاطر البيئية Environmental Risk Analysis	3	-
8	1401823	الإدارة المتكاملة للمناطق الساحلية Integrated Coastal Zone Management	3	-
9	1401824	إدارة المخلفات الخطرة Hazardous Wastes Management	3	-

المحتوى العلمي لمقررات درجة دكتوراه الفلسفة في الدراسات البيئية

المقررات الأساسية

Environmental Sciences and Policies (1401801) 3CR العلوم والسياسات البيئية

- Environmental Policy: Concepts and definitions
- Environmental Impact Assessment
- Environmental Management Systems
- Risk management
- Life cycle analysis
- Economic instruments
- Solid waste management
- Climate change phenomenon
- Impacts of climate change
- Public participation
- Stakeholders analysis

Ecotoxicology (1401802) 3CR السموم البيئية والنظم الحيوية

- Fundamentals of Ecotoxicology
- Biomarkers
- Ecotoxicology and Environmental Toxicology
- Common Environmental toxins
- Exposure to toxic chemical, effect on individual and entire population
- Classification of Ecotoxicology
- Ecotoxicology: Emerging research, methods and policies

Energy Resources and Management (1401803) 3CR إدارة الطاقة ومصادرها

- Introduction to energy definitions, forms, and conversions.
- Energy economics, energy priorities, and energy infrastructure.
- Integrated management system applications, hybrid energy resources operation, Smart Grid, Demand Side Management concepts.
- Traditional energy resources management for thermal and nuclear generation.
- Renewable energy / sustainable resources management for hydro, wind, solar, biomass, and fuel cell generation.
- Understanding the fundamental of commercial, management, and operation diversity of the renewables/sustainable as an energy mix.
- Storage energy technologies types, characteristics and operation.
- Various energy issues and its impact on the environment:
- Global issues of energy, energy supply, international strategies.
- Planning issues for energy infrastructure, public acceptance, and environmental issues of various energy generation resources.

Strategic Environmental Assessment (1401804) 3CR التقييم البيئي الاستراتيجي

- Principles of Strategic Environmental Assessment
- Strategic Environmental Assessment performance criteria
- Methodology for Strategic Environmental Assessment
- Strategic Environmental Assessment and Spatial planning
- Strategic Environmental Assessment in practices

Environmental Health (1401805) 3CR الصحة البيئية

- Environment-human interaction
- Impact of environmental agents on health
- Environmental epidemiology
- Applications and domains of environmental health
- Health Effects of climate change
- Health risk assessment and communication

Applied Environmental Chemistry (1401806) 3CR الكيمياء البيئية التطبيقية

- Toxicological chemistry
- Chemical processes in natural and man made environments
- Environmental chemistry: methodologies and tools
- Aquatic toxicology
- Soil toxicology

Applied Microbiology (1401807) 3CR الميكروبيولوجيا التطبيقية

- Bacterial cell structure and function
- Microbial ecology
- Models and kinetic growth of microbes
- Industrial, agricultural and medical applications of microbiology

المقررات الإختيارية

Solid Wastes Management (1401808) 3CR إدارة المخلفات الصلبة

- Types and Sources of Solid Wastes
- Problems of Solid Wastes
- Methods of Solid Wastes Management:
 - Waste prevention or reduction
 - Recycling
 - Waste treatment: physical – chemical – biological and thermal treatment
 - Land disposal: open dumping - sanitary landfill
- New Trends in Solid Wastes Management
- Integrated Solid Wastes Management

Environmental Molecular Carcinogenesis (1401809) 3CR السرطنة الجزيئية البيئية

- Biology and genetics of cells and organisms
- The nature of cancer and environmental factors of cancer etiology
- Chemical, biological and physical carcinogenesis and metabolic biotransformation
- Tumor viruses (e.g. Epstein-Barr and Hepatitis C viruses)
- Role of viruses or integrated viral genomes in environmental carcinogenesis
- Cellular oncogenesis and tumor suppressor genes
- Growth factors and their receptors
- Signaling programs in cancer
- Cell cycle and apoptosis
- Multistep tumorigenesis

- Maintenance of genomic integrity and development of cancer
- The rationale of prevention and treatment of cancer

Occupational Health and Environmental Safety (1401810) 3CR الصحة المهنية والأمان البيئي

- Conceptual framework of workplace hazards
- Occupational toxic responses and health impact
- Occupational diseases, health surveillance, and biomonitoring.
- Coherent analysis of potential safety of health hazards
- Principles and implementation of occupational health and safety
- Decisions for pertaining personal health and safety

Environmental pollutants and biological imbalance (1401811) 3CR

الملوثات البيئية والخلل البيولوجي

- An introduction to the types of environmental substances that disrupt the functions of hormones
- The environmental and plant sources of substances that disrupt the functions of hormones
- Types of environmental estrogens
- The effect of substances that disrupt the functions of hormones on the reproductive health of humans, animals, wild organisms, fish and marine organisms
- Proposed solutions

Nanometric Toxicology (1401812) 3CR التقنية النانومترية وصحة الإنسان

- Introduction to Nanotechnology
- Nano particles associated risks
- Environmental toxicity of nano particles
- Nano particles and In vitro studies

Control of Industrial Pollution (1401813) 3CR التحكم في التلوث الصناعي

- Industrial pollution types and methods of treatment
- Removal of particulate matter and organic vapour from industrial effluent gases
- Removal of nitrogen oxides and sulphur oxides
- Removal of chromium, phenol and mercury
- Removal of BOD
- Case studies of pollution prevention in some industries

Environmental Risk Analysis (1401814) 3CR تحليل المخاطر البيئية

- Definition and discussion of basic concepts of risk and risk analysis.
- Risk metrics and Risk acceptance criteria.
- Qualitative and quantitative methods for risk analysis
- Monte Carlo Approach for risk analysis
- Barrier analysis.
- Data sources and uncertainties: Rules, standards and guidelines.
- Risk analyses within different industries and applications.
- Integrated risk information system
- Risk analysis and sustainable development

Strategies to Alleviate Environmental Stress (1401815)3CR استراتيجيات تخفيف الإجهاد البيئي

- Effect of hot climate on general performance.
- Thermoregulatory responses.
- Strategies to alleviate heat stress on biological systems:

A) Environmental modifications

- Methods for reducing heat stress.
- Methods for enhancing animal heat losses.

B) Feeding modifications

- Changes in macronutrients composition.
- Changes in micronutrient composition.
- Feeding strategies.

C) Water and feed management.

D) Genetic selection.

Environmental pollutants and destructive oxidation (1401816) 3CR

الملوثات البيئية والأكسدة الهادمة

- Oxidants and antioxidants basic concepts
- Major classes of antioxidants and their sources
- Flavonoids: classification, dietary sources and biological function
- Free radicals and their chemical reactions
- Lipid peroxidation: chemical mechanism, biological implications and analytical determination
- Healthy Aging: free radicals and antioxidants
- Antioxidants defense systems
- Antioxidants and disease prevention

Safety Preparedness and Management (1401817) 3CR التأهب للسلامة وإدارتها

- Concepts of safety management within organizations
- Aspects of safety management
- Requirements and methods for managing hazards and risks
- Overview of injury reporting and investigation requirements
- Legislative framework for environmental safety
- Principals for engaging health and safety matters in decision making

Advanced Air Pollution (1401818) 3CR تلوث هواء – متقدم

- Air pollution monitoring techniques
- Air pollution modeling
- Air pollution control equipment

Technology of Industrial Wastewater Analysis and Treatment (1401819) 3CR

تكنولوجيا تحليل ومعالجة مياه الصرف الصناعي

- Water quality standards
- Laws and regulations relevant to water quality
- Methods of sampling, sample handling and transportation
- Chemical and instrumental analysis of water samples
- Methods of BOD and COD determinations and their relations
- Methods of nitrogen compounds determinations
- Methods of biological examinations of water samples

- Quality assurance of measurements
- Uncertainty and bias determinations

Soil Pollution (Models and Control) (1401820) 3CR تلوث التربة (النماذج والتحكم)

- Types and sources of soil pollution
- Physical and chemical characteristics of soil
- Fate of contamination in soil
- Impacts of soil pollution
- Types and applications of mathematical soil models
- Quantitative analysis of soil parameters
- Case studies

Isotopes in Environmental Studies (1401821) 3CR النظائر في الدراسات البيئية

- Introduction to Isotope in environmental studies
- Theory of isotopes, isotope fractionation in changes in change of states of matter
- Isotope fractionation in chemical reactions, isotope fractionation in closed and open systems
- Isotope in environmental components
- Isotopes fractionation in biological systems,
- Water movement, surface movement, isotopes in water study Surface and groundwater analysis,
- Groundwater age determination, groundwater recharging rates,
- Inductively coupled plasma mass spectroscopy for isotope determination
- Isotopes determination, spectral analysis of laser radiation in isotope measurement.
- Applications in the study of desertification, soil erosion and study of coastal erosion, and soil relaxation, soil surface stability, saturation and permeability, use of isotopes in the study of climate change

Satellite Images Processing Techniques (1401822) 3CR تقنيات معالجة صور الأقمار الصناعية

- Image classification
- Image rationing
- Image indices
- Deriving land surface temperature
- Using remotely sensed data in monitoring environmental changes (Case study)

Integrated Coastal Zone Management (1401823) 3CR الإدارة المتكاملة للمناطق الساحلية

- Marine pollution
- Impact of marine pollution on coastal environment
- Coastal processes
- Coral management
- Environmental impact assessment of coastal projects

Hazardous Wastes Management (1401824) 3CR إدارة المخلفات الخطرة

- Hazardous wastes classification
- Hazardous wastes management systems
- Techniques of hazardous wastes recovery

Environmental Applications of Geographical Information Systems (1401825) 3CR

التطبيقات البيئية لنظم المعلومات الجغرافية

- Environmental application of GIS: A conceptual framework
- Methodology for Developing a GIS
- Spatial Analysis tools of GIS
- Creating and Manipulation Raster surfaces
- Environmental impacts assessment using GIS
- Applying GIS in Suitability analysis and site selection
- Using GIS in Assessing water quality
- GIS Application in assessing vulnerability to sea level rise impacts

Climate Change – Regional Impacts and Adaptation (1401826) 3CR

التغيرات المناخية – التأثيرات الإقليمية والتأقلم

- Climate change trends
- Driving forces of Climate change
- Mathematical model to study impact of climatic changes
- Climate change scenarios
- Impacts of climate change
- Vulnerability to climate change
- Potential adaptation options to climate change

Economic Valuation of Ecosystems and their Functions (1401827) 3CR

التقييم الاقتصادي للنظم البيئية ووظائفها

- Ecosystem functions: services and goods
- Valuing ecosystems functions and goods
- Cost-benefit analysis
- Green Economy

Microbiology in extreme environment (1401828) 3CR

ميكروبيولوجيا البيئات المجهدة

- What are extreme environments?
- What are extremophiles?
- Microorganisms in extreme temperature, pH, low humidity/water activity, salinity, sugar concentrations, pressure, radiation, etc.
- Applications of extremophiles: microbial enzymes and their applications, extremozymes and their applications, extremophiles for production of biofuels, potential of extremophiles and their enzymes in bioremediation, etc.

