

ENTM 451 Insecticide toxicology and resistance**5Cr.Hr. (L3+P4)****Prerequisite:** ENTM 353

1. Classification of insecticides.
2. Examples of insecticide groups
3. Mode and site of action of insecticide groups (chlorinated hydrocarbons - organic phosphates - carbamates – pyrethroids).
4. Properties of insecticide carriers
5. Insecticide formulation and field application.
6. Estimation of insecticide residues in a sample
7. Histo-pathological effects of insecticides
8. Bioassay tests: statistical analysis of bioassay test results
9. Resistance mechanisms, inheritance and management.
10. Movement of insecticides in the environment and residue analysis.
11. Economic and legal aspects of insecticide use.

ENTM 452. Epidemiology of Vector-borne Diseases**3Cr.Hr. (L2+P2)****Prerequisite:** ENTM 305

1. Definitions, scope, and uses of epidemiology.
2. Epidemiology and public health
3. Measuring health and disease.
4. Types of epidemiological studies
5. Sampling strategies and sample size.
6. Types of errors in epidemiological studies

Training sessions

1. Solving basic mathematical problems of selected cases
2. Preparing informed consents for medical entomology studies
3. Class group preparations and discussions orbiting around vector and epidemiological studies carried out in Africa

ENTM 453 Essay (1)**2Cr.Hr. (L2+P0)****Prerequisite:** ENTM 305

Throughout both terms, each student writes an essay on a selected subject under the supervision of one of the staff members. The student presents a written dissertation, and summarizes his work in a talk held at the Department held at the end of the academic Year.

ENTM454 Medical and Veterinary Acarology**2Cr.Hr. (L1+P2)****Prerequisite:** ENTM 255

1. Description of medically and veterinary important ticks and mites
 - a. Classification
 - b. Morphology
 - c. Development
 - d. Habits and habitat
 - e. Anatomy
2. Vector potentiality in relation to disease transmission by hard and soft ticks, endoparasitic mites, ectoparasitic mites and free living mites

ENTM 455 Vector bionomics**2Cr.Hr. (L2+P0)****Prerequisite:** ENTM 256

1. Definition of bionomics and ecological habitats of vectors.
2. Significant environmental factors affecting biology, distribution, behavior, survival, and vectorial status of vectors (temperature, relative humidity, light, sunlight and shade, precipitation, water movement, salinity, wind, pollution, turbidity, microflora and macroflora, fauna).
3. Bionomics of adults (seasonal dynamics, reproductive biology, survivorship, overwintering, flight behavior and host-feeding patterns) and immatures (breeding sites, seasonal abundance, rates of development, survivorship, adult status at emergence).

4. The interaction of environmental factors regulating vector-borne disease transmission.

ENTM 456. Insecticidal Control of Public Health Pests**2Cr.Hr. (L2+P0)****Prerequisite:** ENTM 352

1. Selecting a chemical control strategy
2. Pesticide formulations
3. Safe use of pesticides
4. Operational procedures
5. Diagnosis and treatment of insecticide poisoning
6. Using pesticides for vector control

ENTM 457. Vector-pathogen interactions**2Cr.Hr. (L2+P0)****Prerequisite:** ENTM 305

1. Foregut: structure, function and effect on ingested parasites
2. Midgut: structure, function and effect on ingested parasites
3. Hindgut: structure, function and effect on ingested parasites
4. Hemocoel: cell types and effects on ingested parasites
5. Salivary glands: structure, function and effect on ingested parasites
6. Effect of parasitic infection on vector behavior and survival
7. Host-parasite interactions with reference to dipteran vectors

ENTM 458. Integrated Vector Management**2Cr.Hr. (L2+P0)****Prerequisite:** ENTM 208 & 352

1. Concept, definition, brief history
2. Key elements of Integrated Vector Management (IVM)
 - a) Advocacy, social mobilization and legislation
 - b) Collaboration with health and other sectors
 - c) Evidence-based integration of vector control options
 - d) Planning and implementation of an IVM
3. Capacity-building
4. Examples of global IVM programs for the control of vector-borne diseases

ENTM 459. Forensic Entomology**2Cr.Hr. (L2+P0)****Prerequisite:** (-)

1. Introduction
2. History of forensic entomology
3. Arthropods occurring on dead bodies with special emphasis on blowflies
4. Uses of insects in forensics
5. Collection of entomological evidence and equipments used
6. Processing of collected insects: Labeling, laboratory processing
7. Case studies

ENTM 460 Essay (2)**2Cr.Hr. (L2+P0)****Prerequisite:** ENTM 305

Throughout both terms, each student writes an essay on a selected subject under the supervision of one of the staff members. The student presents a written dissertation, and summarizes his work in a talk held at the Department held at the end of the academic Year.

ENTM 461 Introduction to Population Genetics

1 Cr.Hr. (L1+P0)

Prerequisite: (-)

1. When Darwin met Mendel
2. Terms used in population genetics
3. Allelic and genotype frequency
4. Genetic variation and evolution
5. Measuring genetic variation
6. Hardy-Weinberg equilibrium
7. Processes of evolutionary change

ENTM 462 Immunity of disease vectors and their hosts

2 Cr.Hr. (L2+P0)

Prerequisite: ENTM 353

1. Overview of the immune system.
2. Principles of innate immunity
3. Principles of adaptive immunity
4. Cell-mediated immune responses (Cellular activation of the immune system, signal transduction).
5. Humoral immune responses and effector mechanisms
6. Immune signaling in response to arboviral infections.
7. Fitness costs of immune responses.
8. *Drosophila* immune responses as a model
9. Genes potentially involved in the immune response
10. Vaccines: Principles and practice

ENTM 463 Vector Control in Disasters

1 Cr.Hr. (L1+P0)

Prerequisite: (-)

1. Introduction.
2. Health consequences of disaster
3. Disaster preparedness.
4. Contingency plans
5. Post-disaster action: a. immediate action. b. Assessment of situation
- a. Determining priorities of action. d. Surveillance and control
8. Emergency action in the event of a vector-borne disease
9. General control action
- a. At the institutional and community levels. b. At the personal level
10. Vector and rodent related diseases

ENTM 464 Insect Evolution

1Cr.Hr. (L1+P0)

Prerequisite: (-)

1. Introduction about evolution meaning and history
2. Theories of the origin of arthropods, insects
3. Evidences of evolution
4. Species, population concept, phylogeny.
5. Insect fossils: Orders of insects as fossils
6. Variation: A-Non inherited variation, B- Inherited variation

ENTM 465 Morphometrics and Medical Entomology 1 Cr.Hr. (L1+P0)

Prerequisite: (-)

1. Introduction: bases and uses of morphometrics
2. Systematics: a. Kissing bugs. b. Sand flies. c. Mosquitoes
3. Geographic Variation: a. Kissing bugs. b. Sand flies. c. Mosquitoes
4. Comparisons of Morphometrics with Genetic Variation: a. Kissing bugs
- b. Sand flies. c. Mosquitoes

5. Topics Specific to kissing bugs and mosquitoes
 - a. Adaptation to new ecotopes
 - b. Migration history

ENTM 466 Emergence and Resurgence of Insect-Borne Diseases**1Cr.Hr. (L1+P0)****Prerequisite: (-)**

