**Bayero University, Kano**

**Department of Biological Sciences**

**B. Sc. Applied Biology**

100 level

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title** | **Units** | **Status** | **LH** | **PH** |
| BUK-BIO 101 | Introduction to Aquatic Biology | 2 | C | 30 | - |
| BUK-BIO 102 | Induction to Information Technology in Biological Research | 3 | C | 45 | - |
|  | **Sub-Total** | **5** |  |  |  |

200 level

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title** | **Units** | **Status** | **LH** | **PH** |
| BUK-BIO 201 | Geographical Information System for Biologists | 2 | C | 15 | 45 |
| BUK-BIO 202 | Savanna/Dry Land Management | 2 | C | 15 | 45 |
| BUK-BIO 203 | Stored Products Management | 2 | E | 15 | 45 |
| BUK-MCB 233 | Biorisk Management | 2 | C | 15 | 45 |
| BUK-BIO 207 | Environmental and Pollution Biology | 2 | C | 15 | 45 |
| BUK-BOT 202 | Seedless Plants | 2 | E | 30 | - |
| BUK-ZOO 211 | Invertebrate Zoology | 2 | C | 15 | 45 |
| BUK-BCH 201 | General Biochemistry 1 | 2 | C | 30 | - |
|  | **Sub-Total** | **16** |  |  |  |

300 level

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title** | **Units** | **Status** | **LH** | **PH** |
| BUK-BIO 301 | Research Methodology | 2 | C | 15 | 45 |
| BUK-BIO 302 | Environmental Impact Assessment | 2 | C | 15 | 45 |
| BUK-BIO 303 | Ecological Survey | 2 | C | 15 | 45 |
| BUK-BIO 304 | Introduction to Ecotoxicology | 2 | C | 15 | 45 |
| BUK-BIO 305 | Introductory Nematology | 2 | C | 15 | 45 |
| BUK-BOT305 | Mycology | 2 | C | 15 | 45 |
| BUK-ZOO303 | Basic Immunology | 2 | E | 30 | - |
|  | **Sub-Total** | **14** |  |  |  |

400 level

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course Code** | **Course Title** | **Units** | **Status** | **LH** | **PH** |
| BUK-BIO 401 | Weed Biology | 2 | E | 15 | 45 |
| BUK-BIO 403 | Human and Social Biology | 2 | C | 15 | 45 |
| BUK-BIO 404 | Embryology | 3 | C | 45 | - |
| BUK-ZOO 424 | Fish Biology and Aquaculture | 2 | C | 15 | 45 |
| BUK-ZOO 407 | Ornithology | 2 | E | 15 | 45 |
|  | **Sub-Total** | **11** |  |  |  |
|  | **Grand Total** | **46** |  |  |  |