الباب التاسع: مقررات برامج قسم علوم المواد

مقررات درجة الماجستير الأكاديمي في علوم المواد

يجتاز طالب الماجستير الأكاديمي 24 ساعة معتمدة من المقررات منها 9 ساعات معتمدة من المقررات الأساسية و 15 ساعة معتمدة من المقررات الاختيارية

م	كود المقرر	اسم المقرر	عدد الساعات الأسبوعية		
			نظري	عملي	معتمدة
<u>المقررات الأساسية</u>					
1	1402701	تركيب المواد وعيوب البنين Materials Structure & Defects	2	2	3
2	1402702	خواص المواد Material Properties	2	2	3
3	1402704	تشخيص المواد Materials Characterization	2	2	3
<u>المقررات الاختيارية</u>					
4	1402705	المواد المتبلمرة وتطبيقاتها Polymeric Materials & Applications	2	2	3
5	1402706	تكنولوجيا وإنتاج مواد البناء Technology & Production of Building Materials	2	2	3
6	1402707	اختيار المواد Materials Selection	2	2	3
7	1402708	الكيمياء الضوئية وتطبيقاتها (II) Photochemistry and its Applications (II)	2	2	3
8	1402709	علم وتكنولوجيا الزجاج والمواد السيراميكية (I) Science & Technology of Glass and Ceramics Materials (I)	2	2	3
9	1402710	المواد النانومترية وتطبيقاتها Nanomaterials & Application	2	2	3
10	1402711	التحكم في تآكل المواد Corrosion Control of Materials	2	2	3
11	1402712	فيزياء أشباه الموصلات Physics of Semiconductors	2	2	3
12	1402713	مواد الطاقة المتجددة Materials for Renewable Energy	2	2	3
13	1402714	تحلل وثبات المواد Degradation and Stabilization of Materials	2	2	3
14	1402717	المواد والبيئة Materials and Environment	2	2	3
15	1402718	المواد المتراكبة I Composite Materials (I)	2	2	3
16	1402719	تشغيل المعادن Metals Processing	2	2	3
17	1402720	المواد الحيوية وتطبيقاتها	2	2	3

			Biomaterials & Applications		
3	2	2	علم وتكنولوجيا الأغشية Membranes Science & Technology	1402721	18
3	2	2	النمذجة والمحاكاة في علوم المواد Modeling & Simulation in Materials Science	1402722	19
3	2	2	ميكانيكا الكم لعلوم المواد Quantum Mechanics for Materials Science	1402723	20
3	2	2	الديناميكا الحرارية لعلوم المواد Thermodynamics for Materials Science	1402724	21
3	2	2	موضوعات مختارة في علوم المواد Selected Topics in Materials Science	1402725	22
3	2	2	المواد المتطورة <u>Advanced Materials</u>	1402730	23
3	2	2	الأسطح الوظيفية Functional surfaces	1402731	24
3	2	2	نظم ميكروميكانيكية إلكترونية Micro Electromechanical Systems	1402734	25
3	2	2	التطبيقات التكنولوجية للمواد الطينية Technological Applications of Clay Materials	1402742	26
3	2	2	المواد والإضافات في صناعة البترول Materials & Additives in Petroleum Processing	1402743	27

المحتوى العلمي لمقررات درجة الماجستير الأكاديمي في علوم المواد

Materials Structure & Defects (1402701) 3CR تركيب المواد وعيوب البنين

- Categories of Bonds
- Boundary, and Grain boundary
- Crystal Structures and properties
- Ordering, Point defects, Line defects, Dislocations, Movement of dislocations

Material Properties (1402702) 3CR خواص المواد

- Thermal properties and interatomic bonding effects.
- Introduction to materials properties
- Electrical conductivity
- Dielectric materials and polarization
- Magnetic properties
- Optical Properties
- Semiconductor properties
- Mechanical Properties

Materials Characterization (1402704) 3CR تشخيص المواد

- Concept of UV-visible and infrared spectroscopes
- Thermal analysis characterization
- Basic of scanning and transmission electron microscopes
- Characterization techniques of nanomaterials (atomic force and scanning tunneling microscopes)
- X-ray diffraction techniques

Polymeric Materials & Applications (1402705) 3CR المواد المتبلرة وتطبيقاتها

- Chemical bonds, nomenclature, classifications of polymers; of polymers
- Addition and condensation polymerization Suspension and emulsion polymerizations
- Molecular weight and its methods of measurement.
- Co-Polymerization and their types
- Additives and their types and specifications
- Structure properties relationship.
- Polymers processing.

Technology & Production of Building Materials (1402706) 3CR

تكنولوجيا وإنتاج مواد البناء

- Types of building materials - Production of various building materials, building units, cement, steel and ceramics
- Reaping assets and mechanics for building materials
- Cement materials and additives
- Durability of building materials and more than the surrounding environment

Materials Selection (1402707) 3CR اختيار المواد

- Introduction, Materials in design, The evolution of engineering materials, Case study: the evolution of materials in vacuum cleaners.
- The design process, Types of design, Design tools and materials data, Function, material, shape, and process, Case study: devices to open corked bottles.
- Engineering materials and their properties, Introduction and synopsis, The families of engineering materials, The definitions of material properties.
- Standards, specifications and quality control.
- Material property charts. Materials selection—the basics, The selection strategy, Attribute limits and material indices, The selection procedure, Computer-aided selection, The structural index.

Photochemistry and its Applications (II) (1402708) 3CR الكيمياء الضوئية وتطبيقاتها (II)

- Basic of photochemistry and electronic transitions.
- Absorption and emission spectra.
- Photochemical reactions as well as techniques of photochemistry.
- Applications of photochemistry.

Science & Technology of Glass and Ceramics Materials (I) (1402709) 3CR

علم وتكنولوجيا الزجاج والمواد السيراميكية I

- Introduction to glass and ceramic materials - Equilibrium and phase change
- Techniques for manufacturing glass and ceramic materials
- Structural composition of glass and structural defects - Electrical and optical properties of glass materials - Applications of glass - Structural structure of ceramic materials
- Electrical and mechanical properties of ceramic materials

Nanomaterials & Applications (1402710) 3CR المواد النانومترية وتطبيقاتها

- Quantum physics of materials with nanometer dimensions
- Dependence of physical and chemical properties on nanometer dimensions
- Techniques of physical and chemical manufacturing of nanometer materials
- Applications of nanometer materials in medicine, energy and industry

Corrosion Control of Materials (1402711) 3CR التحكم في تآكل المواد

- Fundamentals of corrosion science
- Mechanics of corrosion - corrosion control
- Methods of corrosion protection (cathode protection - anodic protection - paints - inhibitors - engineering design - chemical and electrochemical measurements to measure corrosion rates of metals - other related topics.

Physics of Semiconductors (1402712) 3CR فيزياء أشباه الموصلات

- Introduction to semiconductor physics –
- Materials used as semiconductors - Structural and crystal structure of semiconductors
- Energy bands and photovoltaic properties of semiconductors - Phonons and thermal properties
- Interaction between photons and phonons - Interaction between photons and electron - Effect of structural defects on light absorption

- Defects in semiconductors - Transmission of current carriers - Generation and union of current carriers - Photoelectric conduction –
- Study of the electrical and optical properties of some electronic devices.

Materials for Renewable Energy (1402713) 3CR مواد الطاقة المتجددة

- Materials and renewable energy.
- Different materials used in PV cells
- Preparation and characterization of PV cells
- Solar collectors between operation and used materials
- Materials used in Fuel cells
- Wind energy and materials
- Operation and materials of hydro-electric and thermo-electric converters

Degradation and Stabilization of Materials (1402714) 3CR تحلل وثبات المواد

- Introduction to polymer decomposition –
- Types of polymer decomposition (thermal decomposition - mechanical decomposition - ultrasonic decomposition - decomposition using light - decomposition using high-energy radiation - decomposition using oxygen)
- Study of corrosion and deterioration of various metals and alloys, protection of metals from deterioration, decomposition and stability of ceramic materials, decomposition of superimposed materials

Materials and Environment (1402717)3CR المواد والبيئة

- The importance of materials,Material consumption and its growth,
- The life cycle of materials.
- Material and energy-consuming systems.
- The use-patterns of products.The -attributes of materials.
- The eco-attributes of materials.
- End of life: Problem or new source.
- Aggregated measures: eco-indicators,
- The material life cycle and criteria for assessment.
- Recycling: ideals and realities
- The energy demands of products.Charts for embodied energy.
- Property charts for embodied energy in structural design.
- Selecting materials for eco-design.

Composite Materials (I) (1402718) 3CR I مواد المتراكبة

- Fibers and the surrounding medium
- Fiber reinforced polymeric materials
- Methods for manufacturing fiber reinforced polymeric materials
- Physical and mechanical properties of fiber reinforced polymeric materials
- Metal and ceramic based composite materials.

Metals Processing (1402719) (3) تشغيل المعادن

(المتطلب السابق 1402724)

- Introduction: materials and their history
- The relationship between material composition and machining –
- Design processes - machining processes - machining, processing and properties –

- Microstructure evolution during machining and machining.

Biomaterials & Applications (1402720) 3CR المواد الحيوية وتطبيقاتها

- Introduction to biomaterials and materials science
- Bioadaptation - biodegradation - polymeric biomaterials
- Relationship between properties and chemical composition of biomaterials
- Biomaterials preparation and design techniques - biomaterials evaluation
- Biomaterials and tissue engineering - biomaterials and drug delivery systems.

Membranes Science & Technology (1402721) 3CR علم وتكنولوجيا الأغشية

- Introduction to membrane science and technology: Historical Development.
- Membrane operations and transport mechanisms.
- Membrane Types and modules.
- Membrane manufacturing techniques.
- Membrane characterization.
- Membrane problems: polarization and fouling.
- Different types of membrane separation processes.
- Reverse Osmosis & Forward Osmosis: Principles and Applications
- Electrodialysis: Principles and Applications
- Membrane electrospinning
- Recent trends and developments in membrane Science

Modeling & Simulation in Materials Science (1402722) 3CR النمذجة والمحاكاة في علوم المواد

- Principles of modeling and simulation processes –
- Methods of modeling and simulation using finite element technology –
- Simulation of molecular dynamics and quantum mechanics –
- Processes of predicting the properties of materials, especially mechanics and thermal processes
- Designing the composition of materials for different applications using different techniques
- Simulations of material performance under specific operating conditions

Quantum Mechanics for Materials Science (1402723) 3CR ميكانيكا الكم لعلوم المواد

- Introduction to quantum mechanics –
- Basic concepts of quantum mechanics waves - quantum behavior –
- Measurements and coefficients in quantum mechanics –
- Mathematical functions used in quantum mechanics –
- Angular and spin moments - hydrogen atom - light emission –
- Applications of quantum mechanics in materials science

Thermodynamics for Materials Science (1402724) 3CR الديناميكا الحرارية لعلوم المواد

- First law of thermodynamics:
- The second law of thermodynamics:
- The third law of thermodynamics:
- Phase equilibrium
- Phase transformation

Selected Topics in Materials Science (1402725) 3CR موضوعات مختارة في علوم المواد

- Selected topics related to case studies of high-performance materials and their uses in various fields

Technological Applications of Clay Materials (1402742) 3CR التطبيقات التكنولوجية للمواد الطينية

- General introduction to different clay materials,
- Classification of clay minerals, properties of minerals,
- Methods of improving the chemical and physical properties of clay by various methods,
- Methods of obtaining nanomaterials from clay minerals,
- Nanocomposites of clay with different polymers,
- Applications of clay materials in medical, engineering and water treatment applications. different technology.

