



# BSc. Biological Science

### Details Of Syllabus – Course Description Year ONE Semester ONE

#### **BIOL 151 Cell structure**

The basic structure of cells and macromolecules and the techniques used in their study including light and electron microscopy, X-ray diffraction and scanning probe microscopy. It introduces the historical development of cell biology. Light Microscopic Techniques. Electron Microscopy. Specialised Microscopic Techniques. Scanning Probe Microscopy and X-ray Diffraction. It also explores Cell Membranes, The Endomembrane System, Chloroplast and Mitochondria, Cytoskeleton and Cell junctions, Extracellular Matrix, Cell Fractionation and Chemical Analysis.

#### **BIOL 153 Introductory Genetics**

Introduction to Heredity, Preformation, Epigenesis, Pangenesis and Lamarckism.

Mendelism: Independent assortment, Factors which influence Mendelian ratios. Types of chromosome, Chromosome abnormalities and human disease. Meiosis and gene segregation with examples of human genetic disorders. Sex determination and sex-linked genes. Production of Genetic maps. Human genetics-pedigree analysis. Genetic Counselling.

#### **BIOL 155 Plant Morphology and Anatomy**

The aim of this course is to review pre-tertiary studies in plant sciences. Origin and development of various plant cells and tissues. Beginning of tissue organisation, primary and secondary growth, tissue systems. Structure, types and modification of roots, stems and leaves. Structure types of inflorescence, flowers, various fruits and seeds.

#### **BIOL 157 Biological Chemistry I**

The structure and properties of matter, origin of elements, evolution of living organisms from chemical systems, Bond formation and molecules. Laws of thermodynamics, Steady state kinetics, Reaction kinetics, various functional groups of organic molecules and their biological roles. Carbohydrates (Structure and properties of mono-, di- and polysaccharides).

#### **BIOL 159 Principles of Systematics**

Definitions and perspective, goals of taxonomy, Short history of taxonomy, Contributions of systematics to biology. Functions and principles of classification, Botanical and zoological nomenclature, Identification, Taxonomic literature and Recent techniques in taxonomy. Interrelationships of various species. Survey of plant and animal kingdoms.

**MATH 157 Algebra**

Elementary set theory, Indices and logarithms, Exponential functions, Trigonometric function, Sequences and series, Quadratic equations, Permutations and combinations, Binomial theorem, Matrices and Determinants.

**ENGL 157 Communication Skills I**

An introduction to parts of speech: nouns and pronouns, verbs, voice and tense, adjectives and adverbs, conjugations, prepositions and interjections. Concord, the article, direct and indirect speech, the sentence, punctuation and paragraphing.

**Year ONE Semester TWO****BIOL 152 Cell Function**

Biological transport processes (Diusion, Osmosis, Active Transport etc.). Classes of enzymes. The role of enzymes in cells, Basic enzyme kinetics and initial rates based on Michaelis-Menten approach. Graphical plots of kinetic data: Lineweaver-Burk, Eadie Hofstee, Cornish-Bowden. Factors eecting enzyme activity, pH, temperature, inhibitors and activators. Cell nutrition; role of carbohydrates, proteins and lipids in cell nutrition. Cellular respiration. Metabolic processes – carbohydrate metabolism, energy conservation, fatty acid metabolism, protein metabolism, and nucleic acid metabolism.

**BIOL 154 Population Genetics & Evolution**

Basic concepts of population genetics, The structure and replication of DNA, Transcription, The genetic Code, Multiple alleles and multiple gene inheritance. Interaction of genotype and environment and their eect on the phenotype. Sex limitation and sex controls; age of phenotypic manifestation. Cytoplasmic inheritance. Human genome project.

**BIOL 156 Non-Vascular Plants**

General features, classification, structure, reproduction and life cycles of Thallophytes and bryophytes. Evolution, Economic importance, Distribution and Ecology of Thallophytes and Bryophytes and their adverse environmental impact.

**BIOL 158 Biological Chemistry II**

Introduction to amino acids: Proteins – primary, secondary, tertiary and quaternary structures. Protein denaturation, Introduction to lipids; Neutral lipids, polar lipids. Fatty acids: Structure, properties and nomenclature. Steroids and terpenes. Chemistry of bacterial cell wall and Cell wall of higher plants.