|  |  |  |
| --- | --- | --- |
| **Content** | **Remark** | **Maximum Score** |
| Institution | Bayero University, Kano | 1 |
| Faculty | Life Sciences | 1 |
| Department | Biological Sciences | 1 |
| Programme (as listed in the CCMAS) | B. Sc. Biology | 2 |
| “Indigenous”/ “Homegrown” (title, status, and contact hours) | BUK-BIO 101 **Introduction to Aquatic Biology** (Units = 2, Status = C, LH = 30, PH = -) | 5 |
| Senate-approved relevance to the vision, mission, strategic goals, uniqueness, and contextual peculiarities of the University | Training of high quality scientists that are knowledgeable in the biology of aquatic plant and animal species, who can use their knowledge to evaluate water quality, predict pollution and proper professional solutions to avert it, with the view to have sustainable and healthy aquatic environments in line with the vision, mission and strategic goals of Bayero University, Kano | 10 |
| **Overview** | The course is designed to expose students to the basic concepts of aquatic ecology as an interactive system, where different species live together and interact with one another, under the influence of biological, physical and chemical factors. These interactions may sometime have negative consequences on the dwelling aquatic organisms and even the terrestrial organisms, including human.  The course will also make the students identify eutrophication as one of the fundamental problems in aquatic ecosystems, learn how it occurs, its effect and possible control and management strategies with the view to prepare students that will play a role, where possible, towards attaining a healthy and sustainable aquatic environment for the benefit of mankind. | 10 |
| **Objectives** | The objectives of the course are to:   1. define Aquatic Biology and Aquatic Habitat 2. explain the origin and importance of aquatic habitats 3. list the major components of aquatic habitats 4. explain the major components of aquatic habitats 5. explain how biotic and abiotic components of aquatic habitats interact with each other 6. list some features of adaptation in aquatic species 7. explain some features of adaptation in aquatic species 8. classify aquatic habitats based on capacity to flow, and salinity content with relevant examples | 15 |
| Learning Outcomes | **Learning Outcomes:**  At the end of this course, students should be able to:   1. define Aquatic Biology and Aquatic Habitat 2. explain the origin and importance of aquatic habitats 3. identify biotic and abiotic factors as the major components of aquatic habitats 4. explain how biotic and abiotic components of an aquatic habitat interact with each other 5. name at least five plant and animal species and state different adaptive features they have for survival in aquatic habitats 6. classify aquatic habitats based on capacity to move, and salinity, with at least three relevant examples in each case 7. briefly explain the concept of eutrophication, its causes, effect and how it can be measured 8. briefly explain the concept of indicator species in an aquatic environment | 20 |
| Course Contents | Definition of Aquatic Biology and Aquatic Habitat. Origin of aquatic habitats. Importance of aquatic habitats. Major components of aquatic habitats. Interactions of biotic and abiotic components. Plant and animal diversity in aquatic habitats, and their adaptive features for survival. Different classifications and characteristics of aquatic habitats as lentic & lotic, freshwater & saline with examples. Eutrophication: causes, measurement, effect and its management. The concept of indicator species. | 35 |

|  |  |  |
| --- | --- | --- |
| Institution | Bayero University, Kano | 1 |
| Faculty | Life Sciences | 1 |
| Department | Biological Sciences | 1 |
| Programme (as listed in the CCMAS) | B.Sc. Biology | 2 |
| Indigenous Homegrown (title, status, and contact hours) | BUK-BIO 102 **Introduction to Information Technology in Biological Research** (Units = 3; Status= C; LH=45 | 5 |
| Senate-approved relevance to the vision, mission, strategic goals, uniqueness, and contextual peculiarities of the university | Produce graduates with the ability and skills to analyze biological data using information technology and as well prepare them for business and computer-related courses. Prepare students to apply the knowledge acquired in the development of new skills in communication (verbal and written), which play an important role in business computing and information processing. This is in line with BUK’s objective and mission to address the problem of information processing and business development.  Relevance is recognized in the ability of graduates from Applied Biology (BUK) to process biological data/information using computer and other computer-related gadgets and as well design new programs that will ease computation of biological information. | 10 |
| Overview  Learning outcomes  Course contents  Minimum Academic Standard | Computer and internet play important roles in all aspects of human life. Computer related technologies have a strong impact on the World. These will attract many students and professionals to the field of information technology. Information technology is very vital to biological sciences as it makes a great revolution in remote education, leads to a remarkable improvement in biological simulation and modeling and aids in easier and visible laboratory studies. Many information technologies, from the earliest computers to email and the Internet, have been developed for scientific applications.  The course is designed to expose students to information technology and computing/analyzing systems. Students will be introduced to biological data processing using computer and computer-related gadgets  The objectives of the course are to:   1. provide a basic knowledge of computer hardware and software. 2. introduce the students to computer software/applications used in analyzing biological data. 3. introduce the students to data collection in different biological researches. 4. introduce the various forms in which biological data is presented (tables, graphs, charts, diagrams, figures, etc.). 5. provide sufficient training on design, writing and documenting, and presentation of biological data using IT devices.   At the end of this course, students should be able to:   1. list any five primary components of a PC and their functions. 2. use some of the available software/applications in analyzing biological data. 3. appropriately collect biological data of any form. 4. Explain the two major forms of data presentation in biological research. 5. use IT devices/softwares to design, collect, present and interpret biological data.   Introduction to Information Technology in Biological Research. Overview of course objectives and expectations. Use of information technology in biological research. Introduction to databases and data types. Basic principles of data management. Introduction to statistical analysis in biological research. Introduction to genomics and bioinformatics. Overview of next-generation sequencing technology. Introduction to genome assembly, annotation, and analysis using various software and tools. Introduction to proteomics and metabolomics. Overview of mass spectrometry technology. Introduction to protein identification, quantification, and analysis using various software and tools. Introduction to computational biology and modeling. Overview of systems biology and its applications in biological research. Introduction to mathematical modeling and simulation. Introduction to ethical considerations in biological research. | 10  15  20  35 |