Materials & Additives in Petroleum Processing (1402743) 3CR

المواد والإضافات في صناعة البترول

- An introduction to the role of materials in improving the performance of petroleum equipment and installations –
- Using chemicals and petroleum additives to improve the performance of petroleum products and raise their efficiency –
- The role of materials in developing equipment performance, increasing its life span and improving performance –
- Reducing operating problems during production, refining, transportation, and even final use

مقررات درجة الماجستير الأكاديمي في "المواد لتطوير وابتكار منتج"

يجتاز طالب الماجستير الأكاديمي 24 ساعة معتمدة من المقررات منها 12 ساعة معتمدة من المقررات الأساسية و 12 ساعة معتمدة من المقررات الاختيارية

م	كود المقرر	اسم المقرر	عدد الساعات الأسبوعية		
			نظري	عملي	معتمدة
المقررات الأساسية					
1	1402704	تشخيص المواد Materials Characterization	2	2	3
2	1402730	المواد المتطورة Advanced Materials	2	2	3
3	1402731	الأسطح الوظيفية Functional Surfaces	2	2	3
4	1402732	الإبداع في تصميم وتطوير المنتجات Creativity in Product Development and Innovation	2	2	3
المقررات الاختيارية					
5	1402705	المواد المتبلورة وتطبيقاتها Polymeric Materials & Applications	2	2	3
6	1402733	البوليمرات ومترابكاتها Polymers and their Composites	2	2	3
7	1402734	نظم ميكروميكانيكية إلكترونية Micro Electromechanical Systems	2	2	3
8	1402735	أدوات الاستدامة Tools for Sustainability	2	2	3
9	1402736	المواد المستخدمة في التصميم والتصنيع Materials in Design and Processing	2	2	3
10	1402737	الهندسية العكسية لتطوير المنتجات Reverse Engineering for Products Development	2	2	3
11	1402738	استراتيجيات التسويق لتطوير المنتج Marketing Strategies for Product Development	2	2	3
12	1402739	النمذجة والتصور Prototyping and Visualization	2	2	3
13	1402740	القضايا الاقتصادية والقانونية والمالية لتطوير المنتجات Economics, Legal and Financial Issues of Product Development	2	2	3
14	1402741	التصميم للتصنيع والتجميع والبيئة Design for Manufacturing, Assembly and Environment	2	2	3

المحتوى العلمي لمقررات ماجستير "المواد لتطوير وابتكار منتج"

Materials Characterization (1402704) 3 CR تشخيص المواد

- Concept of UV-visible and infrared spectroscopes
- Thermal analysis characterization
- Basic of scanning and transmission electron microscopes
- Characterization techniques of nanomaterials (atomic force and scanning tunneling microscopes)
- X-ray diffraction techniques

Advanced Materials (1402730) 3CR المواد المتطورة

- Introduction to materials engineering.
- History and case studies of materials development.
- Composites: Polymer- Metal -Ceramic matrix composites.
- Impact of new materials on economic growth.
- Technology management: the R&D process.
- Materials property charts.
- Selected topic on Advanced materials related to local industries

Functional Surfaces (1402731) 3CR الأسطح الوظيفية

- Introduction to surface science and engineering.
- Different material coating technologies related to polymeric and ceramic materials.
- The effect of surface contaminant and the choice of proper cleaning techniques will be studied.
- Analysis techniques for surface characterization (e.g. hardness, thickness measurements, SEM.....etc.)
- Some of applications for surface modification for some national and local industries (paper, glassetc.) will be provided

Creativity in Product Development and Innovation (1402732) 3CR الإبداع في تصميم وتطوير المنتجات

- Techniques and methods used to improve the creative design ability to innovate new products and product development
- Principles of flexibility, originality and creativity in thinking to solve problems.
- Studying and analyzing problem assessment tools and creativity in the work of the road map for product development.

Polymeric Materials & Applications (1402705) 3CR المواد المتبلرة وتطبيقاتها

- Chemical bonds, nomenclature, classifications of polymers; of polymers
- Addition and condensation polymerization Suspension and emulsion polymerizations
- Molecular weight and its methods of measurement.
- Co-Polymerization and their types
- Additives and their types and specifications
- Structure properties relationship.
- Polymers processing.

Polymers and their Composites (1401733) 3CR البوليمرات ومتراباتها

- An introduction to polymers
- An introduction to reinforcing fibres Synthetic fibres, mechanical/physical properties
- Natural fibres
- Basic information about characterization of composites
- Calculation of composite structures–
- Introduction into laminate theory.
- Processing of composite structures

Micro Electromechanical Systems (1402734) 3CR نظم ميكروميكانيكية الكترونية

- Microfabrication techniques and design principles of electronic micromechanical systems .
- Techniques and materials used to fabricate micro/nanometric devices derived from the integrated circuit industry .
- Studying and implementing some manufacturing processes
- Fabrication of some probes on silicon wafers and deposition of conductive polymers using spin-coating in a glove box.

Tools for Sustainability (1402735) 3CR أدوات الاستدامة

- An introduction to Ecology
- Ecosystem ecology
- Mankind and the planet
- Sustainable Development and Sustainability
- Tools for illustrating ecosystems support
- Life Cycle Assessment Methodology
- LCA applications to materials production.

Materials in Design and Processing (1402736) 3CR المواد المستخدمة في التصميم والتصنيع

- The relationship between design, material selection and operation during the product development
- Innovation process through four different paths.

Reverse Engineering for Products Development (1402737) 3CR

الهندسية العكسية لتطوير المنتجات

- Introduction to RE (Definition of RE, forward vs. reverse engineering, need for RE as a PDI tool, applications of RE)
- Review of advanced and traditional manufacturing techniques.
- Specification of a component, creation of point cloud (scanning/digitizing of a component)
- Processing of scanned data.
- Geometric model development.
- Development of a product based on the generated geometric model.
- Application of rapid prototyping in RE.
- RE hardware and software.
- Methods and techniques of RE in different industries.
- Case histories and mini-project

Marketing Strategies for Product Development (1402738) 3CR

استراتيجيات التسويق لتطوير المنتج

- Studying the development of different strategies for marketing future products.
- How to set priorities for the product characterization process .
- Market analysis techniques and its relationship to quality materials used for manufacturing and developing product specifications within the framework of customer satisfaction and achieving product requirements

Prototyping and Visualization (1402739) 3CR النمذجة والتصوير

- Conceive and analyze the design concept
- Study the properties of materials in order to predict product characteristics and test its feasibility at an early stage of design.
- Manufacturing additives and their implications for the future development of the industry .
- Study how to benefit from the modeling process to evaluate the proposed product and its feasibility .
- Acquiring the necessary skills to produce and present a design for a model using several techniques such as 3-way printing technology.

Economics, Legal and Financial Issues of Product Development (1402740) 3CR

القضايا الاقتصادية والقانونية والمالية لتطوير المنتجات

- Presenting the basic concepts of economics and enabling students to analyze economically in the formulation of commerce .
- Explain the basic concepts of accounting and financial departments in order to present and present products in the process of decision-making,
- Purchasing financing and risk-taking .
- Evaluate the feasibility of new or existing product development by its impact on the market.
- Study of intellectual property rights, patents, international trade agreement and securities management.

Design for Manufacturing, Assembly and Environment (1402741) 3CR

التصميم للتصنيع والتجميع والبيئة

- Defining the main and modern issues in engineering design ,
- Link the product development and innovation process with strategic requirements such as the use of environmentally friendly materials, green technologies ,
- Ease of manufacturing and assembly, and environmental efficiency, by studying the entire life cycle of the product.

مقررات درجة الماجستير الأكاديمي في "تقنيات ومواد الطاقة المتجددة"

يجتاز طالب الماجستير الأكاديمي 24 ساعة معتمدة من المقررات منها 12 ساعات معتمدة من المقررات الأساسية و12 ساعة معتمدة من المقررات الاختيارية

المتطلب السابق	عدد الساعات الأسبوعية			اسم المقرر	كود المقرر	م
	معتمدة	عملي	نظري			
المقررات الأساسية						
	3	2	2	تشخيص المواد Materials Characterization	1402704	1
	3	2	2	مواد الطاقة المتجددة Materials for Renewable Energy	1402713	2
1402751 1402713	3	2	2	أدوات الاستدامة Tools for Sustainability	1402735	3
	3	2	2	مقدمة في الطاقة المتجددة وتطبيقاتها Introduction to Renewable Energy and its Applications	1402751	4
المقررات الاختيارية						
	3	2	2	مواد لتخزين ونقل الطاقة Materials for Storage and Transport of Energy	1402752	5
1402751 1402713	3	2	2	تقنيات النظم الفوتوفولطية Technologies of Photovoltaic Systems	1402754	6
1402751 1402713	3	2	2	تقنيات نظم الطاقة الشمسية الحرارية Technologies for Thermal System of Solar Energy	1402755	7
1402751 1402713	3	2	2	تقنيات طاقة الرياح والمياه Technologies of Wind and Water Energy	1402756	8
	3	2	2	أسس توليد الهيدروجين وخلايا الوقود Principles of Hydrogen Generation and Fuel Cells	1402757	9
	3	2	2	النمذجة والمحاكاة لأنظمة الطاقة المتجددة Modeling and Simulation for Renewable Energy Systems	1402758	10
	3	2	2	تحلية ومعالجة المياه باستخدام الطاقة المتجددة Desalination and Water Treatment using Renewable Energy	1402759	11

	3	2	2	التقنيات المتقدمة في الطاقة المتجددة Advanced technologies for Renewable Energy	1402760	12
1402751	3	2	2	الكتلة الحيوية والطاقة Biomass and Energy	1401727	13

المحتوى العلمي لمقررات درجة ماجستير "تقنيات ومواد الطاقة المتجددة"

Introduction to Renewable Energy and its Applications (1402751) 3CR

مقدمة في الطاقة المتجددة وتطبيقاتها

- Scientific principles of renewable energy
- Solar radiation and its components
- Physical and chemical processes near the earth's surface.
- Photosynthetic process. Harnessing geothermal resources.
- Measurements of solar radiation and environmental parameters.
- Water and energy cycles.
- Fluid mechanics. Kinetic energy in wind. Heat transfer. Applications of renewable energy

Materials for Renewable Energy (1402713) 3CR مواد الطاقة المتجددة

- Materials and renewable energy.
- Different materials used in PV cells
- Preparation and characterization of PV cells
- Solar collectors between operation and used materials
- Materials used in Fuel cells
- Wind energy and materials
- Operation and materials of hydro-electric and thermo-electric converters

Materials Characterization (1402704) 3CR تشخيص المواد

- Concept of UV-visible and infrared spectroscopes
- Thermal analysis characterization
- Basic of scanning and transmission electron microscopes
- Characterization techniques of nanomaterials (atomic force and scanning tunneling microscopes)
- X-ray diffraction techniques

Tools for Sustainability (1402735) 3CR أدوات الاستدامة

المتطلب السابق: 1402713 - 1402751

- An introduction to Ecology
- Ecosystem ecology
- Mankind and the planet
- Sustainable Development and Sustainability
- Tools for illustrating ecosystems support
- Environmental impact assessment (LCA)
- Life Cycle Assessment Methodology
- LCA applications to materials production

Technologies of Photovoltaic Systems (1402754) 3CR تقنيات النظم الفوتوفولطية
المتطلب السابق: 1402751 - 1402713

- Solar Cells and technology.
- Solar cell's array and modules.
- Solar Photovoltaic Systems.
- Storage Batteries and Power Conditioning Equipment.
- Design, Installation and Operation of a Solar PV System.
- Building Integrated Photovoltaics: case studies, typical cases.
- Energy Analysis and Environmental Issues.
- Solar Radiation Measuring Instruments, Measurement of I-V Behavior of a PV Module.
- PV Module Fabrication, Durability tests.
- PV Module Fabrication, Durability tests, Format for Estimating Average Daily Load, Format for PV System Sizing.
- Sizing Example for PV Residential System.
- Connecting to the utility grid

Technologies for Thermal Systems of Solar Energy (1402755) 3CR

تقنيات نظم الطاقة الشمسية الحرارية
المتطلب السابق: 1402751 - 1402713

- Introduction to the components of solar thermal energy systems
- Systems for converting solar energy into thermal energy and electrical energy
- Solar vacuum tube technology
- Durability tests for materials and components of solar thermal energy systems
- Applications for solar thermal energy systems.