**BIOL 160 Invertebrate Zoology**

The course explores the invertebrates with emphasis on selected phyla: Phylum Coelenterata, Phylum Ctenophora, Phylum Platyhelminthes, Phylum Nemertini and Phylum Aschelminthes. Their classification, biology, adaptive radiation, phylogeny and economic importance. The protista concept.

**MATH 158 Calculus**

Co-ordinate geometry and equation of line and Dierentiation. Integration of algebraic, trigonometric, logarithmic and exponential functions. Denite integrals and their applications to areas and volumes. Trapezoidal rule and Simpson's rule. Dierential equations.

## **ENGL 158 Communication Skills II**

The communication process, skills in communication and communication in organisations. Preparing efficient documents, the dynamics of oral communication, written communication; letters and employment correspondence. Writing of technical reports, proposals, memos and writing dissertations and long essays.

## **Year TWO Semester ONE**

### **BIOL 251 Basic Microbiology**

Introduction to the science of microbiology; Brief descriptions of nature and kinds of microorganisms (Prokaryotic and Eukaryotic microorganisms). Examples of prokaryotic: cyanobacteria, phototrophic bacteria, gliding bacteria, sheathed bacteria, budding bacteria, spirocheates helical/curved bacteria, pseudomonads and related bacteria, nitrogen fixing bacteria, coryneform bacteria, actinomycetes cell wall deficient bacteria and archeabacteria. Examples of eukaryotic bacteria: fungi, microalgae and protozoa. Introduction to bacteriophage and the nature of viruses. Structure of microorganisms; size and shape, rigidity and flexibility, storage materials, motility, etc. Nutrient and growth requirements (types of media and conditions for cultivation); physiology and kinetics of growth. Isolation and characterization of bacteria: pure culture, direct isolation and enrichment culture techniques. Classification of bacteria types based on Gram staining reactions; carbon and energy, oxygen, temperature, sporulation etc. Preservation methods for short, medium and long term purposes.

### **BIOL 253 Human Anatomy & Physiology I**

The structure in relation to the physiology of important biological functions and processes within the mammalian body. Cells and tissues in mammals. Relations of tissue structure to function. Respiratory, Cardiovascular, Immune and musculoskeletal system. Associated malfunctioning of these systems.

### **BIOL 255 Vascular Plants (2, 3, 3)**

Invasion of the land surface by plants. The major taxa of terrestrial plants. Introduction to pteridophyte groups – life cycle and ecology. Introduction to spermatophyte groups – life cycle, significance of seed, continental drift and evolution. Introductory palynology.

### **BIOL 259 Plant Growth & Development (2, 3, 3)**

Types of seeds and their structure, seed longevity, seed dormancy, seed germination and quiescence. Phytochrome. Definitions of growth, growth kinetics, cellular differentiation, morphogenesis, development and Phyllotaxis. Regulation of growth and development by plant hormones. Tissue culture, apical dominance, abscission and root initiation. Hormone herbicides and other herbicides. Fruit formation, parthenocarpy. Some factors affecting growth and development: soil, light and gravity.

### **CSM 183 Introduction to Computers I (2, 3, 3)**

Introduction to computers and computing, processing device, input/output devices, application software. Introduction to Windows: the basics, working with windows, file management in Windows XP, managing files with the computer, using the online help and support, introduction to the internet. Introduction to Word document, formatting, creating tables and indexes, formatting tables, inserting objects, merging documents and sorting data-processing.

**ENGL 263 Literature in English I (1, 0, 1)**

Literature as poetry: What is a poem, and its characteristics? Differences between a poem and a song. The genre of speech and the literary device. Practical Appreciation. Texts to be studied: selected African and English poems. Literature as Drama: What is a play, and its characteristics?

Drama as Theatre. Shakespeare. The Modern Play. Texts to be studied: One Shakespeare play and one Modern African Play.

**Electives****FC 181 French for Communication Purposes I (2, 0, 2)**

Aspect Grammatical: La définition et genre d'un objet; l'identité d'une personne; Les jours de la semaine; Les mois de l'année; Les chiffres de zéro à cent. La conjugaison: Le présent de l'indicatif des verbes réguliers et irréguliers. Interrogation avec les suivants: Est-ce-que; Par inversion, Par intonation. L'adjectif: possessif; démonstratif. L'heure et le temps; Localisation; L'emploi de; Le pluriel de noms et d'adjectifs. L'aspect communicatif: faire connaissance/rencontrer quelqu'un. Civilisation; La culture française.