|  |  |  |
| --- | --- | --- |
| **Content** | **Remark** | **Maximum Score** |
| Institution | Bayero University, Kano | 1 |
| Faculty | Life Sciences | 1 |
| Department | Biological Sciences | 1 |
| Program (as listed in the CCMAS) | B. Sc. Biology | 2 |
| Indigenous Homegrown (title, status, and contact hours) | BUK-BIO 201 **Geographical Information System for Biologists** (Units = 2; Status= C; LH=15, PH=45) | 5 |
| Senate approved relevance to the vision, mission, strategic goals, uniqueness, and contextual peculiarities of the university | To train graduates that will demonstrate systematic experience and talents that are of biological values in solving problems and developmental needs of mankind and the environment. Specifically, to embrace and use the technology needed to work directly with the Nigerian society where their expertise is needed. | 10 |
| Overview | Geographic Information Systems (GIS) are aggregate tools for managing, analyzing, describing, presenting and applying information on relationships amongst features that include but not limited to location, size and shape, and their attributes. Its methods enable us to represent spatial, ecological and environmental data as a map. Now GIS has become a universal, invaluable tool across virtually all fields, including ecology, hydrobiology, conservation, forestry, etc.  This course is designed to introduce students to the basic understanding of its promises along with the capabilities. Emphasis will be placed on teaching through practical examples. Course exercises are on distributions of native vegetation, especially forested areas of Falgore, Dansoshiya Forest Reserves and Baturia Bird Sanctuary, as well as nearby spaces of ecological interests. | 10 |
| Objectives | The objectives of this course are to:   1. explain basic skills necessary to work with GIS, primarily using ESRI’s ArcGIS software 2. demonstrate to the students the use of spatial data visualization techniques 3. introduce cartography and software for the production of maps and information graphics 4. explain the concepts of GIS and its application in the Biological research 5. identify, access and use local available data sets 6. introduce skills necessary to create GIS data through global positioning system (GPS) technologies 7. identify ethical questions surrounding data creation, analysis and representation | 15 |
| Learning Outcomes | At the end of the course, the students should be able to:   1. demonstrate familiarity with attributes of spatial data, as well as software use 2. demonstrate handling skill for managing spatial data 3. complete tasks in cartography and maps development 4. explain the applications in GIS management and visualization tasks 5. recognize local data sets and deploy them for biological research 6. create own data sets using GIS tools 7. resolve ethical social and ethical issues pertaining to GIS projects | 20 |
| Course contents | Overview of GIS - concept of GIS, including Vector and raster systems, Scale and resolution, Map projections and coordinate systems. Applications of GIS, its purpose and scope and basics of cartographic design. Focus on identifying sources of GIS data and elements of Metadata, Georeferencing and Global Positioning Systems (GPS), converting digital data to a uniform projection and scale and Vector-to-raster and raster-to-vector data conversions, error propagation. Introduction should include building GIS Tools, user needs assessment, Database design and management, Fundamentals of data storage, Database management, Input of data with GPS  Digitizing, scanning, editing and output, as well as, Cartographic and GIS Data Structures, Spatial Analysis, Laboratory content should include fundamental geographic concepts, introductory training in the use of ArcGIS Software, applying programming with GIS Software, Data Visualization: Frames and Themes, Relational Database Management and uses of Important GIS data types. | 35 |
| Minimum Academic Standard | **Equipment, Software, Instruction and Space**  Personal computer or laptop for each student enrolled  Individual or group licensed software – GIS mapping Software - Esri’s ArcGIS Pro, Maps and QGIS; Imagery and Visualization Software – Abaqus, AutoCAD, Rhino7; Data Analysis Software – Mathematica, Stata17, R&RStudio  Field Cameras  Smart phones  Stereoscopes  GIS database, preferable local  Internet service  Digitizers  Mapping grade Geographic positioning System GPS units and Digital mapping tools  Garmin  PDA, ArcPad devise and software,  Spectra Precision, Real Time Kinematic  **Academic Staff**  At least M.Sc., MS or postgraduate certification in GIS  **Technical Support Staff**  At least one computer-skilled lab attendant, with training in GIS  **Laboratories Space**  Seminar Space/per student – 2.0m2 |  |