1. Global emergence/resurgence of vector-borne diseases
 - a. Malaria. b. Leishmaniasis. c. African Trypanosomiasis
 - d. Dengue. e. Yellow Fever. f. Plague
2. The situation in the WHO-Eastern Mediterranean Region (EMR)
3. Factors Involved in the emergence of VBD's
4. Requirements for overcoming problems of disease resurgence:
 - a. Globally
 - b. In EMR countries

ENTM 468 Bioinformatics**1 Cr.Hr. (L1+P0)****Prerequisite: (-)**

1. Introduction to bioinformatics
2. DNA Sequence Databases, Sequence Formats, Dynamic Programming, BLAST algorithm and BLAST online tools. 3. Becoming an Instant Expert with PubMed/Medline. 4. ORF Finder, GENSCAN, Principles and use of PSI-BLAST
5. Retrieving DNA Sequences. 6. Retrieving Protein Sequences
7. Multiple Sequence Alignments with ClustalW and Protein Analysis (Pfam, Prosite, Prints, Blocks). 8. The Protein Data Bank; Protein Folds, SCOP and CATH; Structural Bioinformatics Primer; Structure Alignment; Synopsis

ENTM 470 Arthropod-Borne Diseases in the Arab World**1Cr.Hr. (L1+P0)****Prerequisite: (-)**

1. The Arab World: its profile
2. Vector-borne diseases in the Arab World
3. Noxious/venomous arthropods of public health significance

ENTM 475 Principles of Molecular Entomology and Genetic Engineering 3Cr.Hr. (L2+P3)**Prerequisite: ENTM 304**

1. DNA structure and arrangement in cells.
2. DNA synthesis and repair.
3. The central dogma.
4. Protein synthesis and gene expression.
5. DNA manipulating enzymes.
6. Recombinant DNA technology.
7. Gene cloning.
8. Gene library. 9. Application of genetic engineering in insects.

ENTM 477 Insect Behaviour**1 Cr.Hr. (L1+P0)****Prerequisite: ENTM 205**

1. Introduction.
2. Tropisms in insects.

3. The senses and behavior.
4. Light compass orientation and mechanism of orientation.
5. Route finding by Hymenoptera.
6. Appreption of time.
7. Elements of behavior – Observation and Description of behavior – Stimulus –response
Theory of behavior – Apperception.

ENTM 479 Insect pest control**2 Cr.Hr. (L2+P0)****Prerequisite: (-)**

2 hours / week for lectures, - hours / week for laboratory sessions, 2 credits for one term

1. Introduction,
2. Harmful effects of insects.
3. Requirements for insect pest control.
4. Methods of insect pest control.
5. The usage of transgenic insects in the control of target pests.
6. Integrated pest managements.

Courses Contents of the Biochemistry Department**BIOC 401: Quality Control and Scientific Article Writing****3 Cr. Hr.****(L3+P0)****Prerequisite: (-)**

Introduction to the quality control, quality assurance and professional skills to deal with the basic principles in clinical laboratory. In addition, the course helps the students to learn the basic approach of preparing scientific manuscript, review papers, conference reports or thesis that will have a high probability of being accepted for publication and of being completely understood when they are published.

BIOC 402: Cancer Biology and Environmental Biology**4 Cr. Hr. (L3+P 2)****Prerequisite: BIOC 301, BIOC 303**

Overview of normal and neoplastic cell growth, proliferation, function, and death, the genetic changes leading to the neoplastic transformation of cells. Topics, will include cell cycle control, DNA damage, tumor microenvironment, apoptosis, activation, and mode of action of proto-oncogenes and tumor suppressor genes, cancer treatment, chemotherapy, and drug resistance. Also, this course focuses on the ecosystem components interaction along with management of environmental problems encountered such as climate change, sustainability and pollution. Heavy metals poisoning from natural resources in relation to serious health consequences will be explored.

BIOC 403: Genetic Engineering**4 Cr. Hr. (L3+P 3)****Prerequisite: BIOC 303**

Introduction to recombinant DNA technology, restriction digestion of nucleic acid, different types of vectors. DNA cloning, traditional and more recent advances in nucleic acid analysis and manipulation. Application molecular biology and genetic engineering in advanced specialized areas. DNA libraries, Polymerase Chain Reaction, and sequencing techniques. Topics include genome analysis, subcloning gene expression, microarrays, RNAi.

BIOC 404: Separation and Biochemical Techniques**3 Cr. Hr. (L2+P****3)****Prerequisite: (-)**

Spectrum of laboratory instrumentation by describing the principles of operations; by introducing the systems currently on the market; and by helping to enable operators to make proper judgment, maintenance and quality assurance. Moreover, the aim of the course is to ensure that the students have the skills to isolate, purify and identify different biological components using different separation techniques.

BIOC 405: Molecular biology 2**3 Cr. Hr. (L2+P 3)****Prerequisite: BIOC 303**

Basic knowledge of molecular biology, gene structure and genomics. Study of the fundamental principles that guide cellular and molecular organization and function. Topics include briefs on DNA and RNA structure, function, replication, damage, repair, control of gene expression and gene therapy. Applications of molecular biology to everyday problems.

BIOC 407: Introduction to Stem Cell Biology**1 Cr. Hr. (L1+P0)****Prerequisite: (-)**

Stem cells are undifferentiated cells in multicellular organisms that can differentiate into specialized cells and can divide to produce more stem cells. They are found in multicellular organisms. This course describes the origin of the stem cells, their types and conditions for differentiation into different cell types, as well as the new avenues for research applications and their use in treatment of chronic diseases.

BIOC 408: Molecular biotechnology**3 Cr. Hr. (L2+P 3)****Prerequisite: BIOC 303, BIOC 403**

Molecular and genetic tools used to analyze and modify genetic material to modify organisms to produce desired small molecules and proteins. Topics will include the properties and uses of biotechnology-useful enzymes, sequencing techniques, PCR, cloning vectors and hosts, DNA and protein microarrays, directed mutagenesis, and the manipulation of expression of particular gene products.

BIOC 409: Molecular Virology**2 Cr. Hr. (L2+P0)****Prerequisite: (-)**

Deep understanding of viruses and their replication at the molecular level. The course will survey the diverse strategies that viruses use in their replication cycles as well as the molecular engagement of the virus with their host cell. Viral characteristics and pathogenesis by referring to the main role of immune system in either responding or defending the body against viral infection. In the meantime, the course presents the types of antiviral therapy.

BIOC 410: Scientific Essay**2 Cr. Hr. (L2+P0)****Prerequisite: (-)**

Introduction to different thesis formats, basic skills to learn how to select scientific essay proposal as well as communicate between different scientific branches (field), also practice the student to use advanced technology in writing and presenting his scientific essay.

BIOC 411: Genetic Disorders

1 Cr. Hr. (L1+P0)

Prerequisite: (-)

Molecular genetics of human diseases, with strong emphasis on genetic disorders will be discussed. Overview of human genetic disorders and how understanding the molecular basis of the disease has an impact on the clinical management, in terms of more accurate and informative diagnostics and more effective targeted therapies. Topics include single gene disorders, multifactorial disorders; cancer genetics; epigenetics; identification and analysis of human disease genes.