**SOC 251 Introduction to Sociology I (3, 0, 3)**

Analysis of the concept of sociology, the sociological orientation and the social sciences. Context for the origin of sociology. Origins of sociology (contributions of Comte, Durkheim, Spencer, Marx and Webber). Sociological Methods: Research and methods and techniques of data collection. Focus on key terms and concepts in sociology. Socialization (Man in Nature versus man in society). Inequalities in society.

**Year TWO Semester TWO****BIOL 252 Microbial Ecology (2, 3, 3)**

An introduction to the natural environments of microorganisms: the atmospheric, terrestrial and the aquatic environments with emphasis on their composition and structure, physicochemical conditions affecting microbial activities, structure for growth, energy flow, macro- and microhabitats. Microorganisms of extreme environments: low water potential, extreme temperatures, extreme pH values, extreme hydrostatic pressure and at low nutrient concentration and high UV light radiation. Biomes. Strategies for survival: role of stationary phase, spore formation and entry into the viable but non-cultivable stage. Dispersal of microorganisms and development of microbial populations: dispersal, colonisation and successions, population establishment, natural selection and adaptations. Interactions involving microorganisms: microbe-microbe, microbe-plant (metabolic associations, antagonisms, the phytosphere, rhizosphere, mycorrhiza, root nodule systems and plant pathogens), microbe-animal (symbiotic, saprophytic and pathogenic).

**BIOL 254 Human Anatomy & Physiology II (2, 3, 3)**

Urinary systems, excretion and osmoregulation. Disorders of salt and water balance. Heat balance and regulation of body temperature. Nervous and endocrine systems – the nerve impulse. Neuromuscular transmission. Functions of the endocrine glands and neuroendocrine integration.

**BIOL 256 Whole Plant Physiology (2, 3, 3)**

Water relations of plants – the ascent of sap, stress, stress physiology, plant moisture stress, plant processes sensitive to water stress, plant productivity and water stress. Free energy and chemical potential. Water potential. Role of water and auxin in cell enlargement. Mechanism of stomatal action. Absorption of mineral salts. Translocation of solutes. Physiology of flowering: the stage of ‘ripeness to flower’ and ‘earliness’, morphological stages in the transformation of a vegetative to a floral meristem. Photoperiodism and flowering. Vernalization

**BIOL 258 Principles of Ecology I (2, 3, 3)**

Introduction to Ecosystems. Dynamic interrelationships of plant and animal communities with their environments. Theoretical background and methods of estimating primary and secondary production in plants and animals. Ecological energetics; populations within ecosystems. Man and his habitat. Biogeochemical cycles.

**CSM 184 Introduction to Computers II (2, 3, 3)**

Introduction to Microsoft Excel; creating a worksheet, entering data in cells, editing, saving, creating a workbook, formatting a worksheet, working with lists, printing a worksheet. Introduction to Microsoft Access; introduction to database, creating database files, creating tables, creating forms, adding titles and graphs to forms, creating queries, creating reports, defining relationships in Access database, viewing existing relationships between tables.

**ENGL 264 Literature in English II (1, 0, 1)**

**Continuation of ENGL 263. Literature as Narrative.** Traditional (19th Century) Narrative. Contemporary Narrative. The African Novel. Texts to be studied: One African Novel and One English Novel.

**Electives**

**FC 182 French for Communication Purposes II (2, 0, 2)** L'aspect grammatical: L'article partitif; la conjugaison; pronominalisation, l'expression gée avec le verbe avoir et être. Degree de l'adjectif; l'expression de la durée, l'expression interrogative avec les adverbs suivants. L'aspect communicative: Au restaurant, invitation, le voyage, remplir une carte, chercher un appartement, correspondance. Civilisation; la culture française.

**SOC 252 Introduction to Sociology II (3, 0, 3)**

The nature and functions of social institutions. Institutions in comparative perspectives. Family, Kingship and marriage patterns. Religion as a social institution. Political arrangements. Education, employment opportunities and the world of work. Population structure, social change and social problems and their management.

**Year THREE Semester ONE****BIOL 351 Chordate Development & Evolution I (2, 3, 3)**

Historical concepts about development and evolution from Aristotle to Darwin. Links between embryology and phylogeny-Von Baer's and Haeckel's laws. Protochordates as a bridge between the advance invertebrates and the chordates. Origin of chordates and vertebrates. Adaptive radiation in vertebrates.

