**Elective course:**

First level: (**General Elective Courses)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course no.** | **Course name** | **No. of hours** | | **Total** | **Registration requirements** | **Exam time** | **The great score** |
| **Theoretical** | **Practical** |
| **E.01** | **تاريخ الطب البيطري**  **Veterinary history** | **1** | **-** | **1** | **-** | **2** | **50** |
| **E.02** | **القوانين و الأخلاق البيطرية**  **Veterinary laws and ethics** | **1** | **-** | **1** | **-** | **2** | **50** |
| **E.03** | **حقوق إنسان**  **Human Rights** | **1** | **-** | **1** | **-** | **2** | **50** |

Second level: (**General Elective Courses)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course no.** | **Course name** | | **No. of hours** | | | **Total** | **Registration requirements** | **Exam time** | **The great score** |
| **Theoretical** | | **Practical** |
| **E.04** | **الاستزراع البحري**  **Mariculture** | | **1** | | **2** | **2** | **-** | **2** | **50** |
| **E.05** | **الأسماك السامة والخطيرة**  **Poisonous and Dangerous Fishes** | | **1** | | **2** | **2** | **-** | **2** | **50** |
| **E.06** | **اقتصاديات المزراع السمكية**  **Fish Farm Economics** | **1** | | **2** | | **2** | **-** | **2** | **50** |
| **E.07** | **التحسين الوراثى في الاحياء المائية المستزرعة**  **Genetic improvement of Cultured Aquatic Animals** | **1** | | **2** | | **2** | **-** | **2** | **50** |
| **E.08** | **جودة المياه فى المزارع السمكية**  **Water quality in aquaculture** | **1** | | **2** | | **2** | **-** | **2** | **50** |

|  |  |  |
| --- | --- | --- |
| **Title:** Mariculture | Credit hours | |
| **Code number:** E.04 | lectures | practical |
| **Prerequisite courses:** No | 1 | 1(2) |
| **Course content:**  General mariculture production systems, factors involved in setting up a mariculture project, factors considered for choosing marine species for aquaculture in your region, commercial production of finfish, commercial production of crustaceans, commercial production of mollusks, use and production of Seaweeds and Aquatic Algae, pharmaceutical uses of marine organisms. | | |

|  |  |  |
| --- | --- | --- |
| **Title:** Poisonous and dangerous fishes | Credit hours | |
| **Code number:** E.05 | lectures | practical |
| **Prerequisite courses:** No | 1 | 1(2) |
| **Course content:**  Poisonous versus venomous fish, biology / ecology of different poisonous fishes, types of marine poisons and poisonous effects, biology / ecology of different dangerous fishes, types of marine venoms and its dangerous effects. | | |

|  |  |  |
| --- | --- | --- |
| **Title:** Fish farm economics | Credit hours | |
| **Code number:** E.06 | lectures | practical |
| **Prerequisite courses:** No | 1 | 1(2) |
| **Course content:**  The fundamentals of fisheries bioeconomics,why there is a need for fisheries management and regulation,different types of regulations affect economic behavior,the production process in intensive and extensive aquaculture,the various externalities affecting both aquaculture production and capture fisheries, and know how to value them,the relevant markets for fish and aquaculture products, how these markets work, and how they affect production. | | |

|  |  |  |
| --- | --- | --- |
| **Title:** Genetic improvement of cultured aquatic animals | Credit hours | |
| **Code number:** E.07 | lectures | practical |
| **Prerequisite courses:** No | 1 | 1(2) |
| **Course content:**  The fundamentals of breeding in aquatic animals, intra-specific crossbreeding, sex reverse, chromosomal manipulation, selective breeding for “growth rate, body confirmation, stress tolerance, pollutant resistance, maturity and time of spawning, gene transfer”, genetic technologies and conservation. | | |

|  |  |  |
| --- | --- | --- |
| **Title:** Water quality in aquaculture | Credit hours | |
| **Code number:** E.08 | lectures | practical |
| **Prerequisite courses:** No | 1 | 1(2) |
| **Course content:**  Adaptive mechanisms in fish, variations in natural water quality characteristics, chemicals in water as a result of human activities, disorders associated with water quality deterioration, corrective actions of water quality problems in aquaculture, and bioremediation in aquaculture. | | |