|  |  |  |
| --- | --- | --- |
| **Content** | **Remarks** | **Maximum Score** |
| **Institution** | Bayero University, Kano | 1 |
| **Faculty** | Life Sciences | 1 |
| **Department** | Biological Sciences | 1 |
| **Programme (as listed in the CCMAS)** | B. Sc. Biology | 2 |
| **‘’Indigenous’’/’’Homegrown’’ Course (title, status and contact hours)** | BUK-BIO202 **Savanna/Dry Land Management,** (Units = 2; Status = C; LH = 15; PH = 45 | 5 |
| **Senate–approved relevance to the vision, mission, strategic goals, uniqueness and contextual peculiarities of the university** | Produce well educated and skillful graduates who have the ability to assess, maintain and conserve savanna biome. This is in line with BUK’s vision and mission to address the problems of desertification and climate change in semi-arid regions. Relevance is seen in the ability of graduates from B. Sc. Biology (BUK) to assess, provide report and develop mitigation strategies that will improve and restore the general health of savanna. | 10 |
| **Overview** | Savanna/Dry Land Management techniques are vital approaches used in improving the general health of dry lands and mitigating habitat destruction as a result of anthropogenic activities that threatens the species survival.  Savannas are critically important ecosystem with multiple ecosystem services. Lately, biodiversity and ecosystem services in savanna are degrading faster than ever before in human history. Northern Nigeria being a savanna biome highlights the importance of preparing students with the knowledge and skills on how to effectively manage and conserve the savanna. | 10 |
| **Objectives** | The objectives of the course are to:   1. introduce the students to meaning of savanna/dry land; 2. outline the different types of savanna; 3. enumerate unique characteristics of savanna; 4. explain how natural and anthropogenic activities threaten savanna animals and vegetation; 5. explain various techniques of preserving and restoring the savanna; 6. explain the consequences related to different management approaches. | 15 |
| **Learning outcomes** | At the end of this course, students should be able to:   1. describe the defining element of savanna; 2. differentiate savanna types; 3. list at least five unique characteristics of savanna and explain each of them; 4. explain at least four natural and anthropogenic activities threatening savanna animals and vegetation; 5. list and explain at least five techniques of preserving and restoring the savanna; 6. develop appropriate management strategies for conservation of savanna; 7. list advantages/disadvantages of different savanna management approaches. | 20 |
| **Course contents** | Concept and definition of savanna. Types and geographical distribution of savanna. Characteristics of the savanna; climate (temperature, precipitation, and wind), soil and nutrients, flora and fauna of the savanna Factors influencing the survival and distribution of plants and animals in the savanna (climatic, physiographic, edaphic, biotic and anthropogenic factors). Economic importance of savanna vegetation. Natural and anthropogenic activities that threaten the survival of savanna animals and vegetation (fire, flooding, drought, poaching, climate change, rising carbon dioxide, overgrazing of livestock, woody cover, excessive agriculture, conversion of land for urbanization, invasive species). Management practices (Reducing pressure on natural resources, Managing fire regimes, protection of ecosystem (avoiding actions that damage systems that are more sensitive to fire), woody encroachment reversal, management of large bodied mammal communities, grazing management, elimination of invasive species and reintroduction of native species, restoring the geomorphology and properties of the soil, defeating poachers, nurturing endangered species, mass media enlightenment, watershed restoration, inter-seeding as needed, swidden fallow, enrichment of species (planting and transplanting), increased soil fertility, driving of game and protection of self sustaining natural ecosystem from interference by modern human. | 35 |
| **Minimum Academic Standards** |  |  |