BIOC 412: Biochemistry of Diseases

2 Cr. Hr. (L2+P0)

Prerequisite: (-)

Brief knowledge concerned with etiology of different diseases. Additionally, the course aims to develop the core knowledge of the different markers that could help in diagnosis of the different diseases along with clinical interpretation.

BIOC 414: Xenobiotics Metabolism

2 Cr. Hr. (L2+P0)

Prerequisite: (-)

Core knowledge and skills related to the general aspects of toxicology including toxic metals and identify environmental toxicants and different mechanisms of detoxification as well as methods of prevention. In addition, the course aims to study xenobiotics metabolism.

BIOC 416: Introduction to Bioinformatics

2

Cr. Hr. (L2+P0)

Prerequisite: (-)

Hands on approach of publicly available data and computational tools important in bioinformatics including molecular biology databases, the analysis of macromolecular sequences, genome assembly and next-generation sequencing, protein-protein interaction, phylogenetics, protein structure and prediction, genetic linkage and association, gene expression arrays, and proteomics.

BIOC 418: Introduction to Proteomics and Functional Genomics

2 Cr. Hr. (L2+P0)

Prerequisite: (-)

Relationship between protein structure and its function, illustration of the roles of protein domains and portraying some examples to demonstrate the effect of protein structure on its function. Furthermore, the course explores the assays that are involved in determination of gene function and correlates that with its transcription level. Topics include techniques used in the field of genetic engineering and their principles that are based on the basic molecular biology information. The students will also apply different analysis software to characterize the genes and the gene products.

BIOC 420: Advanced cell biology

2 Cr. Hr.-(L2+P0)

Prerequisite: (-)

Advanced concepts of cell biology, focusing on the molecular organization of cells, including internal membranes, the cell nucleus, the cell cycle, cytoskeleton, cell-cell adhesion and the extra-cellular matrix, signal transduction, as well as regulation of gene expression and the

intracellular targeting of proteins. This course is designed for undergraduates who have a good knowledge of molecular biology.

BIOC 422: Cancer Biology

2 Cr. Hr. (L2+P 0)

Prerequisite: BIOC 306

General introduction to the nature of cancer, and its underlying causes, including the role of tumor viruses, cellular oncogenes and tumor suppressors. Implications of these factors will be addressed by studying the mechanisms of tumorigenesis, metastasis, and angiogenesis. In addition, the course will investigate the development and clinical use of therapies based on the major discoveries in cancer biology research. Topics include a laboratory component exploring a range of techniques used in the study of cancer biology.

Course contents of the Microbiology Department

MICR 411: Medical Virology

3Cr.Hr. (L2+P 2)

Prerequisite: MICR 312.

Introduction to Medical Virology (Structure ,Classification, Chemical composition, Reaction to physical and chemical agents, Cultivation and assay, Replication, Ecology and mode of transmission); Enteroviruses; Papillomaviruses (Warts); Viral Gastroenteritis; Parvovirus ; Viral Hepatitis; Human Poxviruses; Herpes viruses; Rabies; Viral Haemorrhagic fevers; Viral Respiratory Infections; Influenza; Human retroviruses; Mumps; Rubella; Neurological diseases caused by viruses; Viral Therapy: Chemotherapy, Interferons and Immunoglobulin therapy, Vaccination.

MICR 422: Medical Bacteriology

3Cr.Hr. (L2+P 2)

2)

Prerequisite: MICR 321.

Normal flora of human body; Mechanisms of bacterial infection; Risk factors; Types of culture media. Bacterial pathogens and associated diseases (laboratory diagnosis and pathogenicity) for Gram positive cocci and bacilli; Gram negative cocci and bacilli; acid-fast bacilli; Spirochetes, Chlamydiae; mycoplasma; Rickettsiae and Actinomycetes.

MICR 432: Medical Mycology

3Cr.Hr. (L2+P 2)

Prerequisite: MICR 331.

Introduction (definition of mycoses, epidemiology, Hygiene, incidence, portal of entry); Pathogenesis, host factors, dynamics of host-fungus interaction and classification of mycoses; Superficial mycoses; Cutaneous mycoses (Dermatophytosis); Cutaneous and mucocutaneous Candidiasis; Subcutaneous mycoses; Systemic Mycoses; Non-Infectious diseases. The most common antifungal drugs in clinical use.

MICR 433: Yeasts

2 Cr.Hr. (L1+P2)

Prerequisite: MICR 231

Introduction to yeast: what are yeasts? Yeast ecology, Importance of yeast to man, Major industrial & medical activities of yeasts, General Cellular characteristics of yeast, Yeast cell architecture and function, Types of Vegetative reproduction in yeast, Sexual reproduction, alternative life cycles of diploid and haploid yeast cells, Yeast nutrition and physiology, mechanisms of transportation of various carbon and nitrogen sources, Yeast metabolism, Classification of yeasts: Ascomycetous, Basidiomycetous, and Mitosporic.

MICR 451: Water and Sewage Microbiology**2 Cr.Hr. (L1+P2)****Prerequisite (MICR 221, MICR 231)**

Introduction; Drinking water; Water safety plan; Microorganisms & Potable water; Microorganisms of public health significance; Health problems caused by polluted drinking water; Epidemiology of drinking water infections; Risk assessment methods; Evaluating water quality; Indicator bacteria; Sanitary inspection; Prevention of pollution; Sampling; Management of recreational waters; microorganisms in sewage treatment; Disinfection of effluent; Legionnaire's disease; Legionnaire's disease as a significant nosocomial infection; Bacterial detection in water samples; Monitoring & Conservation of aquatic ecosystems.

MICR 461: Bioinformatics**1Cr.Hr. (L1+P0)**

0)

Prerequisite: (MICR 262)

Collecting and storing sequences in the laboratory; Alignments of pairs of sequences; Multiple sequence alignments; Phylogenetic prediction; The concept of evolutionary tree; Database searching for similar sequences.

MICR 463: Genetic Engineering**1Cr.Hr. (L1+P0)**

0)

Prerequisite: MICR 262.

Principles underlying genetic engineering; Restriction enzymes; Types of cloning vectors: Specialized vectors (Shuttle and Expression Vectors). Site-Directed mutagenesis; Cassette mutagenesis and gene disruption; Translation of the cloned gene; Reporter genes; Expression of mammalian genes in bacteria; Cloning the gene via (mRNA); Applications of genetic engineering: 1-Genetically engineered protein: Genetically engineered vaccines: DNA vaccines; 2- Transgenic animals: 3- Transgenic plants.

MICR 465: Gene Expression**2 Cr.Hr. (L2+P 0)****Prerequisite: (MICR 262)**

Adaptation to the environment; Constitutive enzymes, inducible enzymes; Posttranslational regulation: Non-covalent enzyme inhibition, Feedback inhibition, Covalent Modification of Enzymes, Two-component systems. Transcriptional regulation: The operon, lac operon, trp operon. The regulons maltose regulon, The structure of DNA binding protein, Negative Control of Transcription: Repression and Induction, Positive Control of Transcription, Post-transcriptional and translational regulation, RNA regulation and riboswitch; 4- Some global control systems; Sigma Factors.