Spermatogenesis and oogenesis. Early chordate development-cleavage, blastulation, gastrulation and neurulation.

### **BIOL 353 Principles of Ecology II (2, 3, 3)**

Plant community development, history of origin and evolution of the community. Community organisation: structure and composition, destructive and non-destructive measures for studying plant and animal communities. Major types of biomes: tundra, taiga, chaparral, deciduous forest, grassland and tropical forest. Ecological survey of the West African vegetation types; wetlands, savannahs, sahel and humid tropical forest; their distribution and the status of their exploitation. Application of ecological concepts to management of animal populations. Human population ecology.

### **BIOL 355 Entomology (2, 3, 3)**

Introduction to insects: characteristics and identification, success and abundance, economic importance in relation to man. The biology and ecology of insects. Characteristic features and economic importance of the following orders of insects: Thysanura, Collembola, Orthoptera, Isoptera, Zoraptera, Ephemeropelta, Odonata, Plecoptera, Psocoptera, Mallophaga, Embioptera, Thysanoptera, Anoplura, Hemiptera, Homoptera, Desmaptera, Neusoaptera, Coleoptera, Strepsiptera, Mecoptera, Trichoptera, Lepidoptera, Diptera, Siphonaptera and Hymenoptera. Principles of control of insects: Physical, chemical and biological.

### **BCHEM 365 Biophysics (3, 0, 3)**

Sedimentation techniques; theory, forces involved and types of sedimentation techniques. Applications of sedimentation. Electrophoresis - theory and equipment used. Applications of electrophoresis. Electrical phenomena and electro-chemistry.

### **BCHEM 471 Immunology (3, 0, 3)**

Introduction to the immune response: Different types of immunity. Cells and tissues of the immune system. Antibodies: Generation of antibody diversity: Immunoglobins gene structure and rearrangement. Antibody structure and function. Measurement and Production of antibodies in vitro, monoclonal antibodies.

Uses of antibodies in modern research. Immune response: Production of antibodies in vivo: B-cells. Killing mechanisms I:- The complement system. Recognition of Target: The Major Histocompatibility Complex. Killing mechanisms II:- T-cells and the T-cell receptor. How the system deals with immune challenges eg. bacteria, viruses and parasites. Failure of the immune response: Immunodeficiencies and autoimmunity. Transplantation and HIV.

### **MATH 153 Statistical Methods I (2, 0, 2)**

Introduction to Basic concepts; notation, tables and charts and Organisation of Data. Measures of location: Mean, Median, Mode, Percentile for grouped and ungrouped data and Graphical estimation. Measures of dispersion: ranges, mean, deviation, variance and standard deviation skewness and kurtosis. Probability, probability distributions, random variables and the normal distribution.

## **Electives**

### **LAW 151 Law of Contract I (3, 0, 3)**

Nature of contract; sources of law, concept of bargain and classification. Formation of contract; offer and acceptance, consideration, intention to create legal relations. Contents of contract, terms, representation, excluding and limiting terms and fundamental breach of terms. Capacity; infants, illiterates, co-operations, mental patients and drunken persons.

### **MGT 471 Principles of Management I (3, 0, 3)**

The objective of this course is to equip students, without basic knowledge in management, with the tools of decision-making, organization and management of decision-making, organization and management of firms and organization. It covers: Nature and scope of management; managerial functions, organizational theories; goals of business organization – economic and social responsibilities of management; decision-making techniques and influence; nature and types of organization and their implications for organizational administration.

## **Year THREE Semester TWO**

### **BIOL 352 Chordate Development & Evolution II (2, 3, 3)**

Organogenesis in amphibians and the chick. Morphogenesis and comparative anatomy of selected vertebrate systems (at least 4 systems in any year). Origin of life and modern synthetic theory of evolution. Evolution of Man. Theories governing development-Principles,

Morphogenetic fields, Pattern formation and Control of development

### **BIOL 354 Plant Metabolism (2, 3, 3)**

Photosynthesis: discovery, evidence that photosynthesis is a several stage process, source of oxygen produced and the light and dark reactions. Respiration. Nitrogen metabolism: forms of nitrogen available to plants, nitrate reduction, relationship of nitrate reduction to respiration and photosynthesis, assimilation of ammonium into organic compounds, protein synthesis and nitrogen cycle. Mineral nutrition: water culture experiments, roles of mineral nutrients in plant metabolism and symptoms of mineral deficiency.