|  |  |  |
| --- | --- | --- |
| Content | Remarks | **Maximum Score** |
| Institution | Bayero University, Kano | 1 |
| Faculty | Life Sciences | 1 |
| Department | Biological Sciences | 1 |
| Programme (as listed in the CCMAS) | B. Sc. Biology | 2 |
| Indigenous Homegrown (title, status, and contact hours) | BUK-BIO 203 **Stored Products Management** (2 Units; Elective; L=15, P=45 | 5 |
| Senate-approved relevance to the vision, mission, strategic goals, uniqueness, and contextual peculiarities of the university | To produce graduates with the ability and skills to store and preserve food products. Prepare students to apply the knowledge gained to real situations through preservation and storage management, with the vision, mission and strategic goals of Bayero University, Kano, to address the problem of deterioration of food products. Relevance is recognized in the ability of graduates from Applied Biology (BUK) to conduct researches that are related to food management, insect pests survey that causes damage to stored products. | 10 |
|  |  |  |
| Overview  Objectives  Learning outcomes  Course contents  Minimum Academic Standard | Stored products management is a study that will guide the students on how to learned about ways of storing products to avoid spoilage and perishing due to some factors.  The course is designed to expose students on how to manage stored products, how to control pests and diseases, how to set rules and regulations guiding the management of the products  This emphasizes the need of training students with the knowledge of managing products and skills in Applied Biology to store their products, manage the products, controls pests and diseases affecting the products in semi-arid Nigeria.  The objectives of the course are to:   1. define stored products 2. identify and explain the factors affecting food storage 3. introduce students to the concept of shelf life and factors affecting it 4. identify pests associated with stored products and their effect 5. introduce students to the basic knowledge of fish, fruits and grains management 6. train the students on the application of Integrated Pest Management of stored products   At the end of the course, the students should be able to:   1. list and explain at least five types of stored products 2. list and explain at least five factors affecting stored products, how they affect the quality of the products 3. define shelf life of stored products, 4. list the two types of shelf life, 5. explain at least four effects of the factors affecting shelf life of foods 6. identify and explain at least five different food storage techniques, 7. explain different pest management practices   Stored products, Types of stored products, Stored product management (Definition). Factors affecting stored products, Shelf life, Types of shelf life, Factors affecting shelf life of stored products, Effect of shelf life on stored products. Pests of stored products, Types of pests, Control Stored insect pests. Integrated Pest Management of Stored Products. Fish/Fruit/Grain storage management. Development of Storage Techniques. Sampling, Inspecting and Grading. Quarantine, plant quarantine (grains), Fish, vegetables and Fruits quarantine. | 10  15  20  35 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Institution** | Bayero University, Kano | | 1 |
| **Faculty** | Life Sciences | | 1 |
| **Department** | Biological Sciences | | 1 |
| **Programme (as listed in the CCMAS)** | B. Sc. Biology | | 2 |
| **‘’Indigenous’’/’’Homegrown’’ Course (Title, status and contact hours)** | BUK-BIO 207 **Environmental and Pollution Biology,** (2 Units; Status = C; LH = 15; PH = 45) | | 5 |
| **Senate-approved relevance to Vision, Mission, Strategic goals, Uniqueness and Contextual peculiarities of the University** | Training of high-quality graduates who are highly skilled and knowledgeable in the field of Pollution, types and its impact on Ecosystem at large especially in densely populated human habitations like urban Kano and its peri-urban neighborhood. It is imperative to know that knowledge on the health and ecological effects of air, soil/land and water pollution will improve the capacity of graduates of Applied Biology in terms of contribution to societal development. Relevance is seen in public health and environmental sanitation knowledge and expertise of Applied Biologists from BUK who will greatly contribute in the project of implementing pollution control strategies in the society and industries. These values are in agreement with vision and mission of BUK of addressing ecological problems which is as a result of exponential waste generation experienced in overpopulated urban habitations like Kano and its peri-urban neighborhood. | | 10 |
| **Overview** | Pollution Biology study is vital in the area of assessment and control of pollution in our environment. It is well known that pollution is posing an ecological and health risks to humans and the entire Ecosystem especially in the sub-saharan Africa (Nigeria inclusive).  This course is designed to expose students to the types of pollution; sources of pollution; impact of pollution on biota; pollution control strategies; techniques of testing pollution and interpretation of results. | | 10 |
| **Objectives** | The objectives of the Course are to:   1. describe the basic concepts of pollution; 2. enumerate and explain types of pollution; 3. explain the impact of pollution on biota; 4. introduce students to various sampling techniques. 5. explain pollution control measures and strategies. | | 15 |
| **Learning Outcomes** | At the end of this Course, students should be able to:   1. explain basic concepts of pollution; 2. enumerate and differentiate the three major types of pollution; 3. list and explain at least five impact of pollution on biota 4. conduct pollution testing related to air, water and land/soil, and interpret results; 5. proffer at least three solutions/ways of controlling pollution in each case; 6. explain the 3Rs (Recycle, Re-use and Reduce use) of pollution control. | | 20 |
| **Course Contents** | Introduction to the basic concepts of pollution. Types of pollution (air, water and land/soil). Sources of pollution. Types of pollutants. Impact of pollution on biota. Climate change, flooding, drought, precipitation, pesticides, eutrophication, acid rain, ozone layer depletion, etc. Techniques of testing pollution. Pollution control and strategies. | | 35 |
| **Minimum Academic Standards** |  | |  |
| Content | Remarks | Maximum score | |
| Institution | Bayero University, Kano | 1 | |
| Faculty | Life Sciences | 1 | |
| Department | Biological Sciences | 1 | |
| Programme (as listed in the CCMAS) | B. Sc. Biology | 2 | |
| Indigenous Homegrown (title, status, and contact hours) | BUK-MCB 233 **Biorisk Management** (2CU; Status = C; LH = 15; PH = 45) | 5 | |
| Senate-approved relevance to the vision, mission, strategic goals, uniqueness, and contextual peculiarities of the university | Training of high quality graduates who are highly skilled and knowledgeable in biorisk management is in agreement with BUK’s mission in producing microbiology graduates with vast knowledge on global health security. Relevance is seen in Microbiologists from BUK being able to develop appropriate biosafety and biosecurity programs to reduce or eliminate the risk of potential exposure to biological hazards. | 10 | |
| Overview  Objectives  Learning outcomes  Course contents  Minimum Academic Standard | Biorisk management is an important approach to prevent diseases among personnel and to protect community from harm by preventing the release of infectious agents. This highlights the importance of preparing microbiology students with the knowledge and skills on principle of biosafety and biosecurity frameworks. The course is designed to enable students learn risk assessment, risk control and biosafety program management.  Laboratory biosafety also consists of containment principles, technologies and practices implemented to prevent unintentional exposure to pathogens and toxins or their unintentional release. The course also introduces student to laboratory biosecurity measures including protection, control and accountability for valuable biological materials within laboratories in order to prevent their unauthorized access, loss, theft, misuse, diversion or intentional release.  The objectives of the course are to:  1. explain biorisk, biohazard and biosafety  2. identify biorisk, bioharzard and biosafety in laboratory, environment and health  3. assess biorisk, bioharzard and biosafety in laboratory and environment  4. describe the biorisk management framework  5. describe the techniques for biological waste management  6. discuss relevance of biorisk management in global health security framework  7. discuss biosecurity and biocontainment measures  At the end of the course, students will be able to:  1. explain at least one concept each of biorisk, biohazard and biosafety  2. identify at least three biorisk, biohazard and biosafety in laboratory,  environment and health  3. Give three distinctions of biorisk, biohazard and biosafety in  laboratory and environment  4. describe at least one framework for biorisk management  5. apply the techniques for at least two biological waste management  6. explain one relevance of biorisk management in global health security  framework  7. assess biosecurity and biocontainment measures using two relevant examples  Definition of common terms (risk, hazard, threat, biorisk, biosafety, biosecurity, biorisk management, valuable biological materials, risk assessment, risk characterization and risk mitigation). Risk associated with biological work, Biorisk management framework. Assessment, mitigation and performance (AMP) model. Basic Biosafety and Biosecurity risk assessment. Performance evaluation and its importance. Relevance of Biorisk management in global health security framework. Biological Waste and Waste Management. Record and Record Keeping, etc. Identifying Biological risk spectrum and Biological Safety and Security tools using case studies. Biosafety in Microbiology and Molecular Biology. Introduction to agents of bioterrorism. Assessment of biological hazards and risks. Biorisk Mitigation via personal protective equipment and biosafety cabinets. | 10  15  20  35 | |