MICR 471: Physiology of Plant Diseases

1Cr.Hr. (L1+P 0)

Prerequisite: MICR 372

How pathogens attack plants; mechanical forces by pathogens on host tissues; Chemical weapons of plant pathogens; Enzymatic degradation of cell wall substances; Enzymatic degradation of different substances in plant cell; Role of microbial toxins in plant diseases, Host specific & host non-specific toxins; Growth regulators in plant diseases; Effect of plant pathogens on physiological activities of host; Effect of pathogens on plant metabolism; Defense mechanisms of the host.

MICR 472: Biotechnology

1Cr.Hr. (L1+P 0)

0)

Prerequisite: (MICR 372)

I.Fundamentals; Public perception of biotechnology; Public awareness of genetic engineering; Regulatory requirements; Safety of genetically engineered foods. II. Biotechnology business: Biotechnology companies; Patents; III. The world of Omics: Genomics, Proteomics and metabolomics; IV. Microbial growth kinetics; V. Food biotechnology: Microbial production of food ingredients; Enzyme technology in dairy products; VI. Environmental biotechnology: Drinking & Waste water treatment; Microbiological degradation of xenobiotics; Microorganisms removing heavy metals from aqueous effluent.

MICR 480: Molecular Immunology

1Cr.Hr. (L1+P 0)

Prerequisite: (-)

Receptor and immunity, Adaptive immunity and immunoglobulin super family, MHC, MHC genes and polymorphism, Antibody proteins and antigen binding, Antibody genes and diversity, TCR proteins and antigen binding, TCR genes and diversity, Clonal selection and tolerance, Molecular signals in immunity, Clonal selection and tolerance, B-cell tolerance, Cytokines and chemokines.

MICR 481: Plant Pathology (1)

2Cr.Hr. (L1+P 2)

Prerequisite: MICR 321, MICR 331.

Introduction; Parasitism and pathogenecity; Host range of pathogens; Identification of plant diseases; Classification of plant diseases; Stages of disease development; Dissemination of pathogens and dispersal of plant diseases; Symptoms of plant diseases; Environment and disease development; Parasitic diseases: Fungal Diseases: Downy mildew; Powdery mildew; Rust diseases; Smut diseases; Blights; Rots; Wilt; Leaf spot; Bacterial Diseases: Blights; Rots; Wilts; Galls; Leaf spot; Non-parasitic diseases: Diseases due to low and high temperatures, Light effect, Soil moisture disturbance, Oxygen relations, Nutritional disorders.

MICR 482: Plant Pathology (2)
(L1+P2)

2Cr.Hr.

Prerequisite: MICR 312, MICR 331.

Fungal Diseases: Downy mildew; Powdery mildew; Rust diseases; Smut diseases; Blights (Damping-off and seedling blight, early blight of potato and tomato, late blight of potato and tomato); Rots (Foot and root rots); Wilt; Leaf spot; II- Viral diseases: Mosaic and yellows (Tobacco mosaic, Wheat streak mosaic, Barley yellow dwarf). III- Diseases caused by parasitic higher plants; IV-Diseases caused by Nematodes; V- Control of plant diseases.

MICR 483: Industrial Microbiology

2Cr.Hr. (L2+P 0)

Prerequisite: 372.

Historical development of industrial microbiology & fermentation basics; Industrial microorganisms; I Strain stability & the General methods of microbial preservation; Fermentation substrates & Medium formulation; Fermentor systems, Sterilization, types of fermentation process; Control of foaming process, Optimization of fermentation process; The methods of measuring the Scaling up process, downstream process and Bio separation of products e.g. Baker's yeast, SCP, Ethyl alcohol, Vinegar, Citric acid and microbial enzymes ; Safety on large scale processes.

MICR 485: Diagnostic Microbiology
2)

3Cr.Hr. (L2+P

Prerequisite: MICR 312, MICR 321, MICR 331

Methods of collection and handling of different specimens from different sources (soil, human body, water, plants,...etc); Introduction to procedures and techniques used to isolate and identify viruses, bacteria and fungi; Morphological, physiological, serological, biochemical and molecular characteristics of different microorganisms; Comparison between different strategies of identification (e.g., simultaneous, sequential) of microorganisms; Recent and automated techniques used for identification of different microorganisms.

MICR 486: Cell and Tissue Culture

2Cr.Hr. (L2+P 0)

Prerequisite: (-)

Introduction: Science of plant, animal and human cells; Classes of the cell lines; Sterilization; Essential requirements for the cultivation of the cell lines; Optimum condition for sub-culturing the cell lines; Callus formation and differentiation; Measuring Cell Growth; Types of tissue culture media; *In vitro* cultivation of cells; establishing and maintaining cell lines; Measurement of cell growth; Principles and basic techniques used in freezing, banking, preservation of the cell lines; Types of cell lines carcinoma; Applications of cell & tissue culture in agriculture, medicine, biotechnology,...etc.

MICR 487: Microbial Toxins**1 Cr.Hr. (L1+P 0)****Prerequisite: MICR 221, MICR 231.**

Introduction: Microbial toxins; Toxigenic microorganisms; Toxins in plant, animal & human Diseases; Phytotoxins: Mode of action, Bioherbicides; I. Mycotoxins: Exposure routes, Outbreaks: Ergotism, ATA, Classes: Aflatoxins: Kwashiorker, Hepatocellular carcinoma; *Fusarial* Toxins: Characteristics, Toxicity, In Biological Weapons; Fumonisin & Esophageal Cancer; Control of Mycotoxins: Physical, Chemical, Biological; II. Bacterial toxins: Mechanisms of Bacterial Pathogenicity; Endotoxins and Exotoxins; Bacterial Food Poisoning. Botulism; *E. coli* toxins; Tetanus toxins; Bacterial toxins in Cosmo-therapy.

MICR 488: Selective Topics**3Cr.Hr. (L3+P 0)****0)****Prerequisite: (-)**

Recent advances in selected topics in the field of Microbiology and other related fields.

MICR 489: Basic Immunology**1Cr.Hr. (L1+P 0)****Prerequisite: MICR 212.**

Introduction to immunology, the immune system (cells and organs), innate immune response (physical and chemical barriers, phagocytosis, interferons, complement, inflammatory response, fever), the adaptive immune response, immunogens and antigen, T-cells, natural killer cells, B-cells, antibody, antigen-antibody reactions, humoral immunity, cell-mediated immunity, natural and artificial immunity, allergy, hypersensitivity and autoimmunity, transplantation.

MICR 490: The Graduation Research Work (L1+P4)**3****Cr.Hr.****Prerequisite (-)**

The graduation research work proceeds as follows:

- Students will be randomly distributed to staff members of the department.

- Each staff member will define a research subject to students, the head of the department is notified with the beginning of the semester.
- At the end of the semester, each student offers a report on the research topic, including what has been reached from the results.
- Search is arbitration before the start of the final examinations by a committee approved by the department board and research supervisor.

Course Contents of the Geology Department

GEOL 401: Precambrian Rocks of Egypt

3 Cr. Hr. (L2+P2)

Prerequisite: (GEOL 303)

Introduction: Historical background, distribution of basement rocks in Egypt - Classification of the basement rocks of Egypt: geosynclinal model classifications and plate tectonic model classifications - The basement rock units of Egypt: Gneisses and migmatites, ophiolites and ophiolitic mélange, arc-metavolcanics, arc-granitoids, Dokhan volcanics, Hammamat Sediments, Younger gabbros, Younger granites and post-granite dykes - Mineral deposits and ornamental stones in the Basement complex - Phanerozoic plutonism and volcanicity.