Fourth level: (**Clinical Elective Courses)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course no.** | **Course name** | **No. of hours** | | **Total** | **Registration requirements** | **Exam time** | **The great score** |
| **Theoretical** | **Practical** |
| **E.09** | **تكنولوجيا تصنيع اعلاف الاحياء المائية**  **Aquatic Animal Feed Manufacturing Technology** | **1** | **2** | **2** | **-** | **2** | **50** |
| **E.10** | **الإستزراع المائى المتكامل**  **Integrated Aquaculture** | **1** | **2** | **2** | **-** | **2** | **50** |
| **E.11** | **تقييم الاثر البيئي لمشروعات الاستزراع السمكي**  **Environmental Risk Assessment of Aquaculture Projects** | **1** | **2** | **2** | **-** | **2** | **50** |
| **E.12** | **تاثيرات التغييرات المناخية علي الثروة السمكية**  **Impacts of Climatic Changes on Fish Resources** | **1** | **2** | **2** | **-** | **2** | **50** |

|  |  |  |
| --- | --- | --- |
| **Title:** Aquatic Animal Feed Manufacturing Technology | Credit hours | |
| **Code number:** E.09 | lectures | practical |
| **Prerequisite courses:** No | 1 | 1(2) |
| **Course content:**  Types of feeds offered to different commercial freshwater and marine fishes, Cereal harvesting and treatment, moisture content of cereals, storage of cereals, types of driers, storage of feeds, machinery for preparing compound feeds, types of mill construction, types of feed mixing apparatus, preparation of pellets, types of driers, disorders related to erratic feed manufacture / storage, feed additives, anti-stress diets and anti-mycotoxin diets. | | |

|  |  |  |
| --- | --- | --- |
| **Title:** Integrated aquaculture | Credit hours | |
| **Code number:** E.10 | lectures | practical |
| **Prerequisite courses:** No | 1 | 1(2) |
| **Course content:**  Integrated agriculture and aquaculture, integrated irrigation and aquaculture, waste water use in aquaculture and public health, and environmental considerations. | | |

|  |  |  |
| --- | --- | --- |
| **Title:** Environmental risk assessment of aquaculture projects | Credit hours | |
| **Code number:** E.11 | lectures | practical |
| **Prerequisite courses:** No | 1 | 1(2) |
| **Course content:**  Determining the scope of the risk analysis, Hazard identification, Risk assessment, Risk management , Risk communication, Overview of the pathogen risk analysis process , Overview of the food safety and public health risk analysis process , Overview of the ecological (pests and invasive spp) risk analysis process , Overview of the genetic risk analysis process , Overview of the environmental risk analysis process , Overview of the financial risk analysis process , Overview of the social risk analysis process and Implementation of risk analysis in aquaculture (National policy level). | | |

|  |  |  |
| --- | --- | --- |
| **Title:** Impacts of climatic changes on fish resources | Credit hours | |
| **Code number:** E.12 | lectures | practical |
| **Prerequisite courses:** No | 1 | 1(2) |
| **Course content:**  Impacts on fisheries: The encountered variables of global climatic changes (CO2 emission, sea level rise, melting glaciers, dams, Nitrogen / eutrophication, and invasive species), hydrogical cycle and rainfall patterns, water temperature , oxygen content, Ice coverage, seal level and ocean circulation; Impacts on aquaculture: migration , adaptation, fishing practices, invasive species and spread of diseases. | | |