|  |  |  |
| --- | --- | --- |
| Content | Remarks | Maximum score |
| Institution | Bayero University, Kano | 1 |
| Faculty | Life Sciences | 1 |
| Department | Biological Sciences | 1 |
| Programme (as listed in the CCMAS) | B,Sc Applied Biology | 2 |
| Indigenous Homegrown (title, status, and contact hours) | BUK-BOT 202  **Seedless Plants** (Units = 2; Status = Elective; LH = 30, | 5 |
| Senate- approved relevance to the vision, mission, strategic goals, uniqueness, and contextual peculiarities of the university | Training of graduates with the ability and skills to identify and understand the biology of fungi, algae and all other seedless plants. It will prepare students to recognize the major classes in seedless plants, apply the knowledge gained to real situations and relate the evolutionary sequence of seedless plants. This is in line with the vision and mission of Bayero University, Kano to lead in scientific research and education in Africa. | 10 |
| Overview | The study of non-vascular plants such as fungi, algae, bryophytes and pteridophytes will enable students to understand the morphology and reproduction of seedless plants as ancestors to seed plants in evolution.  The course is designed to expose students to essential ecological roles played by seedless plants (food spoilage, pathogens and other symbiotic relationships). | 10  15  20  35 |
| Objectives | The objectives of the course are to:  1.  explain the evolutionary sequences of seedless plants.  2. explain the evolutionary sequences of the seedless plants.  3. describe the basic structure and morphology of fungi, algae and bryophytes.  4.  identify plants that do not produce seeds.  5. explain the mode of reproduction and life cycle of seedless plants |
| Learning outcomes | At the end of the course, the students should be able to:  1. describe the basic structure of fungi, algae, bryophytes and pteridophytes;  2. relate the evolutionary sequences of the seedless plants;  3. identify plants that do not possess seeds;  4. recognize the major classes in seedless plants;  5. explain the fossils plants; and  6. summarize the general characteristics of fungi, algae, bryophytes and pteridophytes. |
| Course contents  Minimum academic standards | Morphology and reproduction of fungi. Morphology and reproduction of algae. Morphology and reproduction of bryophytes and pteridophytes. Classifications of fungi, Algae, bryophytes and Pteridophytes. General characteristics of fungi, algae, bryophyte and pteridophytes. A study on fossils of fungi, algae, bryophytes and Pteridophytes. Evolutionary sequences of the members of Thallophytes (Bacteria, fungi and bryophytes and pteridophytes) |