### **BIOL 356 Economic Entomology & Pest Control (2, 3, 3)**

Life cycles of selected insects of economic and medical importance. Insect vectors of human diseases – Simulium damnosum, Mosquitoes (Anopheles sp., Aedes sp. and Culex sp.), Glossina sp. Human diseases such as Malaria, Filariasis, Yellow fever, Onchocerciasis, Trypanosomiasis, Dengue fever. Mode of transmission, symptoms and treatment. Control of the vectors must be emphasised.

Numerical change in insect populations. Theories to explain insect numbers. Life system concept. Ecological basis for pest control. Methods of pest control and the concept of integrated pest management (IPM). This should be discussed with respect to insect pests of agricultural importance.

### **BIOL 358 Mycology (2, 3, 3)**

General features of fungi: the vegetative body, non-mycelial and mycelial thalli. The fungal hypha; its branching, fusion and septation. Specialised somatic structures: how the basic filament is modified for absorption, attachment, exploration and invasion. Habitat, modes of life and nutrition (parasites,

saprophytes, lichens and mycorrhizas), life cycle (perfect and imperfect state), sex and sexual compatibility (monoecious and dioecious forms and homothallism and heterothallism). Reproduction in fungi:

asexual reproduction; fission of somatic cells, fragmentation of mycelium, production of asexual spores. Sexual reproduction; plasmogamy, karyogamy and meiosis. A review of life cycles, somatic and reproductive structures and processes in reproduction of selected fungi to illustrate the reasons for the different taxonomic groupings. The classification adopted is a modification of Ainsworth (1966). The exploitation of fungi by man in the food and chemical industries. Mushroom farming in Ghana.

### **BIOL 360 Molecular Biology (2, 3, 3)**

An introduction to genetic notations, conventions and terminology. Prokaryotic chromosomal DNA: structure and function, Plasmid DNA structure, functions, host range, compatibility and copy number regulations. Phage DNA structure, infection, replication and function. Classes of RNA: synthesis, structure, function, phylogenetic significance, mutagenesis, mutations and mutant types, notations, biochemical basis of mutants. Mutagens: spontaneous base analogue, chemical mutagen, intercalating agents, mutator genes, spontaneous types of mutations; inversion, translocation, missense, nonsense, frameshift, deletion, insertion etc. Reversion and revertants. Transgenics: conjugation, transformation and transduction.

### **MATH 154 Statistical Methods II (2, 0, 2)**

Central ideas of estimation, confidence intervals and hypothesis tests. To perform sensible statistical analyses using the computer package SPSS and to report the results of analysis effectively. Large sample estimation; large sample tests of hypothesis; small sample tests. Hypothesis tests (including test of association for tables). Experimental design and Analysis of Variance. Regression and Correlation. Multiple regression. Discrete distributions. Tackling non-standard problems (including data transformations). Overview and tips on writing statistical analyses.

## **Electives**

### **LAW 152 Law of Contract II (3, 0, 3)**

Vitiating elements of a contract; mistake, misrepresentation, duress, illegality and unenforceable contracts. Privity of contract; rules and exceptions. Discharge of contract, by performance, agreement, breach and frustration. Remedies/damages; equitable remedies in outline only, quantum merit claims and quasi contract.

### **MGT 472 Principles of Management II (3, 0, 3)**

Organizational behaviour/human relations-interpersonal and group processes; the application of concepts, like leadership, motivation, communication, morale, to the management of people and organization, time management, analysis of causes of change, managing change, innovation, management control.

## **Year FOUR Semester ONE**

### **BIOL 451 Gene Expression, Modification & Genetic Engineering**

**(2, 3, 3)**

Organisation of eukaryotic genome and the way in which gene expression is regulated. Bacterial gene expression. Transcription-promoter and structure and consensus sequences. Regulation of the lac and trp operons. Eukaryotic gene expression. The structure of chromatin. Eukaryotic RNA polymerases. Promoters and enhancers. Transcription factors. Post transcriptional events. Translational control. The control of gene expression during differentiation of eukaryote. Signal transduction.

Receptors, second messengers and effectors. Causes of Cancer.