Technologies of Wind and Water Energy (1402756) 3CR تقنيات طاقة الرياح والمياه
المتطلب السابق: 1402751 - 1402713

- Historical introduction to wind energy systems
- Techniques for measuring fluid velocity
- Types of turbines - Energy conversion by turbines - Installing components of wind systems - Electrical interconnection with the network
- Techniques of hydroelectric systems

Biomass and Energy (1401727) 3CR الكتلة الحيوية والطاقة
المتطلب السابق: 1402751

- Biomass sources in solar energy conversion cycles to biomass –
- Sources of organic materials –
- Technologies for using biomass to produce biogas, alcohol and oils –
- Direct and indirect burning –
- Technical and environmental precautions for biomass utilization processes –
- Economic benefits –
- Biomass systems as a source of energy generation.

Principles of Hydrogen Generation and Fuel Cells (1402757) 3CR
أسس توليد الهيدروجين وخلايا الوقود

- Introduction to hydrogen energy
- Materials and techniques for hydrogen generation by solar energy –

- Hydrogen storage techniques –
- Basics of electrochemistry of fuel cells
- Components of fuel cells –
- Performance of different types of fuel cells
- Applications of fuel cells.

Modeling and Simulation for Renewable Energy Systems (1402758) 3CR

النمذجة والمحاكاة لأنظمة الطاقة المتجددة

- From mathematical description to computer simulation
- Methods used to determine the quantitative error in simulation
- Defining a list of specifications for renewable energy sources
- Preparing a list of modeling and simulation systems and their functions
- Listing mathematical equations to calculate the appropriate size and efficiency of the resource
- Choosing one of the comprehensive specialized software such as HOMER/MATLAB, SIMULINK)) to implement a case study of a multi-resource renewable energy system.

Desalination and Water Treatment using Renewable Energy (1402759) 3CR

تحلية ومعالجة المياه باستخدام الطاقة المتجددة

- An introduction to the lack of water resources
- Solar distillers and materials used
- Membranes used for solar desalination
- Technology of solar energy systems for humidification and dehumidification
- Materials used for water treatment
- Desalination and water treatment systems with renewable energy
- Applications and case studies.

Advanced technologies for Renewable Energy(1402760) 3CR التقنيات المتقدمة في الطاقة المتجددة

- Graphene for energy applications
- Nanomaterials for thermoelectric converters
- Materials and techniques for recycling carbon dioxide
- Materials for emitting diodes
- Energy generation technology using piezoelectric materials
- Techniques and innovative materials for renewable energy uses.

Materials for Storage and Transport of Energy (1402752) 3CR مواد لتخزين ونقل الطاقة

- Introduction and materials science in energy
- Materials for thermal energy storage and transport.
- Materials for electrical energy storage and transport
- Capacitors, super-capacitors and batteries.
- Materials for electrical energy storage and transport.
- Hydrogen storage.
- Energy management

المقررات التكميلية لبرامج الماجستير بقسم علوم المواد

يجتاز الطالب 6 ساعات يحددها مجلس القسم لكل طالب بناء على الخلفية العلمية المطلوبة للطالب للالتحاق بقسم علوم المواد على سبيل المثال هذه المقررات المذكورة في الجدول اسفله موضوعة للطالب خريج كلية التربية من الاقسام العلمية

م	كود المقرر	اسم المقرر	عدد الساعات الأسبوعية		
			نظري	عملي	معتمة
1	1402001	رياضة تطبيقية Applied Mathematics	2	2	3
2	1402002	أساسيات الكيمياء Basics of Chemistry	2	2	3
3	1402003	فيزياء حديثة Modern Physics	2	2	3

المحتوى العلمي للمقررات التكميلية لبرامج الماجستير بقسم علوم المواد

رياضة تطبيقية 3CR Applied Mathematics (1402001)

- Functions Graphs - Models - Limits - Differentiation - Applications Directions and digital functions
- Determinants and series functions
- Exponential and logarithmic functions
- Integration and applications
- Some probability functions and their applications - Fourier series functions and their applications

أساسيات الكيمياء 3CR Basics of Chemistry (1402002)

- General principles of chemical foundations: elements, atoms and ions
- Introduction to chemical reactions - chemical structure - dissolution and precipitation - acids and bases - oxidation and reduction reactions –
- Basics of organic chemistry.

فيزياء حديثة 3CR Modern Physics (1402003)

- Special relativity - time extension - Doppler effect - length contraction - mass relativity - mass and energy - massless particles
- Photoelectric effect - X-ray diffraction - Kempton effect - pair production - Dobrogli waves - particle diffraction - a body inside a box –
- The uncertainty principle - Atom nucleus - Electron orbits - Bohr atom –
- Excitation of atoms - Laser.

مقررات درجة دكتوراه الفلسفة في علوم المواد

يجتاز الطالب 18 ساعة معتمدة من المقررات التالية:

عدد الساعات الأسبوعية			اسم المقرر	كود المقرر	م
معمدة	عملي	نظري			
3	2	2	الاتجاهات الحديثة في علوم وتكنولوجيا خلايا الوقود Recent Trends in Fuel Cells Science and Technology	1402800	1
3	2	2	تصنيع الالكترونيات الدقيقة Microelectronics Fabrication	1402801	2
3	2	2	تكنولوجيا النانو للالكترونيات الدقيقة والتطبيقات الالكتروضوئية Nanotechnology for Microelectronics and Optoelectronics Applications	1402802	3
3	2	2	المواد شبه الموصلة Semiconductor Materials	1402803	4
3	2	2	فيزياء الخلايا الشمسية Solar Cells Physics	1402804	5
3	2	2	تكنولوجيا النانو للمجسات Nanotechnology-Enabled Sensors	1402806	6
3	2	2	البوليمرات الموصلة وتطبيقاتها Conducting Polymers and their Applications	1402807	7
3	2	2	تحلل البوليمرات Polymers Degradation	1402808	8
3	2	2	تشخيص البوليمرات Polymers Characterization	1402809	9
3	2	2	المتبلورات الممتصة والمتحللة حيويًا Absorbable and Biodegradable Polymers	1402810	10
3	2	2	البوليمرات النانومترية Polymeric Nanomaterials Rubber Technology	1402811	11
3	2	2	خلائط البوليمر Polymer blends	1402812	12
3	2	2	المركبة المواد (II) Composite Materials (II)	1402813	13
3	2	2	تكنولوجيا المطاط Rubber Technology	1402814	14
3	2	2	الكيمياء الكهربية وعلم التآكل Electrochemistry and Corrosion Science	1402815	15
3	2	2	البوليمرات لتثبيط التآكل Plastics for Corrosion Inhibition	1402816	16
3	2	2	فحص ومتابعة التآكل Corrosion Inspection and Monitoring	1402817	17
3	2	2	التقنيات التحليلية لعلوم وتكنولوجيا الخرسانة Analytical Techniques in Concrete Science and Technology	1402818	18
3	2	2	مواد وتكنولوجيا المباني الخضراء Materials and Technology of Green Buildings	1402819	19
3	2	2	مواد وتكنولوجيا إصلاح المباني Materials and Technology of Green Buildings	1402820	20

			Materials and Technology for Buildings Repair		
3	2	2	إنتاج وتركيب المواد الأسمنتية Production and Composition of Cementations Materials	1402821	21
3	2	2	تكنولوجيا النانو والطاقة Nanotechnology & Energy	1402823	22
3	2	2	المواد الحفزية للصناعة Catalytic Materials for Industry	1402824	23
3	2	2	علم وتكنولوجيا الزجاج و المواد السيراميكية II Science &Technology of Glass and Ceramics Materials (II)	1402825	24
3	2	2	المحفزات الضوئية وتطبيقاتها Photocatalysts& Applications	1402826	25
3	2	2	التشغيل المتطور للمواد الهيدروكربونية Advanced Processing of Hydrocarbons Materials	1402827	26
3	2	2	اتجاهات حديثة في علوم المواد Recent Trends in Materials Science	1402828	27
3	2	2	دور المواد في صناعة البترول Role of Materials in the Petroleum Processing	1402829	28
3	2	2	دور المواد في صناعة البتروكيماويات Role of Materials in the Petrochemicals Industry	1402830	29
3	2	2	الوقود الحيوي المستدام Sustainable Biofuels	1402831	30
3	2	2	تطبيقات الهلاميات المائية (الهيدروجيل) في علم المواد Applications of Hydrogels in Materials Science	1402832	31

المحتوى العلمي لمقررات درجة دكتوراه الفلسفة في علوم المواد

Recent Trends in Fuel Cells Science and Technology (1402800)

3CR

الاتجاهات الحديثة في علوم و تكنولوجيا خلايا الوقود

- Introduction to Scientific Writing.
- The Simple Logic of Writing.
- Searching the Web Effectively.
- Preparing visuals.
- Writing the introduction.
- Materials and Methods.
- Writing Results.
- Writing Discussion.
- Other tips.
- Presenting Your Work –ppt/posters.
- Writing Scientific Publications (with current academics).
- Case study.

Microelectronics Fabrication (1402801) 3CR تصنيع الالكترنيات الدقيقة

- Introduction in microelectronics fabrication.
- Lithography.
- Thermal oxidation of silicon.
- Diffusion and ion implantation.
- Film deposition.
- MOS processing.
- Process for micro electro mechanical systems

Nanotechnology for Microelectronics and Optoelectronics Applications (1402802)3CR

تكنولوجيا النانو للالكترنيات الدقيقة والتطبيقات الالكتروضوئية

- Introduction to Nanotechnology in Microelectronics and Optoelectronics
- Semiconductor nanoscale crystal growth techniques
- Devices based on the use of nanometer zinc oxide
- Mesoscopic physics and nanotechnology
- Semiconductor physics
- Quantitative nanostructure semiconductor synthesis
- Electric field transmission in nanomaterials formulations.

Semiconductor Materials (1402803) 3CR المواد شبه الموصلة

- Introduction to the bundle theory of semiconducting materials
- Properties of semiconducting materials
- Preparation and manufacture of semiconducting materials (one element - two elements - three elements)
- Narrow band gap semiconductors - Wide band gap semiconductors - Oxidized semiconductors
- Characterization Electrical, optical and microscopic of semiconductor material
- Applications of semiconductor materials for optoelectronic devices - Modernity in semiconductor materials

Solar Cells Physics (1402804)**3CR** فيزياء الخلايا الشمسية

- Introduction to solar cells
- Properties and physics of photovoltaic cells
- Installation of solar cells - symmetric solar cells
- Asymmetric solar cells
- Surface barrier in solar cells
- Photovoltaic processes in semiconductors
- Energy levels in semiconductors
- Relations between optical constants - absorption spectrum - transitions Radiant and non-radiative - Processes in the binary junction
- Induced radiation - Polarizing effects

Nanotechnology-Enabled Sensors (1402806)**3CR**

تكنولوجيا النانو للمجسات

- Introduction of nanotechnology
- Sensors characterization and physical effects
- Nanofabrication and patterning techniques
- Characterization techniques nanomaterials-Inorganic nanotechnology enabled sensors
- Organic nanotechnology
- Enabled sensors

Conducting Polymers and their Applications (1402807)**3CR**

البوليمرات الموصلة وتطبيقاتها

- Introduction of conducting polymers.
- Physics theory of conducting polymer.
- Charge carriers and conduction mechanisms of conducting polymers.
- Preparation techniques of conducting polymers.
- Applications conducting polymers

Polymers Degradation (1402808)**3CR**

تحلل البوليمرات

- Basic concepts of polymer decomposition
- Methods of studying polymer decomposition
- Factors leading to the rapid decomposition of polymers (the effect of specific weight - the effect of chemical composition - the effect of surface shape)

Polymers Characterization (1402809)**3CR**

تشخيص البوليمرات

- Thermal diagnosis
- Spectroscopic methods - chromatography and its derivatives
- Hardness - tear strength - shock resistance - tensile strength
- Ease of ignition - flame spread - the critical limit coefficient of oxygen.