GEOL 402: Phanerozoic Rocks of Egypt

3 Cr. Hr. (L2+P2)

Prerequisite: (GEOL 305)

Tectonic framework of Egypt - The Paleozoic surface exposures and subsurface successions in Sinai, the Eastern Desert and the Western Desert of Egypt - The Triassic at Areif El-Naga, other exposures and subsurface sections - The Jurassic exposures in Northern Sinai and the Gulf of Suez region - The distribution and stratigraphical Paleontology of the Cretaceous rocks in Egypt - The Paleocene exposures in Egypt - The Eocene rocks in Sinai, the Western Desert, the Eastern Desert and the Nile Valley of Egypt - The Oligocene facies in Egypt - The Neogene stratigraphy of Egypt - the Quaternary (terraces of the River Nile, the Quaternary in the Egyptian Deserts).

GEOL 403: Economic Geology

3 Cr. Hr. (L2+P2)

Prerequisite: (GEOL 202)

Introduction - Major genetic classification of mineral deposits - Relationship between plate tectonics and ore deposition - Origin of mineral fluids - Ore deposits associating mafic and ultramafic rocks - Pegmatites and hydrothermal deposits - Porphyry ore deposits associating felsic rocks - Sedimentary ore deposits (mechanical, chemical and biochemical) - Laterites - supergene sulfides enrichment and karst deposits - Ore deposits of Egypt.

GEOL 404: Mining Geology

2 Cr. Hr. (L1+P2)

Prerequisite: (GEOL 301)

Introduction - Stages of exploration program - Sampling of ore body - Indicators of ore deposits - Structural control of ores - Evaluation of ore body - Types of mining operations and mine features - Calculations of reserve estimations - Average assay - Surface and subsurface mining - Mine safety and hazards, tonnage-grade relationship - Impact of mine water and mine waste on environment.

GEOL 405: Petroleum Geochemistry

1 Cr. Hr. (L1+P1)

Prerequisite: (GEOL 204)

Introduction - Petroleum: oil and natural gases - The factors influencing organic richness - Stages of hydrocarbon generation - Kerogen formation, composition and maturation - Compounds present in bitumen and oil (general and specific compounds) - Factors affecting composition of bitumen and kerogen - Principles of source rock evaluation - Interpretation of source rock data - Oil-Oil and Oil source rock correlation - Analytical techniques: Bitumen and Kerogen analyses - Effect of biodegradation, water washing, cracking and deasphalting on oil in reservoirs - Predicting thermal maturation through constructing geochemical models.

GEOL 406: Engineering Geology**3 Cr. Hr. (L2+P2)****Prerequisite: (GEOL 301)**

Advanced soil and rock mechanics - Engineering classification of soils - Engineering classification of rocks - Site investigation techniques - In-situ tests and monitoring techniques - Mechanical properties of sedimentary, igneous and metamorphic rocks - Rocks and Soils slope stability analysis and protection measures.

GEOL 407: Hydrogeology**3 Cr. Hr. (L2+P2)****Prerequisite: (GEOL 301)**

The hydrologic cycle and functions - Aquifers and relationships - Field and Laboratory measurements - Groundwater flow systems - Mathematical and graphical approaches - Hydro-geochemical characteristics and functions - Exploration and exploitation techniques - Hydrogeology of Egypt and the Arab World region - Laboratory Exercises.

GEOL 408: Graduation Project**2 Cr. Hr. (L1+P3)****GEOL 409: Geology of Underground Water****2 Cr. Hr. (L1+P2)****Prerequisite: (-)**

Types of subsurface water - Groundwater origin and occurrence - Aquifers properties - Wells and springs - Hydro-geological measurements - Flow systems and approaches - Geological Impacts - Assessment Techniques - Hydro-geological conditions of Egypt and the Arab World region - Laboratory Exercises.

GEOL 410: Petroleum Geology**3 Cr.Hr. (L2+P3)****Prerequisite: (GEOL 204 + Geol 301)**

Introduction, Petroleum and reservoir (origin, migration and accumulation), Composition of hydrocarbon, Properties of crude oil and natural gas and oil and as phases, Structural geology and hydrocarbon traps, Hydrocarbon traps (structural, stratigraphic and combinations types), Egyptian models of traps: 1- structural types, 2-stratigraphic types, 3: mixed traps, Reservoir characters and petroleum reservoir performance, reservoir pressure, reservoir loss and destruction, Geological considerations and engineering practices, Geologic factors and reservoir properties, Production and geologic factors, Geologic studies for engineers.

GEOL 411: Lab Techniques**2 Cr. Hr. (L1+P2)**

Prerequisite: (GEOL 202 OR GEOL 204)

Sampling methods - samples treatment before analyses - Grain size analysis - Heavy minerals separation - Isodynamic magnetic separation - Heavy mount and thin sections preparations - Staining techniques - Techniques for measurements of porosity and permeability of rocks - Instrumental techniques for mineral identification - X-ray Diffraction - Differential Thermal Analysis - Infrared - Instrumental methods for determination of major and trace elements - Atomic Absorption - X-ray Fluorescence - Radiometric methods and Mass Spectrometry.

GEOL 412: Hydrogeologic Modeling**2 Cr. Hr. (L1+P2)****Prerequisite: (GEOL 301)**

Definitions and Concepts - Types of Hydrogeological Models - Scope and Significance - Management of Water Resources - Assessment and Development of Water Resources - Processes - Design and Operation Requirements - Sensitivity Measurements - Forecasting Processes and Results - Case studies - Laboratory Exercises.

GEOL 413: Basin Analysis**2 Cr. Hr. (L1+P2)****Prerequisite: (GEOL 204 OR GEOL 301)**

Introduction to basin analysis - Tools of basin analysis - Sedimentary basins - Basins versus plate tectonic environment - Lithospheric mechanics - Mechanics of sedimentary basin formation - Extensional basins - Compressional and strike-slip basins - Case studies of sedimentary basins - Basin fill, Depositional styles - Evolution of sedimentary basin fill - Thermal history - Subsidence history - Seismic facies analysis - Basic seismic interpretation - Well logging analysis - Biostratigraphic analysis - facies analysis - Basin mapping methods - Tectonism and sedimentation - Sequence stratigraphy - Applications to petroleum play assessment; petroleum system and play concept.

GEOL 414: Ore Petrology**2 Cr. Hr. (L1+P2)****Prerequisite: (GEOL 304)**

Introduction - Preparation of the ore polished sections - Ore Microscope - Reflectivity and bireflectance of ore minerals - Physical and mechanical properties of ore minerals - Microchemical tests - Textures of the ore minerals (descriptive and genetic textures) - Paragenesis of mineral groups.