Genetic analysis in bacteria: isolation and construction of mutants. Genetic and physical mapping of mutants. Restriction endonucleases and recombinant DNA. Complex vectors for cloning and expression: YACs, cosmids,  $\lambda$  phagemids, riboprobe type vectors, plus examples of expression vectors for various host systems. Cloning strategies: genomic, cDNA, enrichment, positional, functional and cloning by PCR. In vitro mutagenesis and protein engineering: Methods of site directed mutagenesis to include phosphorothioate and methylation selection, exon III deletions, and PCR-directed mutagenesis. Gene transfer and expression in eukaryotes: Transfer methods into yeast, animal and plant cells to include calcium phosphate precipitation, PEG-induced fusion, electroporation, lipofection and microprojectile bombardment. Expression of transiently and stably inherited genes. Gene targeting in plants and animals: homologous recombination, antisense oligodeoxyribonucleotides and RNAs, ribozymes. Gene therapy in Man: Advances including ethical and legislative considerations.

**BIOL 457 Food & Industrial Microbiology (2, 3, 3)**

The scope of Food Microbiology – Food spoilage, Preservation, Food safety, Fermentation, Microbiological Quality Assurance.

Microorganisms and Food Materials – Diversity of habitat – Air, Soil, Water, Plants and Animals. The Microbiology of Food Preservation – Canning, Pasteurisation, Irradiation, Freezing, Packaging, Chemical preservatives. Spoilage (decay and disease). Food Microbiology and public Health. Bacterial and Non-bacterial agents of foodborne illness. Microbes as food – mushrooms, algae, single cell protein (bacteria, yeasts). Microbes in food production – cheese, yoghurt, bread, beer, wine, vinegar, soy sauce and Ghanaian fermented foods – Kenkey, koose, koko, banku etc. Methods for the microbiological examination of foods. Controlling the microbiological quality of foods.

**BIOL 459 Human Reproductive & Neuroendocrine Functions (2, 3, 3)**

The brain, spinal cord; parts of the brain and their functions; blood-brain barrier. Cerebral circulation and the factors affecting; cerebral circulation, cerebrospinal fluid, peripheral nervous system, sensory receptors, sensory coding, spinal reflexes, somatosensory system, sensory pathways, pain and motorpathways. Reproduction; the male reproductive system, spermatogenesis, sperm maturation, storage and capacitation, endocrine function of testis and abnormalities of testicular function. Female reproductive system; oogenesis, menstrual cycle, ovarian and uterine cycles, control of menstrual cycle, disorders of menstrual cycle, ovarian hormones, puberty, climacteric/menopause, human sexual response, pregnancy, fertilisation and implantation, placental functions, hormonal changes during pregnancy and parturition. Disorders in fertility.

### **BIOL 461 Animal Behaviour (2, 3, 3)**

Denition. Methods and Problems: the ethological approach – characteristics, strengths and weaknesses; Brief outline of the classical ethological theory; Modern study of behaviour. Behavioural specializations: Sensory capacities and limitations; Motor specialisations – levels of structure and behaviour. Behavioural inventories: Self maintenance – securing food, defence, etc; Species maintenance or reproductive behaviour, mating, parental care. Social Behaviour: Aggregations, Communication. Organisation of Behaviour: Stimulus response mechanisms. Discrimination; Oriented movements – taxis. Motivation – Spontaneous behaviour, Drive. Ontogeny of behaviour: Instinct/inherited behaviour; Learning behaviour; Intelligence; Consciousness. Rhythms of behaviour – adaptive significance. Applied ethology.

### **BIOL 463 Aquatic Ecology (2, 3, 3)**

The freshwater environment-physical, chemical and biological characteristics of standing and running waters. Methods of determining physico-chemical factors in the freshwater environments: temperature, density, dissolved oxygen, Biochemical oxygen demand, free carbon dioxide, pH, total dissolved solids, total solids, colour, turbidity, transparency, salinity, nitrates, ammonia, phosphates and hydrogen sulphide. Freshwater plants and animals-distribution and adaptations. Community structure and dynamics in lakes and rivers. Productivity of lakes, nutrient cycling and eutrophication.

## **Year FOUR Semester TWO**

### **BIOL 452 Biodiversity Conservation & Utilization (2, 3, 3)**

Definitions and current status. Biodiversity and a gene pool. Preservation value of biodiversity. Human dependence on biodiversity. Domesticated biota: indigenous and exotic. Introduction to some basic concepts of biological diversity, how it is organised in the natural world, what threatens it and what the costs and benefits of sustaining ecosystems might be. Renewable and non-renewable resources of the earth; conservation and development aims. Human activities and loss of biodiversity with special reference to tropical ecosystems and Ghana's communities. Conservation principles and strategies; case studies of the environmental and social consequences of economic development and conservation in tropical climate. Tourism. Principles and techniques of beekeeping and mushroom and snail rearing.