Absorbable and Biodegradable Polymers (1402810)3CR

المتبلمرات الممتصة والمتحللة حيويًا

- Sorbent and biodegradable polymers (basic concepts and definitions)
- Classification of sorbent polymers
- Mechanism of biodegradation of polymers
- Developments in detailing the properties of sorbent and biodegradable materials
- Uses of sorbent and biodegradable polymers in the fields of medicine, agriculture and packaging, study of the compatibility and toxicity of polymers

Polymeric Nanomaterials (1402811) 3CR البوليمرات النانومترية

- General introduction to nanoparticles
- Chemical and physical methods used to prepare nanoscale polymers
- Polymers used to prepare nanoparticles
- Preparation of nanoparticles and fibers
- Modern applications in the field of nanoparticles

Polymer blends (1402812) 3CR خلائط البوليمر

- Introduction to polymer blends
- Solubility and reaction agents in blended polymers
- Compatibility of blended polymers
- Methods of preparing blended polymers
- Rheology of blended polymers
- Fillers and hardeners for polymers - plasticizers - stabilizers - flame retardant materials

Composite Materials (II) (1402813) 3CR المواد المتراكبة II

- An introduction to polymers
- Types of plastic additives, reinforced fibers, including glass fibers, carbon fibers, and natural fibers. Identification and analysis of retinal structures.
- Identification and analysis of fibers. Overlays analysis. Computational methods to find out expectations in mechanical properties.

Rubber Technology (1402814) 3CR تكنولوجيا المطاط

- Additives used in the rubber industry, such as vulcanizing materials, oxidation inhibitors, blowing materials, leveling materials, accelerators,
- The effect of additives on properties, forming methods, mixing methods,
- Physical and mechanical tests for the final product.

Electrochemistry and Corrosion Science (1402815) 3CR الكيمياء الكهربائية وعلم التآكل

- General introduction to electrochemistry
- Electrometallurgy Cathodic protection by sacrificial electrodes
- Selection of sacrificial electrodes Cathodic protection by induced current
- Anodic protection
- Inert metals High temperature corrosion Case studies of motor wear.

Plastics for Corrosion Inhibition (1402816) 3CR البوليمرات لتثبيط التآكل

- Introduction.
- Design Principles of Plastics Containing Metal Corrosion Inhibitors.
- Films Incorporating Corrosion Inhibitors.
- Inhibited Coatings.
- Structural Inhibited Plastics.
- Inhibited Engineering Service Materials.

Corrosion Inspection and Monitoring (1402817) 3CR فحص ومتابعة التآكل

- Economics of corrosion
- Detection of corrosion

- Follow-up of corrosion by means of electrical impedance devices
- Follow-up and examination by means of voltage stabilizers
- How to detect corrosion periodically in industrial sites
- Non-destructive evaluation
- Development of a strategy for protection against corrosion in industrial facilities.

Analytical Techniques in Concrete Science and Technology (1402818) 3CR

التقنيات التحليلية لعلوم وتكنولوجيا الخرسانة

- Thermal analysis technique
- Infrared spectrum
- Scanning electron microscope
- X-ray microanalysis
- X-ray diffraction
- Rheological techniques.

Materials and Technology of Green Buildings (1402819) 3CR مواد وتكنولوجيا المباني الخضراء

- Green facilities
- Building materials from natural sources
- Soil division (determination, analysis and testing of properties)
- Properties of manufactured materials from the environment
- Building techniques using bricks made from natural soil –
- Building finishes made of natural materials and methods of preserving them from various environmental factors
- How to isolate buildings and green facilities
- Repair and maintenance of green buildings
- Advantages and disadvantages of green buildings.

Materials and Technology for Buildings Repair (1402820) 3CR

مواد وتكنولوجيا إصلاح المباني

- An introduction to the types of building materials
- Causes and forms of deterioration of building materials and their manifestations
- Methods of examining buildings and determining their condition
- Methods of collecting and extracting samples from buildings and conducting field tests
- Practical tests (physical, chemical and mechanical) to determine the method and materials for repair required for buildings
- Various repair materials and their applications
- Foundations And methods of using repair materials
- Materials and methods for protecting and treating external surfaces in buildings.

Production and Composition of Cementations Materials (1402821) 3CR

إنتاج وتركيب المواد الأسمنتية

- Introduction to the history of the cement industry
- Raw materials for the Portland cement industry
- Components and compounds of Portland cement
- The role of different cement compounds in hydration, hardening and adhesion of cement
- Different types of cement and their composition

- Dvantages and disadvantages of cement
- Pozzolan materials - pozzolan cement (industry - composition - uses)
- Types and applications Concrete additives and their benefits (according to local and international specifications).

Nanotechnology & Energy (1402823) 3CR **تكنولوجيا النانو والطاقة**

- An introduction to the role of nanotechnology to overcome the challenges of the energy sector - solar cells induced by light - electrothermal nanometer converters - ceramic membranes for the collection and storage of carbon dioxide
- Materials for energy storage and distribution
- Nanometer materials in production processes.

Catalytic Materials for Industry (1402824) 3CR **المواد الحفزية للصناعة**

- Introduction to catalysts
- Catalytic reactions
- Theory and mechanics of adsorption process
- Homogeneous and heterogeneous catalytic industrial processes
- Analysis of information for reactor design
- Catalytic industrial reactions in the petroleum and petrochemical fields
- Evaluation of the performance of industrial catalysts.

Science &Technology of Glass and Ceramics Materials (II) (1402825) 3CR **علم و تكنولوجيا الزجاج والمواد السيراميكية II**

- Ceramic Materials and Properties.
- Ceramics, Glasses, and Micas for Electrical Products.
- Electronic Ceramics.
- Advanced Ceramics and Composites.
- Inorganic Glasses—Structure, Composition and Properties.
- Inorganic Glasses—Commercial Glass Families,Applications, and Manufacturing Methods.
- Advanced Applications of Glass.
- Ceramics and Glasses in Microelectronics.
- Industrial diamond.

Photocatalysts& Applications (1402826) 3CR **المحفزات الضوئية وتطبيقاتها**

- Basic of concepts of photocatalysts and factors affecting photocatalysis
- Types of chemical reactors for photocatalysis and kinetics of photocatalysis
- Visible light active photocatalysis
- Applications of photocatalysts
- Recent trends in photocatalysis

Advanced Processing of Hydrocarbons Materials (1402827) 3CR **التشغيل المتطور للمواد الهيدروكربونية**

- Advanced technologies for the manufacture of gaseous and liquid hydrocarbons
- Production of raw materials and intermediates for the petrochemical industries and related polymeric materials
- The relationship between manufacturing techniques and operating conditions with the properties of the produced materials.

Recent Trends in Materials Science (1402828) 3CR اتجاهات حديثة في علوم المواد

- Vision of materials science in 2030.
- Hydrogel and its Applications in Materials Science
- Advance adsorbed materials and its Kinetics, Isotherms, and Thermodynamic Modeling
- Reverse Osmosis Technology, its Applications
- Transparent wood: synthesis methods and properties
- Energy storage materials
- Advanced biomaterials: synthesis, properties and applications
- Nanomaterials: synthesis and properties
- Graphene and its applications
- Photoresist materials
- Superhydrophobic Metals: Fabrication Methods,
- Superhydrophobic Metals: Properties and Applications
- Nanocomposites and its Applications

Role of Materials in the Petroleum Processing (1402829) 3CR دور المواد في صناعة البترول

- Introduction to crude oil production -transportation and refining
- The role of different materials used in production, transport and refining operations and their diversity with the role of equipment
- The role of materials in improving the performance of equipment with different operating conditions
- The role of materials in securing and raising the efficiency of operations in the petroleum industry and natural gas production.

Role of Materials in the Petrochemicals Industry (1402830) 3CR دور المواد في صناعة البتروكيماويات

- Introduction to the petrochemical industry
- The evolution of the role of materials in the development of the petrochemical industry
- The role of materials in increasing the ability to produce modern petrochemical materials with advanced specifications
- The role of materials in petrochemical operations - Production of modern petrochemical materials at a better economic cost.

Sustainable Biofuels (1402831) 3CR الوقود الحيوي المستدام

- Introduction to sustainable biofuels
- Definition of biodiesel and its specifications - comparison with diesel - biodiesel production processes
- Different types of catalysts used in biodiesel production
- Applications of biodiesel - definition and specifications of bio-jet fuel and its comparison with mineral jet fuel
- Different production processes For bio-jet fuel - definition of bio-ethanol and its specifications
- Comparison with ethanol
- Different production processes of bio-gas and its applications

- Bio-hydrogen its definition, specifications and comparison with ethanol - its different production processes and applications

Applications of Hydrogels in Materials Science (1402832) 3CR

تطبيقات الهلاميات المائية (الهيدروجيل) في علم المواد

- Basic introduction to hydrogels: definition, classification, and synthesis
- Physical and chemical properties of hydrogels
- Characterization techniques of hydrogels
- Uses of hydrogels as adsorbent surfaces in the removal of water contaminants (eg, removal of dyes and heavy metals)
- Studying adsorption isotherms, kinetic properties, and dynamic properties Thermo - applications of hydrogels
- Modern applications such as; Drug delivery and biomedical applications - Applications of hydrogels in bone regeneration and dental applications - Applications of hydrogels in ultrafast conductors

الباب العاشر: مقررات برامج قسم التكنولوجيا الحيوية

أولاً: ماجستير التكنولوجيا الحيوية

❖ مقررات درجة الماجستير في التكنولوجيا الحيوية

- يجتاز طالب الماجستير 24 ساعة معتمدة من المقررات منها 17 ساعات معتمدة من المقررات الأساسية و7 ساعة معتمدة من المقررات الاختيارية و عدد 12 ساعات معتمدة للرسالة.

م	كود المقرر	اسم المقرر	عدد الساعات الأسبوعية			المتطلب السابق
			نظري	عملي	معتمدة	
<u>المقررات الاساسية</u>						
1	1403701	التكنولوجيا الحيوية الميكروبية Microbial Biotechnology	2	-	2	
2	1403702	أساسيات البيولوجيا الجزيئية Basics of Molecular Biology	2	-	2	
3	1403703	أساسيات التكنولوجيا الحيوية Basics of Biotechnology	2	-	2	
4	1403704	التحليلات الكيموحيوية في العلوم البيولوجية Biochemical Analysis in Biological Sciences I	1	4	3	
5	1403705	تطبيقات التكنولوجيا الحيوية Applications of Biotechnology	2	-	2	1403703
6	1403708	الكيمياء الحيوية للتقنية الحيوية Biochemistry of Biotechnology	3	-	3	
7	1403720	الاحصاء الحيوى Biostatistics	2	2	3	
<u>المقررات الاختيارية</u>						
8	1403709	تكنولوجيا التخمير Fermentation Technology	2	-	2	
9	1403712	الهندسة الكيموحيوية Biochemical Engineering	2	-	2	
10	1403714	الهندسة الوراثية Genetic Engineering	2	-	2	1403702
11	1403716	طرق بحثية في البيولوجيا الجزيئية Research Methods in Molecular Biology	2	2	3	1403702
13	1403721	اساسيات المعلوماتية الحيوية Basics of Bioinformatics	2	2	3	
14	1403722	علم الوراثة Genetics	2	-	2	
15	1403723	اساسيات تقنية النانوبيوتكنولوجى Basics of Nano-Biotechnology	2	-	2	
16	1403724	بيولوجيا الخلية Cell Biology	3	-	3	
17	1403725	التحليلات الكيموحيوية في العلوم البيولوجية II Biochemical Analysis in Biological Sciences II	1	4	3	1403704