GEOL 415: Geoarcheology**2 Cr. Hr. (L1+P2)****Prerequisite: (GEOL 202 OR GEOL 204)**

Introduction to Geoarcheology - Composition of rock forming monuments - Composition of the bedrocks of the monuments and their stability - Environmental impacts on the monuments, chemical and mechanical weatherability of monuments, clay and salt problems (case study) - Protection of monuments against weathering - Minerals of decoration and painting of ancient times - Metals of ancient Egyptian civilization (gold, silver, copper and bronze) - Mining of ancient Egyptian methods and techniques - Geoarcheological techniques for the study and protection of cultural heritage.

GEOL 416: Prospecting and Exploration**2 Cr. Hr. (L1+P2)****Prerequisite: (GEOL 301)**

Types of sedimentary basins - Factors favoring formation of hydrocarbons in sedimentary basins - Phases of Exploration (investigative, reconnaissance, economic, and

consolidation phases) - DHI's, Methods of geophysical prospecting (gravity, magnetic, electric, and seismic) - Methods of geochemical prospecting - Interpretation of magnetic and gravity anomaly maps to delineate boundaries of sedimentary basins - Interpretation of seismic reflection profiles and surface and subsurface geologic maps to identify prospects and leads - Structure contour maps and selecting the best locations for exploratory wells - Designing a development plan of a newly discovered hydrocarbon field.

GEOL 417: Environmental Geology**2 Cr. Hr. (L1+P2)****Prerequisite: (GEOL 301)**

Introduction and definitions - Concepts of environmental geology - Geological sites and processes - Mineral resources and environmental impacts - Natural hazards - Climate change - Pollution - Waste disposal - Methods of disposal and site selections - environmental impacts of mining and the extractive industries - Medical problems related to geology and ecosystem interaction - Land evaluation and site assessment - Techniques used to monitor human-geosphere interactions: field mapping, GIS, remote sensing and geochemical techniques - Developing solutions or management plans for environmental problems.

GEOL 418: Hydrogeochemistry**2 Cr. Hr. (L1+P2)****Prerequisite: (GEOL 304)**

Definitions and Concepts - Groundwater Aquifers - Sources and Origin - Flow Routes - Chemical Components of Ground Water - Rock interactions - Destructive and Constructive Impacts - Graphical Representations - Hydrogeochemical Classifications and Functions - Quality Assessment for Human Uses - Laboratory Exercises.

GEOL 419: Principles Remote Sensing**2 Cr. Hr. (L1+P2)****Prerequisite: (GEOL 101)**

Fundamentals of RS - Energy, Sensor, and Platforms - Aircraft and Satellites - Active and Passive RS - Electro Magnetic Radiation (EMR), interactions and scattering - Visible, Infra-Red (IR), Near IR, Middle IR, Thermal IR and Microwave - Planck's and Stefan-Boltzman laws - Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy - Reflectance and Specular and Diffuse Reflection Surfaces - Spectral Signature - Imaging spectrometry and spectral characteristics - Optical and Microwave RS - Satellites, Orbits and Purpose - Satellite Sensors and Resolution - Description of Multi Spectral Scanning - Description of Sensors in Landsat, SPOT, IRS series - Radar - Geometrical characteristics - Sonar remote sensing systems.

GEOL 420: Principles of Mining Geology**1 Cr. Hr. (L1+P1)****Prerequisite: (GEOL 322)**

Introduction - Exploration program - Sampling of ore body - Indicators of ores - Types of ore reserves - Types of mining and mine features - Calculations of average assay - tonnage-grade relationship - Mine safety and mine gases - Mine pollutions and impact of mines on environment.

GEOL 421: Geology of Egypt**4 Cr. Hr. (L3+P3)****Prerequisite: (GEOL 326)****Precambrian Rocks of Egypt**

Distribution of basement rocks in Egypt - Tectonic evolution of basement rocks - Classification of the basement rocks of Egypt: geosynclinal versus plate tectonic model classifications - The basement rock units of Egypt: Gneisses and migmatites, ophiolites-melanges, metasediments, arc-metavolcanics, arc-granitoids, Dokhan volcanics, Hammamat Sediments, Felsites, Younger gabbros, Younger granites and post-granite dykes - Mineral deposits and ornamental stones in the Basement complex - Phanerozoic plutonism and volcanicity.

Phanerozoic Rocks of Egypt

Tectonic framework of Egypt - The Paleozoic surface exposures and subsurface successions in Sinai, the Eastern Desert and the Western Desert of Egypt - The Triassic at Areif El-Naga, other exposures and subsurface sections - The Jurassic exposures in Northern Sinai and the Gulf of Suez region - The distribution and stratigraphical Paleontology of the Cretaceous rocks in Egypt - The Paleocene exposures in Egypt - The Eocene rocks in Sinai, the Western Desert, the Eastern Desert and the Nile Valley of Egypt - The Oligocene facies in Egypt - The Neogene stratigraphy of Egypt - the Quaternary in Egypt - Subsurface stratigraphy of oil fields in Egypt.

GEOL 422: Principles of Engineering Geology

2 Cr. Hr. (L1+P2)

Prerequisite: (GEOL 301)

Engineering soils and rocks - Atterberg limits - Engineering classification of soils - Engineering classification of rocks - Mechanical properties of sedimentary, igneous, and metamorphic rocks - Site investigation techniques - Slope stability theories.

GEOL 423: Geostatistics

2Cr. Hr. (L1+T2)

Prerequisite: (GEOL 101)

Definitions - Sampling methods and related problems - Summarizing Data - Graphical Data Analysis - Describing Uncertainty - Hypothesis tests - Differences between two independent groups - Comparing several independent groups - Correlation - Simple linear regression - Alternative methods to regression - Multiple linear regression - Trend analysis - Methods for data below the reporting limit - Discrete relationships - Regression for discrete responses - Presentation graphics - Probability.

GEOL 425: Organic Geochemistry

2 Cr. Hr. (L1+P2)

Prerequisite: (GEOL 204)

Introduction - Petroleum: oil and natural gases - Sources of natural gases - Organic facies and organic matter transformation - The carbon cycle and the factors influencing organic richness - Organic chemistry: Names and structures - Kerogen formation, composition and maturation - Compounds present in bitumen and oil (general and specific compounds) - Factors affecting composition of bitumen and kerogen - Biomarkers (Tools for correlation) - Analytical techniques: Bitumen and Kerogen analyses - Principles of source rock evaluation - Interpretation of source rock data - Effect of biodegradation, water washing, cracking and deasphalting on oil in reservoirs - Predicting thermal maturation through constructing geochemical models

GEOL 430: Mineral Processing

2 Cr. Hr. (L1+P2)

Prerequisite: (GEOL 322)

Introduction - Material balance and flowsheet - Comminution - Crushing - Grinding - Liberation - Screening - Classification - Physical separation methods: gravity separation, magnetic separation, electrostatic separation, froth flotation and miscellaneous separation

methods - Mixing, Thickening and filtration - Drying, -Building materials: aggregates and cement - Ceramic raw materials: Kaolin and feldspars - Refractories: acidic and basic- Metallurgy: steel and copper.

GEOL 431: Concepts of Sequence Stratigraphy

2 Cr. Hr. (L1+P3)

Prerequisite: (GEOL 204)

Definition and development of Sequence Stratigraphy - Depositional sequences and time significance - Accommodation and shoreline shifts - Milankovic theory, sedimentary cycles and global sea-level curve - Methods of sequence stratigraphic analysis - Types of stratigraphic sequences - Systems tracts - Parasequences and parasequence sets - Sequence models - Time attributes of different stratigraphic surfaces - Sequence stratigraphy in hydrocarbon exploration.