Fifth level: (**Clinical Elective Courses)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course no.** | **Course name** | **No. of hours** | | **Total** | **Registration requirements** | **Exam time** | **The great score** |
| **Theoretical** | **Practical** |
| **E. 13** | **الأمراض البازغة فى الأحياء المائية**  **Emerging Aquatic Animal Diseases** | **1** | **2** | **2** | **-** | **2** | **50** |
| **E.14** | **أمراض ورعاية أسماك الزينة**  **Ornamental Fish Diseases and Management** | **1** | **2** | **2** | **-** | **2** | **50** |
| **E.15** | **البحيرات والمياة الداخلية**  **Limnology** | **1** | **2** | **2** | **-** | **2** | **50** |
| **E. 16** | **طب البرمائيات و الثدييات البحرية**  **Amphibians and Marine Mammals Medicine** | **1** | **2** | **2** | **-** | **2** | **50** |
| **E.17** | **تطبيقات تقنية النانو في طب الاحياء المائية**  **Application of Nano-technology in Aquatic Animal Medicine** | **1** | **2** | **2** | **-** | **2** | **50** |
| **E.18** | **الاحياء المائية كنماذج لحيوانات التجارب**  **Aquatic Animals as Laboratory Animal Models** | **1** | **2** | **2** | **-** | **2** | **50** |

|  |  |  |
| --- | --- | --- |
| **Title:** Emerging Aquatic Animal Diseases | Credit hours | |
| **Code number:** E.13 | lectures | practical |
| **Prerequisite courses:** No | 1 | 1(2) |
| **Course content:**  Historical aspects , fundamentals , factors triggering emergence of diseases, types of emergence, classification of diseases (viral , bacterial m rickettsial and parasitic diseases), control of emerging diseases. | | |

|  |  |  |
| --- | --- | --- |
| **Credit hours** | | **Title:** Ornamental fish diseases and management |
| **Practical** | **Lectures** | **Code Number:** E.14 |
| 1 (2) | 1 | **Prerequisite courses:** No |
| **Course contents:**  Introduction of ornamental fish diseases and aquatic environment, study the relation between stress factors and diseases, scientific classification of ornamental fish diseases, epidemiology of ornamental fish diseases, field and laboratory diagnosis of ornamental fish diseases, treatment, prevention and control of ornamental fish diseases. | | |

|  |  |  |
| --- | --- | --- |
| **Title:** Limnology | Credit hours | |
| **Code number:** E.15 | lectures | practical |
| **Prerequisite courses:** No | 1 | 1(2) |
| **Course content:**  Lakes and ponds as aquatic environments with distinct terrestrial boundaries where the interactions between organisms are often strong and adaptations to the aquatic environment easily recognized. Physical (light, temperature, and mixing) and chemical (dissolved elements and compounds) properties of lakes affect organisms in important ways, and lake organisms, likewise, influence the physical and chemical properties of their environment. Lakes are exciting environments for study in their own right and for gaining perspective on ecological and evolutionary processes in general. | | |

|  |  |  |
| --- | --- | --- |
| **Title:** Amphibians and marine mammals medicine | Credit hours | |
| **Code number:** E.16 | lectures | practical |
| **Prerequisite courses:** No | 1 | 1(2) |
| **Course content:**  Synopsis on Amphibian medicine (Bacterial, Viral, Mycotic , Parasitic diseases and non infectious disorders) and Marine mammals medicine (Bacterial, Viral, Mycotic and Parasitic diseases and non infectious disorders), control and prevention of common infectious diseases. | | |

|  |  |  |
| --- | --- | --- |
| **Title:** Application of Nanotechnology in Aquatic Animal Medicine | Credit hours | |
| **Code number:** E.17 | lectures | practical |
| **Prerequisite courses:** No | 1 | 1(2) |
| **Course content:**  **Nanoparticles for detection of fish diseases, DNA nano-vaccines, Gene delivery, Smart Drug Delivery, Nanoparticles for Enhancement of Fish Growth, Nanodelivery of Nutraceuticals, Tagging and Nano-Barcoding, Water filtration and Remediation, Nanotechnology devices for Aquatic Environment ManagementandHarvest and Post-Harvest Technology.** | | |

|  |  |  |
| --- | --- | --- |
| **Title:** Aquatic animals as laboratory animal models | Credit hours | |
| **Code number:** E.18 | lectures | practical |
| **Prerequisite courses:** No | 1 | 1(2) |
| **Course content:**  Introduction, models of gene expression, toxicology models, infectious diseases models, other diseases models and future directions. | | |