Microbial Biotechnology (1403701) 2CR التكنولوجيا الحيوية الميكروبية

- What is microbial biotechnology?
- Microbial growth
- Bacterial identification (morphological and biochemical aspects)
- Bacterial identification (Molecular aspects)
- Bacterial cells (structure and function)
- Microbial symbiosis
- Biological control
- Genetic exchange systems
- Bacteria and plant diseases

Basics of Molecular Biology (1403702) 2CR أساسيات البيولوجيا الجزيئية

- DNA Structure
- DNA as the genetic material
- DNA organization and nucleosome structure
- Genes in eukaryotic and prokaryotic systems-Genes vs Operons
- Transcription in prokaryotes
- Transcription in eukaryotes
- Post transcription modifications
- Introns and possible functions
- Translation in prokaryotes
- DNA replication
- Gene expression

Basics of Biotechnology (1403703) 2CR أساسيات التكنولوجيا الحيوية

- Definition and applications of biotechnology
- Projects in Biotechnology such as Human Genome Project
- Principle steps of a bioengineered biotechnology process
- Manipulation of gene expression in prokaryotes
- Manipulation of gene expression in eukaryotes
- Mammalian cells and mammalian cell culture
- Transgenic animals and transgenic plants
- Methods of introducing a recombinant plasmid into animal cells
- Downstream processing in biotechnology
- Site-directed mutagenesis
- Introduction to proteomics and glycomics
- Gene editing techniques
- Protein Therapeutics and epigenetics

Biochemical Analysis in Biological Sciences I (1403704) 3CR

التحليلات الكيموحيوية في العلوم البيولوجية I

- Instrumentation with a focus on centrifugation
- Microbiological techniques
- Isolation of DNA from bacteria and plant tissues

- Isolation of DNA from other sources
- Determination of DNA concentration
- Scanning of DNA preparation and agarose gel electrophoresis
- Polymerase chain reaction (PCR)
- Electron microscopy
- Protein purification
- Polyacrylamide gel electrophoresis (PAGE)
- Immunoassay and western blotting techniques
- Isolation and analysis of bacterial lipopolysaccharides (LPS)
- Oral examination and report submission

Applications of Biotechnology (1403705)

2CR

تطبيقات التكنولوجيا الحيوية

- Biotechnological applications of bacteria
- Molecular approaches in medicine
- Immunodiagnosics from lab scale to commercialization market
- Drug delivery systems and bioimaging
- Engineering of microbial enzymes (tools and application)
- Vaccines
- Optogenetics
- Gene therapy
- Metagenomics
- Secondary metabolites and their medical applications
- Other related novel topics

Biochemistry of Biotechnology (1403708)

3 CR

الكيمياء الحيوية للتقنية الحيوية

- Protein structure and function
- Disorders related to protein metabolism
- Protein applications in nanotechnology
- Lipid structure and function with special emphasis on liposomes
- Glycolipids and their biotechnological applications
- Biomimetic cell membranes
- Antisense therapy
- Genome editing using CRISPR/ CAS
- Cell Signalling
- Other related novel topics

Biostatistics (1403720)

3CR

الإحصاء الحيوى

- Common terminology used in biostatistics
- Experimental design
- Sampling protocol
- Measurement of central tendency (e.g. mean, variance,..)
- t-Test (paired and unpaired)
- F-Test (ANOVA)
- Correlation analysis

- Regression analysis
- Chi-square test
- Data analysis (e.g. SPSS)
- Case Studies

Fermentation Technology (1403709) 2CR تكنولوجيا التخمير

- Introduction to fermentation technologies
- Bioethanol
- Fundamentals and applications of Anaerobic digestion
- Upstream processing
- Immobilization of Enzymes
- Cell Immobilization
- Design of bioreactors
- Downstream processing
- Antibiotic production

Biochemical Engineering (1403712) 2CR الهندسة الكيموحيوية

- Theory and laws of Thermodynamics
- Units of heat exchange, boilers, steam generation and sterilization
- Bioreactors: batch and continuous systems
- Wastewater treatments basic concepts
- Primary, secondary and tertiary steps via aerobic treatments
- Anaerobic treatments of wastewater
- Novel trends in wastewater treatments
- Oxidation ponds and lagoons
- Biosensors

Genetic Engineering (1403714) 2CR الهندسة الوراثية

- Definition of genetic engineering
- Do we need genetic engineering? Examples
- Restriction enzymes and maps
- Vectors & Plasmids
- cDNA synthesis
- Gene cloning
- Genomic libraries
- Epigenetics
- Gene expression

Research Methods in Molecular Biology (1403716) 3CR طرق بحثية في البيولوجيا الجزيئية

- Nucleic acids isolation and purification.
- From RNA to cDNA
- Cloning of PCR products
- Ligation
- Transformation and screening of clones
- Using databases (e.g.NCBI) for gene analysis and ORF
- Mutation detection methods
- Trends in sequencing techniques

- Next-generation sequencing
- DNA array, array-based gene expression analysis and array-based methylation analysis.
- Gene expression quantification
- FISH: basics and applications
- Serial Analysis of Gene Expression (SAGE)
- Real Time Polymerase Chain Reaction.
- Human Genome Project
- Introduction to Genomics and Proteomics

Basics of Bioinformatics (1403721) 3CR اساسيات المعلوماتية الحيوية

- Historical Overview & Central Dogma & Databases
- BLAST programmes & BLASTn
- Protein structure & Substitution matrices
- BLASTp & PSI-BLAST
- Multiple Sequence Alignment
- Phylogenetics
- Hydropathy plots & Motifs & Domains
- Secondary protein structure prediction
- Tertiary protein structure prediction
- Drug design & docking
- Bioinformatics and diseases

Genetics (1403722) 2CR علم الوراثة

- Fundamentals of genetics
- Population genetics
- Human cytogenetics
- Molecular genetics
- Human pathogens
- Developmental and behavioural genetics
- Medical and cancer genetics
- Genome projects

Basics of Nano-Biotechnology (1403723) 2CR اساسيات تقنية النانوبيوتكنولوجي

- Nanotechnology for water and wastewater treatment
- Membrane and membrane process
- Different types of polymeric nanocarriers
- Stimuli-responsive nanocarriers
- Types, preparations and theragnostic applications
- Advantages versus limitations of nanocarriers

Cell Biology (1403724) 3CR بيولوجيا الخلية

- Introduction to cell contents and cellular structures
- Membrane structure
- Transport across cell membranes
- Cytoskeleton and cellular architecture
- Extracellular matrix and cell junction

- Intracellular compartments and protein transport
- Cellular communication
- Cell cycle

Biochemical Analysis in Biological Sciences II (1403725) 3CR

التحليلات الكيموحيوية في العلوم البيولوجية II

- Genetic editing tools
- Gene mutation
- Tissue culture
- Tissue engineering
- Cellular functions
- Cell Apoptosis
- Characterization and preservation of cells
- Mycoplasma detection in cell culture
- Novel advances and techniques

ثالثاً: دكتوراه الفلسفة في التكنولوجيا الحيوية

❖ مقررات درجة دكتوراه الفلسفة في التكنولوجيا الحيوية

- يختار الطالب 18 ساعة معتمدة من المقررات التالية:

المتطلب السابق	الساعات الاسبوعية			اسم المقرر	كود المقرر	م
	ساعات معتمدة	عملي	نظري			
	3	-	3	التشخيص الجزيئي للأمراض Molecular Diagnosis	1403803	1
	3	-	3	الجينات والتطفر Genes and Mutations	1403804	2
	3	-	3	تقنيات المناعة الحيوية Immuno-Biotechnology	1403807	3
	3	-	3	المعلوماتية الجينية الصيدلانية Pharmacogenomics	1403808	4
	3	-	3	التصنيع الحيوي Bioprocessing	1403809	5
	3	-	3	مقرر تخصصي متقدم Advanced Specialized Course	1403810	6
	3	-	3	المعلوماتية البروتينية وهندسة البروتينات Proteomics and Protein Engineering	1403811	7
1403702	3	-	3	البيولوجيا الجزيئية المتقدمة Advanced Molecular Biology	1403812	8
1403704	3	4	1	طرق بحثية في التقنية الحيوية Methods in Biotechnology	1403813	9
1403709	3	-	3	تكنولوجيا التخمير المتقدمة Advanced Fermentation Technology	1403814	10
1403721	3	2	2	المعلوماتية الحيوية المتقدمة Advanced Bioinformatics	1403815	11
	3	-	3	الإدارة البيولوجية للمخلفات Biological Waste Management	1403816	12
	3	-	3	التكنولوجيا الحيوية للأغذية Food Biotechnology	1403817	13

Molecular Diagnosis (1403803) 3CR التشخيص الجزيئي للأمراض

- Introduction to Molecular diagnosis of human diseases
- Diagnostics Biomarkers in Saliva
- Mass-spectrometry in molecular diagnostics
- Immunodiagnostics
- Microarray and molecular diagnostics
- Bioinformatics tools in molecular diagnostics
- Personalized medicine as diagnostics tools
- Molecular diagnosis of relevant diseases
- Nanodiagnostics
- Liquid biopsy in malignancy
- Off and online in proteomics
- Flow cytometry in molecular diagnosis

Genes and Mutations (1403804) 3CR الجينات والتطفر

- Nucleic acid structure and genome organization
- Genetic and epigenetic changes in the genome
- Definition and types of mutations
- DNA repairing system
- Nonsense mediated decay system
- Nonsense suppression of mutations
- Single nucleotide polymorphism, a new term for an old concept
- Microsatellite and other polymorphisms due to variable number of tandem repeats
- Genes and oncogenes
- Cell cycle and its regulation
- Trends in mutation detection
- Array based gene expression analysis
- Whole genome genotyping

Immuno-Biotechnology (1403807) 3CR تقنيات المناعة الحيوية

- Immune responses (innate and adaptive)
- Structure and function of immunoglobulins
- Types of antigens
- Antigen- antibody interactions
- Molecular background of autoimmune diseases
- Controlling balance of cytochine network as a therapeutic goal
- Gene-modified cell therapy in autoimmunity
- Biomimetic cell membrane coated nanoparticles
- Immunity and cancer
- Topics assigned to students

Pharmacogenomics (1403808) 3CR المعلوماتية الجينية الصيدلانية

- Definition of pharmacogenomics and pharmacogenetics
- Microbiome Pharamcogenomics
- Methods and tools employed for genetic testing

- Pharamcogenomics of relevant drugs and diseases
- microRNAs
- Other related novel topics

Bioprocessing(1403809) 3CR التصنيع الحيوي

- Mass & energy balances, fluid dynamics and heat & mass transfer
- Microbial growth, kinetics and fermenter operation
- Downstream operation
- Case studies
- Flow sheeting, Piping and instrumentation and materials used for construction of bioprocess plants
- Vessels for biotechnology application and design of fermenters
- Design considerations
- Selection and specification of equipment used for handling fluids and solids
- Design of facilities for cleaning of process equipment used in biochemical industries
- Utilities of biotechnology production plants, Process economics, Bioprocess validation and Safety considerations

Advanced Specialized Course (1403810) 3CR مقرر تخصصي متقدم

- Variable topics and assignments to be selected by the instructor in accordance with the students research fields

Proteomics and Protein Engineering (1403811) 3CR المعلوماتية البروتينية وهندسة البروتينات

- 3D structure determination of proteins
- Directed evolution strategies
- Chimeragenesis in protein engineering
- Computational protein design
- Principles of proteomics
- Proteomics approach and techniques in identification of reliable biomarkers for diseases
- Application of proteomics in breast cancer diagnosis
- Proteomics and post translational modifications of proteins