GEOL 432: Geochemical Prospecting

2 Cr. Hr. (L1+P2)

Prerequisite: (GEOL 304)

Definitions - Forms of ore mineral deposits - Geochemical principles and processes creating anomalies - Geochemical dispersion of elements and formation of dispersion halos - Geochemical provinces - Modern developments in understanding geochemical systems and techniques applied to mineral exploration - Stages of geochemical prospecting - Field equipments and analytical methods of geochemical prospecting - Use of technical and geochemical calculations in geochemical prospecting - Methods of planning and execution of complete exploration programs - Interpretation of geochemical data and preparation of geological and geochemical exploration reports.

Courses Contents of the Geophysics Department

GEOP 401: Plate Tectonics and Geophysics

2 Cr. Hr. (L1+P2)

Prerequisite: (-) For Geophysics Program

Types of tectonic plates, Internal structure of the earth, continental drift theory, plate tectonics theory, origin of the earth's magnetic field, magnetic reversals and stripping, sea floor-spreading, and ocean floor mapping, concentration and distribution of the earthquakes and volcanic activities. Types of plate boundaries, continental margins, island and volcanic arcs. Causes of plate motion, sources of heat within the earth, convection cells, radioactive decay, and residual heat. Extraterrestrial plate tectonics. Applications of plate tectonics.

GEOP 402: Earthquake Seismology

3 Cr. Hr. (L2+P3)

Prerequisite: (-) For Geophysics Program

Introduction - Different definitions of Earthquake – Different Earthquake parameters – the Birth of an earthquake – internal Structure of the earth - Elastic waves - Seismic deformation and Distribution of seismic wave velocities in the earth's interior. Propagation paths and Earthquakes classification - Recording systems – estimation of the Earthquake parameters (epicenter location, Depth of focus, and origin time determination, Magnitude and Seismic moment). Earthquake intensity scales - Earthquake Magnitude - and energy. Frequency-magnitude relationship - First motion – Seismo-tectonic brief of Egypt - Earthquake hazard assessment - Site effect Soil liquefaction.

GEOP 403: Petroleum Systems

3 Cr. Hr. (L2+P2)

Prerequisite: (GEOP 305) For Geophysics Program

The principles of the petroleum system comprising hydrocarbon play concept, source rocks, maturation, migration, reservoirs, traps, and seals. Outline of exploration and production techniques in the petroleum industry. The principles related to evaluating potential reservoirs and the environmental and economical impact of the utilization of the fossil fuels and the possible alternative fuel resources.

GEOP 404: Mining Geophysics

2 Cr. Hr. (L1+P2)

Prerequisite: (-) For Geophysics and Geology-Geophysics Programs

Mining and Geophysics. Magnetic and gravity methods (background, susceptibilities and densities of ores and minerals, induced and remnant magnetization). Electrical and Electromagnetic methods (classification of galvanic and inductive tools, resistivities of ores and minerals, depth of investigation, modern technologies, and case histories). Seismic methods (generation and registration of seismic waves, depth of investigation, modern reflection/refraction technologies, and case histories). Thermal and radiometric methods (thermal conductivities and radioactivities, depth of investigation, and case histories). Borehole airborne and satellite applications. Combination of geophysical methods and better answers. Egyptian mining Geophysics.

GEOP 405: Well Logging-2

3 Cr. Hr. (L2+P2)

Prerequisite: (GEOP 305) For Geophysics Program

Introduction and Definition. Reservoir pressure test analysis; RFT, MDT, RDT and their applications. While drilling logging; LWD and MWD; GEOVISION. Cased hole tools; CHDT, TDT, RST, ECS and CBL. NMR, CMR and MRIL tools and their applications. Imaging tools; FMI, FMS, OBMI, RAB, UBI and their applications.

GEOP 406: Seismic Data interpretation

3 Cr. Hr. (L2+P3)

Prerequisite: (-) For Geophysics Program

Introduction, identify a horizon, tie a loop, ways to identify, pick intersected lines, put on map, work an area, shot point location map, base map, time structure map, depth map, Methods for measuring seismic wave velocities, their representation and applications. Time corrections, processing, and correlation of field records. Resolution and precision of reflection measurements, composition of reflections, synthetic seismograms, precision of seismic reflection times. Reflection seismic data over geologic structures. Picking reflectors, tying, and construction of time structural and the converted depth structural maps. Advanced 3D seismic interpretation, time slices, depth slices, gentle dip, steep dip, faults, narrowing, widening, structural lows and structural highs.

GEOP 407: Research Essay

2 Cr. Hr. (L0+P4)

Prerequisite: (-) For Geophysics Program

According to the course objectives.

GEOP 408: Research Project

2 Cr. Hr. (L0+P4)

Prerequisite: (-) For Geophysics Program

Field measurements, data processing, interpretation, conclusions, and references.

GEOP 409: Seismic Stratigraphy

2 Cr. Hr. (L1+P3)

Prerequisite: (-) For Geophysics Program

Wiggles, traces, seismic section, pick a reflection horizon, identify a horizon, tie a loop, tie loop by loop, ways to identify, pick intersected lines, many reflections, put on map, work an area, contouring techniques, shot point location map, base map, time structure map depth

map, interpret structures, anticlines, faults, synclines salt domes, diapirs, basement structures. Advanced 3D seismic interpretation, time slices, depth slices, gentle dip, steep dip, faults, narrowing, widening, structural lows and structural highs.

GEOP 410: Dynamics of Petroleum Reservoirs Fluids **2 Cr. Hr. (L1+P2)**

Prerequisite: (-) For Geophysics and Geology-Geophysics Programs

Hydrodynamics genesis of geochemical anomalies hydrocarbon leakage. Oil entrapment by hydrodynamics of compaction and radioactivity mapping techniques. Geostatic equilibrium and compaction and fluid relationships. Well log methods for estimating formation pressures. Well log methods for estimating formation pressures. Introduction to hydrodynamics of infiltration and water driving forces. Delineating hydrodynamics traps. Procedure for hydrodynamics entrapment mapping. Projective technique to find hydrocarbon-water contacts. Hydrodynamic flushing. Determining fresh water flushing from logs. Hydro-osmotic studies in thin shaly sands: reservoir characteristics. Reservoir acidisation. Hydraulic fracturing. Plotting pressure-depth curves. Interpretation of the pressure-depth curves.

GEOP 411: Potential Field Data Interpretation **2 Cr. Hr. (L1+P3)**

Prerequisite: (-) For Geophysics Program

Potential Field Methods (Gravity-Magnetic-Electrical). Gravity interpretation Methods. Magnetic interpretation Method. Electrical and electromagnetic data interpretation Methods. Integrative Potential Field Methods. Case Studies Part 3 Multi-dimensional Inverse and Forward Modeling of Potential-field data.

GEOP 412: Geological Application on Well Logging **2 Cr. Hr. (L1+P2)**

Prerequisite: (GEOP 305) for Geophysics program, and (GEOP 313) for Geology-Geophysics program. For Geophysics and Geology-Geophysics Programs

The course describes all aspects of the principles and methods associated with the geological interpretation of open-hole well logs. The class deals with both well-established and newer, more sophisticated tools, showing how log data can be used to determine lithology and interpret facies, stratigraphic and structural features.