### **BIOL 454 Environmental Physiology (2, 3, 3)**

Principles of homeostasis. Seme-mechanisms of organisms.

Adaptation-denitions, adaptations to special environments – desert region, cold region, high altitude, and aquatic environment. Hibernation, aestivation, diapause. Respiration, osmoregulation and excretion. Buoyancy and Diving. Biological rhythms.

### **BIOL 455/456 Research Project I & II (0, 24, 6)**

A project will be captured in a thesis that will be a detailed written report on a research carried out independently by individual students over a period of two semesters. Project titles are selected with reference to the research interest and capabilities of sta. Main objectives – use of literature, learning of research techniques, an appreciation of the nature of biological problems and their solution - devising appropriate experiments and/or planning sets of interventions,

requiring careful observation, data collection, analysis, discussion and drawing of appropriate conclusions. Projects should preferably be professionally relevant and demand-driven to enhance individual employment prospects.

### **BIOL 458 Special Topics in Biology (2, 3, 3)**

Special relevant topics in Biology would be given to students. Topics would be selected with reference to the field of specialisation and capabilities of staff.

### **Electives**

#### **BIOL 460 Parasitology (2, 3, 3)**

Basic principles, ecological and epidemiological concepts: symbiosis, phoresis, mutualism, commensalism and parasitism (endo-, ecto-, obligate, facultative, accidental, temporary, hyper). Evolution of parasitism. Host-parasite relationships/ interactions: niches, habitats, environment and distribution within hosts, reproductive potential, categories of hosts; definitive, intermediate, paratelic (transport) and reservoir hosts, host-specificity, susceptibility and resistance. Morphology and life cycle of some phyla: Protozoa – Amoeba (Entamoeba histolytica), Flagellates (Giardia, Trypanosoma), Sporozoa (Coccidia, Plasmodium, Eimeria, Toxoplasma), Platyhelminthes and Aschelminthes: Trematodes (Fasciola, Schistosoma), Cestoda (Taenia, Echinococcus), Aschelminthes/Nematodes (intestinal, blood and tissue types). Arthropoda: Arachnida (ticks, mites), Insecta (lice, fleas, bugs, flies, myiasis, parasitic hymenoptera), Crustacea (copepods). Epidemiology, diagnosis, pathogenesis, immunology, treatment and control of the diseases caused by the parasites mentioned above.

#### **BIOL 462 Fish & Fisheries Biology (2, 3, 3)**

Classification, morphology and functional anatomy of fishes. Distribution and ecology of selected groups of tropical African fishes. Dynamics of fish populations. Assessment of fish production. Growth measurement. Exploitation of fishery resources. Management of natural and cultured fish stocks. Introduction to fish disease and fish toxicology. Aquaculture.

#### **BIOL 464 Plant Pathology (2, 3, 3)**

Types of plant diseases. Study of important diseases of crops in Ghana. Morphology and germination of fungal spores. Spore liberation, dispersal and deposition in pathogenic fungi. Host-parasite interaction. Morphology and nature of virus particles. The main groups of plant pathogenic viruses. Infection of plants by viruses. Mycoplasmas. The main groups of plant pathogenic bacteria. Morphology of plant nematodes. The main groups of plant pathogenic nematodes. Ecology of plant pathogenic nematodes. Soil-borne disease. Survival and infection of plants by soil inhabiting pathogens. Epidemiology and controls of plant diseases of importance in Ghana. Formae speciales and physiological races. The gene-for-gene concept. Breeding for resistant cultivars.

#### **BIOL 466 Environmental Microbiology (2, 3, 3)**

The role of microorganisms in the cycling of bio-elements: the carbon cycle (general aspects, degradation of organic matter, degradation of fossil fuels). The nitrogen cycle (general aspects, ammonification, nitrification, dinitrogen fixation), sulphur and phosphorus cycle.

Transformation of other ions (iron, manganese, calcium, silicon etc.

Bioconversion, degradation of man-made compounds (xenobiotics). Pesticides, synthetic polymers, other recalcitrant chemicals, waste water treatments.