Advanced Molecular Biology (1403812) 3CR البيولوجيا الجزيئية المتقدمة

- Transcription in Eukaryotes
- Transcriptional factors and post transcription modification and RNA editing
- Translational coupling
- Molecular aspects of apoptosis
- Molecular aspects of cell cycle
- Molecular aspects of signal transduction pathways
- RNA splicing and ribozymes
- Possible functions of introns & noncoding RNA
- Biological roles of microRNAs and circulating free DNA
- Molecular biology of stress and heat shock protein
- Molecular aspects of oncogenes
- Gene therapy & DNA repair

- Molecular aspects of oncogenes

Methods in Biotechnology (1403813) 3CR طرق بحثية فى التقنية الحيوية

- Preparation of competent cells
- Isolation of plasmids
- Transformation
- Isolation of restriction enzymes
- PCR
- Protein SDS-PAGE
- Western blot

Advanced Fermentation Technology (1403814) 3CR تكنولوجيا التخمر المتقدمة

- Fundamentals of the fermentation Industry
- New approaches of microbial cell's immobilization (Nano, MOFS)
- Types of fermentation processes (submerged and solid-state)
- Characteristics and advantages of the SSF interface
- Suspended cultures and Biofilms
- Aerobic vs. anaerobic solid state fermentation systems
- Novel designs of Bioreactors
- Heat and Mass Transfer in Solid-State Fermentation Bioreactors
- Extractive fermentation and new downstream technologies
- Computer modelling of fermentation processes (Monod and alike)
- Animal and Mammalian cell cultures
- Microbial Fuel Cells
- Biohydrogen Production

Advanced Bioinformatics (1403815) 3CR المعلوماتية الحيوية المتقدمة

- Introduction to genes and proteins
- Basics of programming
- Homology modelling
- Protein structure and PPI
- Genome Browser
- RNA sequencing
- miRNA sequencing
- Case Studies

Biological Waste Management (1403816) 3CR الإدارة البيولوجية للمخلفات

- Solid Waste Management Stages
- Bioactive phenolics production via waste treatment
- Ellagic acid production
- Large-Scale aseptic techniques for solid-state fermentation by aerobic microorganisms
- Anaerobic Solid-State Fermentation
- Filamentous Microbial Growth Dynamics on a Solid Matrix
- Gas double dynamic solid-state fermentation technology
- Technology Characteristics of Fluidized bed fermenter
- Techno-economic of butanol extractive fermentation in multiphase fluidized bed reactor

- Liquor Fermentation

Food Biotechnology (1403817) 3CR التكنولوجيا الحيوية للأغذية

- Introduction to Food biotechnology and its importance
- Food analysis
- Food laws and quality assurance
- Fermented products
- Principles of food engineering
- Nutrition and Health
- Marine food biotechnology
- Plant food biotechnology
- Probiotics
- Preservation and food processing
- Recent advances from literature

**الباب الحادى عشر: مقررات برامج قسم تكنولوجيا المعلومات
أولاً: الماجستير فى تكنولوجيا المعلومات**

- يجتاز طالب الماجستير 24 ساعة معتمدة من المقررات الموضحة فى الجدول التالى :

المتطلب السابق	عدد الساعات الأسبوعية			اسم المقرر	كود المقرر	م
	معتمدة	عملي	نظري			
	3	2	2	تكنولوجيا الإنترنت Internet Technology	1404701	1
	3	2	2	تحليل وتصميم الخوارزميات Analysis and Design of Algorithms	1404702	2
	3	2	2	نظم الاتصالات وشبكات الحاسبات Communication Systems and Computer Networks	1404703	3
	3	2	2	تحليل وتصميم نظم المعلومات Information System Analysis and Design	1404704	4
	3	2	2	الشبكات العصبية و البرمجة الجينية Neural Networks and Genetic Programming	1404705	5
	3	2	2	نظم قواعد البيانات Database Systems	1404706	6
	3	2	2	نظم التجارة الإلكترونية E-Commerce Systems	1404707	7
	3	2	2	تكنولوجيا وتطبيقات الوسائط المتعددة Multimedia Technology and Applications	1404708	8
	3	2	2	أمن الشبكات والمعلومات Network and Information Security	1404709	9
	3	2	2	نظم المعلومات المبنية على شبكة الويب Web Based Information Systems	1404710	10
	3	2	2	هياكل البيانات Data Structures	1404711	11
	3	2	2	التعرف على الأنماط Pattern Recognition	1404712	12
	3	2	2	نظم ضغط وتشفير البيانات Data Compression and Ciphering	1404713	13
	3	2	2	معالجة الصور والرسومات والإظهار Image Processing, Graphics and Visualization	1404714	14
	3	2	2	المحاكاة بالحاسبات Computer Simulation	1404715	15

	3	2	2	موضوعات مختارة في الذكاء الاصطناعي Selected Topics in Artificial Intelligence	1404716	16
	3	2	2	نظم دعم اتخاذ القرار الذكية Smart Decision Support Systems	1404717	17
	3	2	2	أمن نظم التشغيل Operating System Security	1404718	18
	3	2	2	هندسة البرمجيات Software Engineering	1404719	19
	3	2	2	قياسات البرمجيات ونظم الجودة Software Metrics and Quality Systems	1404720	20
	3	2	2	مخازن البيانات والتنقيب عن البيانات Data Mining and Data Warehousing	1404721	21
	3	2	2	البرمجة المتقدمة Advanced Programming	1404722	22
	3	2	2	التعلم الآلي Machine Learning	1404723	23
	3	2	2	معالجة اللغات الطبيعية Natural Language Processing	1404724	24
	3	2	2	الرؤية بالحاسب Computer Vision	1404725	25
	3	2	2	الحوسبة السحابية Cloud computing	1404726	26
	3	2	2	موضوعات مختارة في تكنولوجيا المعلومات Selected Topics in Information Technology	1404727	27
	3	2	2	التنقيب في النصوص Text mining	1404728	28
	3	2	2	أنظمة التوصية Recommender Systems	1404729	29
	3	2	2	تحليلات البيانات Data Analytics	1404730	30
	3	2	2	التعلم العميق Deep learning	1404731	31

Internet Technologies (1404701) 3hr: (تكنولوجيا الإنترنت)

- Introduction
- Network protocols
- Types of internet connections
- Client-side technology
- Server-side technology
- Email
- Web technology
- Web security
- Web design
- Internet security
- Digital operations
- Internet ethics
- Cybercrime.

Analysis and Design of Algorithms (1404702) 3CR (تحليل وتصميم الخوارزميات)

- Introduction to Algorithms
- Algorithm design and analysis, The running time of a program, Worst-case and expected time complexity.
- Analysis of simple recursive and non-recursive algorithms.
- Searching, merging, and sorting.
- Introductory notions of algorithm design: Divide-and-conquer, Dynamic programming Greedy methods.
- Graph algorithms. Depth-first search and breadth-first search shortest path problems

Communication Systems and Computer Networks (1404703) 3CR

نظم الاتصالات وشبكات الحاسبات

- Introduction
- Use of computer networks
- Network Hardware
- Network software
- Reference Models & Example Networks
- Network standardization
- Theoretical basis of data communication
- Guided and wireless Transmission media
- Communication satellites
- Selected Comp. & Comm NW topic
- Data link layer

Information System Analysis and Design (1404704) 3CR (تحليل وتصميم نظم المعلومات)

- Introduction to Information System Analysis and Design.
- Software development life cycle methods.
- Modeling system requirements.
- Principles and Elements of Software Design.
- Software quality.

Neural Networks and Genetic Programming (1404705) 3CR (الشبكات العصبية و البرمجة الجينية)

- Introduction to Evolutionary Computing.
- Fundamentals of Artificial Neural Networks (ANN).
- Models of ANN (with Tutorials).
- Learning algorithms for ANN (with Tutorials).
- Implementations and Tools for Building ANN
- Fundamentals of Genetic Algorithms (GA).
- Implementations and Tools for Building GP.

Database Systems (1404706) 3CR (نظم قواعد البيانات)

- Introduction to database processing & development.
- The Entity-Relationship (E-R) model
- The Semantic Object (S-O) model
- Database technologies and application
- The Relational model & Normalization
- Database design using different models.
- Foundation of relational implementation
- Structured Query Language(Sql)

E-Commerce Systems (1404707) 3CR (نظم التجارة الإلكترونية)

- Introduction to e-commerce
- E-business and E-commerce
- Electric payment system
- E-government
- M-commerce
- Website Development for e-Commerce
- E-Commerce Security
- Electric customer relationship management
- Research Topics in ecommerce

Multimedia Technology and Applications (1404708) 3CR (تكنولوجيا وتطبيقات الوسائط المتعددة)

- Fundamentals of multimedia, media and data streams, sound/audio, image, graphics, video and animation.
- Topics in data compression including coding requirements, source, entropy, and hybrid coding, JPEG, H.261, MPEG, MP3 and etc.
- Computer technology issues such as communication architecture, multimedia workstations, cache systems, storage systems and optical storage.
- Multimedia operating system issues such as real-time operation, resource management, process management, file systems, and Multimedia networking.
- Multimedia synchronization, presentation requirements, reference model, and synchronization techniques.
- Multimedia applications including digital libraries, system software, toolkits, conferencing paradigms, structured interaction support, and examples from video/audio/graphics conferencing

Network and Information Security (1404709) 3CR (أمن الشبكات والمعلومات)

- Security problem in computing
- Basic Encryption and Decryption
- Monoalphabetic Ciphers (Substitution)
- Polyalphabetic Substitution Ciphers
- Transpositions (Permutations)

- Stream and Block ciphers
- Cryptanalysis
- Secure encryption systems
- Public key encryption systems.
- Merkle-Hellman Knapsacks
- Rivest-Shamir-Adleman (RSA) Encryption
- El Gamal and Digital Signature Algorithms
- Hash Algorithms
- Secure secret key (Symmetric) systems
- The data Encryption Standard (DES)

Web Based Information Systems (1404710) 3CR (نظم المعلومات المبنية على شبكة الويب)

- Introduction to Internet
- Semantic web
- Web databases
- System Architecture
- Service based systems
- Research topics

Data Structures (1404711) 3CR هياكل البيانات

- Course Orientation
- Basic Concepts of Data Structures
- Dynamic Memory Allocations
- Some Common Data Structures
- Binary Trees and Recursion
- Complexity Analysis of Algorithms

Pattern Recognition (1404712) 3CR (التعرف على الأنماط)

- Basics of pattern recognition systems and its application: An introduction
- Probability review
- Parametric & Non-parametric Techniques
- Probability of error with normal distributions
- Dimensionality Reduction
- Linear transformation
- The whitening Transformation
- Eigen-Faces & Fisher-Faces.
- Unsupervised learning, clustering techniques, and related applications
- Linear and piecewise linear classifiers
- Practical concerns and System evaluation

Data Compression and Ciphering (1404713) 3CR (نظم ضغط وتشفير البيانات)

- A brief review of the basics of information theory, data compression .
- The basic mathematical knowledge needed for source modeling.
- Elements of source coding theory.
- Introduction to lossless compression, Huffman coding, Arithmetic coding, dictionary techniques, and context-based compression.
- Lossless compression and lossy compression.
- Rate distortion theory, sampling theory, scalar quantization, and vector quantization and Lempel-Ziv coding) .
- Practical compression methods (Huffman coding, dictionary coding, arithmetic coding, and Lempel-Ziv coding)

- Transform Coding DFT, DCT, LZ78 , LZW wavelet, and Hadamard transforms.
- Quantization and space sampling, interlaced and non-interlaced scanning, quantization.
- Application to Multimedia compression.
- Introduction to distributed source coding (DSC) and compressive sensing.
- Confidentiality using Symmetric encryption.