GEOP 413: Seismic Data Processing **3 Cr. Hr. (L2+P3)**

Prerequisite: (GEOP 311) For Geophysics Program

Seismic data formats and field acquisition standard SEG Y format. Seismic data multiplexing and demultiplexing. reformatting Seismic data to internal Industry format. Trace editing for noisy data (filtering, omitting, polarity reversal, notch filtering ...). Refraction and elevation statics, Noise removal techniques, (FK filters, Frequency filtering). Deconvolution (Spiking and predictive and the mathematics of the inverse filter). Velocity analysis (Constant Velocity Panels, Constant Velocity Stacks and correlation methods). Seismic migration (principles and characteristics). Data delivery in standard SEG Y format.

GEOP 414: Inversion Theory **2 Cr. Hr. (L1+P2)**

Prerequisite: (-) For Geophysics Program

Principles. Forward modeling algorithms, data and model vectors. Inverse model resolution and uncertainties. A plausible earth model. Non-linear problem in Geophysics. N-dimensional (data) and M-dimensional (model parameter) Euclidean spaces. Forward calculation, objective function and error minimization. Model update and $N \times M$ Jacobian (model resolution/sensitivity) matrix. Inversion as optimization (non-linear problem regularization and model discretization). Marquardt-Levenberg (Layered-earth) Inversion Scheme and

singular-value decomposition (SVD). The least-square fitting and 'Gauss-Newton' solution. Inversion as optimization. Modeling the nearby-topography. One-dimensional (1D) and multi-dimensional (MD) earth inversions. Inversion applications for different field geophysical data sets.

GEOP 415: Well Logging

2 Cr. Hr. (L1+P3)

Prerequisite: (GEOP 313) For Geology-Geophysics Program

Introduction and Definition. Principles and applications of electric logs used for definition of permeable zones and shale content; SP, GRL and CL. Principles and applications of porosity logging tools; Density, Sonic and Neutron logs. Principles and applications of Resistivity logs; Conventional, logs, Focused current electric logs, Induction logs Micro logging devices. Principles and applications of production monitoring logs; TDT. Logging interpretations of clean reservoir rocks; Porosity types, formation water resistivity, coefficients of water and hydrocarbon saturations. Lithology interpretations. Logging interpretations of shaly reservoir rocks; Formation water resistivity, porosity types and coefficients of water and hydrocarbon saturations. Lithology interpretation.

GEOP 416: Formation Evaluation

3 Cr. Hr. (L2+P2)

Prerequisite: (GEOP 305) for Geophysics program, and (GEOP 313) for Geology-Geophysics program. For Geophysics and Geology-Geophysics Programs

Introduction & Definition. Determination of volume of shale content (Vsh), by using single and double-curves of clay indicators analytically or graphically. Evaluation of the types of shale distribution in reservoir rocks. Estimation of total and effective porosities either analytically or graphically of clean and shaly rocks. Determination water saturations (Sw and Sxo). Hydrocarbon saturations (Sh, Shm and Shr) for clean and shaly reservoir by using graphically and analytically techniques. Determination of lithologic types by using analytical techniques through simultaneous equations or graphical techniques through different types of crossplots. Source rock evaluation.

GEOP 417: Seismic Data Interpretation Techniques

3 Cr. Hr. (L2+P3)

Prerequisite: (GEOP 315) For Geology-Geophysics Program

Introduction, identify a horizon, tie a loop, ways to identify, pick intersected lines, put on map, work an area, shot point location map, base map, time structure map, depth map, Methods for measuring seismic wave velocities, their representation and applications. Time corrections, processing, and correlation of field records. Resolution and precision of reflection measurements, composition of reflections, synthetic seismograms, precision of seismic reflection times. Reflection seismic data over geologic structures. Picking reflectors, tying, and construction of time structural and the converted depth structural maps. Reflection seismic data as a tool for lithologic and stratigraphic studies, depositional history, stratigraphic traps, environments of deposition.

GEOP 418: Bases of Paleomagnetism

2 Cr. Hr. (L1+P2)

Prerequisite: (GEOP 204) For Geology-Geophysics Program

Introduction to geomagnetism - Rock magnetism - Natural remnant magnetization (NRM) - Field sampling and laboratory measurements - Statistical analysis and paleo-magnetic poles: Geochronology, paleogeography and global tectonics - Paleomagnetism in Egypt.

GEOP 419: Hydrodynamics

2 Cr. Hr. (L1+P3)

Prerequisite: (GEOP 208) For Geology-Geophysics Program

Introduction and Definitions - Sedimentary basin formation and its applications in hydrocarbon prospecting - Fundamentals of sedimentary basins - The mechanics of sedimentary basin formation - Evolution of basins - Subsidence history - Thermal history - The concepts, objectives, criteria and applications of fluid mechanics in hydrocarbon prospecting - Hydrodynamic of compaction - Oil entrapment potential - Geostatic equilibrium - Formation pressure - Shale compaction effects - Geological significance of abnormal pressures - Applications of overpressure detection - Hydrodynamics of infiltration - Well logs as hydrodynamic potential measuring devices - Delineating hydrodynamic traps - Procedure for hydrodynamic entrapment mapping.

GEOP 431: Petrophysics

1 Cr. Hr. (L1+P1)

Prerequisite: (GEOP 102) For Geology Program

Introduction and definitions. Principles of porosity of rocks. Principles of permeability of rocks. Specific and relative permeability of rocks. Principles of electric resistivity of rocks. Factors affecting resistivity of reservoir rocks. Specific weight and density of rocks. Factors affecting; mineral composition, porosity and water saturation. Diffusion adsorption activity of rocks. Relation with lithologic composition. Sonic properties. Isotropic and Anisotropic rocks. Factors affecting velocity of sound wave propagation.

GEOP 433: Well logging

2 Cr. Hr. (L1+P2)

Prerequisite: (GEOP 102) For Geology Program

Introduction and definitions. Principles and applications of electric logs used for definition of permeable zones and shale content; SP, GRL and CL. Principles and applications of porosity logging tools; Density, Sonic and Neutron logs. Principles and applications of Resistivity logs; Conventional, logs, Focused current electric logs, Induction logs Micro logging devices. Principles and applications of production monitoring logs; TDT. Logging interpretations of clean reservoir rocks; Porosity types, formation water resistivity, coefficients of water and hydrocarbon saturations. Lithology interpretations. Logging interpretations of shaly reservoir rocks; Formation water resistivity, porosity types and coefficients of water and hydrocarbon saturations. Lithology interpretation.

COMP 420: Computer applications in chemistry 2Cr.Hr (L1+P 2)

Prerequisite: (-)

This course provides an introduction to solve problems using a computer. The course teaches how real-world problems in Chemistry can be solved computationally using a computer programming language such as C++ or some Mathematical packages such as MATLAB. For example, topics of MATLAB include simple operations and working with variables, matrices, access matrix elements, matrix operations, relational and logical operators, plotting in two-dimensions, plotting in three-dimensions, interpolation, MATLAB functions, input / output and data management.