Image Processing, Graphics and Visualization (1404714) 3CR (معالجة الصور والرسومات والإظهار)

- Image presentation.
- Image filtering.
- Image processing.
- Graphics Principles.
- Computer Vision.

Computer Simulation (1404715) 3CR (المحاكاة بالحاسبات)

- Introduction to computer simulation.
- Generation of pseudo random numbers.
- Generation of stochastic variants.
- Simulation design.
- Validation of simulation model.

Selected Topics in Artificial Intelligence (1404716) 3CR (موضوعات مختارة في الذكاء الاصطناعي)

- Introduction to AI
- Other Topics are changeable according to the latest technological trends and their contemporary applications for solving modern problems in artificial intelligence. The course also includes modern engineering applications of AI in different fields. Additionally, the course will examine the impact of the latest and advanced AI technologies on our life.

Smart Decision Support Systems (1404717) 3CR (نظم دعم اتخاذ القرار الذكية)

- Basic Foundations.
- Architecture of DSS.
- Modeling tools and techniques.
- Introduction to smart components.
- Building an initial prototype for AI-based DSS.
- Search techniques.
- Case Study

Operating System Security (1404718) 3CR أمن نظم التشغيل

- Intruders: Intrusion Techniques.
- Intrusion Detection techniques.
- Password management Viruses & related threads.
- Firewall design principle.

Software Engineering (1404719) 3CR هندسة البرمجيات

- Software processes.
- Project management.
- Software Requests.
- System models.
- Software verification.

Software Metrics and Quality Systems (1404720) 3CR قياسات البرمجيات ونظم الجودة

- Introduction to Software Quality.
- Total Quality Management .
- Software Development Process Models.
- Process Maturity Framework and Quality Standards.
- ISO 9000.
- Fundamentals in Measurement Theory .
- Level of Measurement.
- Some Basic Measures .
- Reliability and Validity .
- Measurement Errors.
- Assessing Reliability.

Data Mining and Data Warehousing (1404721) 3CR (التنقيب عن البيانات و مخازن البيانات)

- Introduction to data mining and data science
- Methods of learning & classifications techniques
- Cluster Analysis Basic Concepts and Methods
- Neural Network, Backpropagation, Genetic Algorithms and fuzzy logic as a Classifier
- Data warehouse and big data.
- text mining, Applications

Advanced Programming (1404722) 3CR (البرمجة المتقدمة)

- Introduction.
- Functional Programming with programming language
- Object-Oriented Programming with programming language.
- Web Programming Techniques.
- Network Programming.

Machine Learning (1404723) 3CR (التعلم الآلي)

- Introduction to Machine Learning.
- Introduction to Probability & Linear Algebra.
- Types and Algorithms of Machine Learning.
- Linear & logistic Regression.
- Naive Bayes.
- Neural Networks.
- Deep Learning.
- Bayesian deep learning.

Natural Language Processing (1404724) 3CR (معالجة اللغات الطبيعية)

- Introduction to Natural Language Processing.
- Sentiment Analysis.
- Text Analytics.
- Feature Extraction.
- Bag of Words Model
- Machine Learning Fundamentals.
- Introduction to Word Embeddings.

Computer Vision (1404725) 3CR (الرؤية بالحاسب)

- Introduction to computer vision.
- Image Formation.
- Image Warping. Interpolation. Image Quality metrics.

- Image Filtering. Aliasing. Blurring, Sharpening and Edge Detection. Gaussian kernel and its derivatives. Scale-space pyramids. Thresholding.
- Classical object recognition. Convolutional Neural Networks (CNNs). CNN Interpretability. GCN, Transformers
- Fully convolutional networks. Up-convolution. Optical flow. FCNs for Stylization. Segmentation.
- Generative Adversarial Networks (GANs). Image transformation networks. Super-resolution.
- Domain Adaptation and Generalisation.
- Cross-modal: vision and language; sketch (recognition, retrieval and synthesis).
- 3D vision (feature encoding, reconstruction). Neural rendering.
- Image deep learning models.
- Video processing and analysis.

Cloud computing (1404726) 3CR (الحوسبة السحابية)

- Introduction to cloud computing,
- Cloud computing platforms and infrastructure.
- Parallel programming distributed storage systems in the cloud.
- Cloud Service Model.
- Cloud Deployment Model.
- Cloud Performance.
- Cloud Security.

Selected Topics in Information Technology (1404727) 3CR

موضوعات مختارة في تكنولوجيا المعلومات

- Introduction to Information Technology
- This course's Topics are focused on the study of various topics related to Information Technology. It covers the latest technological trends and their contemporary applications for solving modern problems. The course also includes modern engineering applications of IT in different fields, as well as contemporary medical applications of IT. Additionally, the course will examine the impact of the latest and advanced IT technologies on the management of business, industry, and human resources.

Text mining (1404728) 3CR (التنقيب في النصوص)

- Text mining and analysis techniques
- Social media data analysis
- Pattern discovery in textual data
- Knowledge extraction from text
- Text mining applications in decision-making
- Natural language processing for text mining
- Fundamentals of text mining
- Algorithms and methods for text mining
- Potential use cases of text mining.

Recommender Systems (1404729) 3CR (أنظمة التوصية)

- Introduction to Recommender Systems
- Taxonomy of Recommender Systems
- Techniques and algorithms for recommender systems
- Evaluating Recommender System
- Attacks on collaborative recommender systems

Data Analytics (1404730) 3CR (تحليلات البيانات)

- Defining data, analytics and different analytics tools.
- Types and properties of data sources.
- Extracting, visualizing, and understanding data.
- The data analytics cycle.
- Investigating different types of data analytics.

Deep learning course content: (1404731) 3CR (التعلم العميق)

- Introduction and basics
- Backpropagation training.
- Optimization
- Cross-validation, Evaluation, and Loss functions
- Convolutional networks.
- Topics in sequence modeling (Recurrent Neural Networks (RNN), Gating and attention mechanisms, and Transformer)
- Unsupervised Learning (Self-supervised learning, Autoregressive Models, Variational Autoencoders (VAE), and Generative Adversarial Networks (GAN))
- Any new paradigms related to deep learning

ثانيا: دكتوراه الفلسفة في تكنولوجيا المعلومات

□ مقررات درجة دكتوراه الفلسفة في تكنولوجيا المعلومات

□ يجتاز الطالب 18 ساعة معتمدة من المقررات الآتية:

م	كود المقرر	اسم المقرر	عدد الساعات الأسبوعية		
			نظري	عملي	معمدة
1	1404801	النظم المساعدة في إتخاذ القرارات المبنية على الذكاء الاصطناعي AI-Based Decision Making	2	2	3
2	1404802	أمن الحاسبات والشبكات المتقدم Advanced Computer and Network Security	2	2	3
3	1404803	التنقيب في قواعد البيانات Database Mining	2	2	3
4	1404804	موضوعات متقدمة في هندسة البرمجيات Advances in Software Engineering	2	2	3
5	1404805	النظم الموزعة Distributed Systems	2	2	3
6	1404806	سياسات نظم المعلومات Information Systems Policy	2	2	3
7	1404807	موضوعات متقدمة في تصميم نظم قواعد البيانات Advances in Database Systems Design	2	2	3
8	1404808	تطبيقات المحاكاة والتميط بالحاسبات Applied Computer Simulation and Modeling	2	2	3
9	1404809	أساليب بحثية في تكنولوجيا المعلومات Research methods in information technology	2	2	3
10	1404810	موضوعات مختارة في الرؤية بالحاسب Advances in Computer vision	2	2	3
11	1404811	تفاعل الانسان و الحاسب Human Computer Interaction	2	2	3
12	1404812	موضوعات خاصة Special Topics	2	2	3
13	1404813	موضوعات متقدمه في علوم البيانات Advances in Data Scince	2	2	3
14	1404814	موضوعات مختارة في تعلم الآلة Selected Topics in Machine Learning	2	2	3
15	1404815	تحليلات البيانات المتقدمة Advanced Data Analytics	2	2	3

AI-Based Decision Making (1404801) 3CR (النظم المساعدة فى إتخاذ القرار المبنيه على الذكاء الإصطناعى)

- Course Orientation
- Topic Selection / Discussions
- Research Topic Presentations
- Conclusions & Discussions

Advanced Computer and Network Security (1404802) 3CR (أمن الحاسبات و الشبكات المتقدم)

- Advancements of Network Security
- Application Layer Security (PGP)
- Network Layer Security (IPSec)
- Transport Layer Security (SSL)
- Digital Signatures
- Research Topics and Presentations

Database Mining (1404803) 3CR (التنقيب فى قواعد البيانات)

- Web database concepts
- Mining Relational databases
- Mining web database
- Clustering techniques
- Applications of database mining
- Research issues

Advances in Software Engineering (1404804) 3CR (موضوعات متقدمة فى هندسة البرمجيات)

- Critical systems specification
- Application architecture
- Object-oriented design
- Quality management
- Configuration management
- Scenario – Based evaluation of software architecture

Distributed Systems (1404805) 3CR (النظم الموزعة)

- Server design
- Network programming
- Naming
- Storage system
- Security of the system
- Fault tolerance issues

Information Systems Policy (1404806) 3CR (سياسات نظم المعلومات)

- Definition of terms related to systems policy
- Computer usage guidelines which include:

- Authorization and security.
- Auditing and monitoring policy.
- Access to information systems
- Software acquisition and distribution
- E-mail usage policy
- Unacceptable use of information systems
- Privacy violation

Advances in Database Systems Design (1404807) 3CR

موضوعات متقدمة في تصميم نظم قواعد البيانات

- Introduction to database systems and its emphasis on Object oriented
- Data modeling, transaction management, active mechanisms, and heterogeneous database management systems
- Studying existing database systems

Applied Computer Simulation and Modeling (1404808) 3CR تطبيقات المحاكاة والتنميط بالحاسبات

- Introduction to CS and modeling
- Studying existing models
- Developing equations for basics models
- Develop numerical tools to solve equation models

Research methods in information technology (1404809) 3CR أساليب بحثية في تكنولوجيا المعلومات

- Management information system: concepts
- Marketing and manufacturing information system
- Introduction to systems investigations
- System analysis phases
- Information systems design and implementation

Advances in Computer Vision (1404810) 3CR موضوعات متقدمة في الرؤية بالحاسب

- Introduction to CV including low-level image analysis
- Image transformation
- 3D image reconstruction
- Motion and video analysis
- 3D object recognition

Human Computer Interaction (1404811) 3CR تفاعل الإنسان والحاسب

- Introduction to HCI
- Understanding users and their tasks
- Designing and building visual interfaces
- Principles of design
- The past and future of HCI
- Case study

Special Topics (1404812) 3CR (موضوعات خاصة)

- This course's Topics are focused on particular topics related to new technology era that is not related to any other course. It covers the latest technological trends and their contemporary applications for solving modern problems.

Advances in Data Science (1404813) 3CR (موضوعات متقدمة في علوم البيانات)

- Data querying, execution, and optimization
- Getting and cleaning data
- Performance tuning, monitoring, and optimization
- Regression models
- Practical ML
- Developing data products

Selected Topics in Machine Learning (1404814) 3CR (موضوعات مختارة في تعلم الآلة)

- advanced neural net and deep learning models, such as: ResNET, Zero shot, GAN, LSTM.
- Evolutionary and bio-inspired algorithms (like GA, EA, ES, PSO, ACO, AIS) in search, optimization and classification.
- Markov models, Kernel methods. SVM
- Bayesian modeling
- Machine learning in Industries and business.

Advanced Data Analytics (1404815) 3hr. (تحليلات البيانات المتقدمة)

- Processing large datasets.
- Extracting low & high-dimensional data.
- Analytics – business Alignment.
- Data analytics capabilities.
- Capturing value with different types of data analytics.