|  |  |  |
| --- | --- | --- |
| Content | Remarks | Maximum score |
| Institution | Bayero University, Kano | 1 |
| Faculty | Life Sciences | 1 |
| Department | Biological Sciences | 1 |
| Programme (as listed in the CCMAS) | B.Sc. Biology | 2 |
| Indigenous Homegrown (title, status, and contact hours) | BUK-ZOO 211 **Invertebrate Zoology** (2 Units; Core; L = 15, PH =45 | 5 |
| Senate approved relevance to the vision, mission, strategic goals, uniqueness, and contextual peculiarities of the university | Training of high-quality graduates with sound knowledge on the most diverse group of animals on earth is in line with the University’s objective and mission. The students shall apply the knowledge gained on the functional role of invertebrate group in the natural environment and human society. | 10 |
| Overview  Objectives  Learning Outcomes  Course Contents  Minimum Academic Standard | The course introduces students to the diversity of invertebrates, which are the vast majority of all animals on the planet. It covers the development, adult anatomy, biology and evolutionary relationships of the main animal phyla including Porifera, Coelenterate, Platyhelminths, Nematoda, Entoprocta, Nemertinea, Acanthocephala, and Rotifera  The objectives of the course are to:  1.explain the diversity of lower invertebrates  2.state the classification of lower invertebrates  3. explain the morphology, life cycle and physiology of lower invertebrates  4. study the evolutionary origin of lower invertebrate  5. compare and contrast the morphology, life cycle and physiology of different lower invertebrates’ groups  At the end of the course, the students should be able to:  1. describe the variety of lower invertebrate animals  2. explain the evolutionary origin and diversity of lower invertebrate  3. compare and contrast the morphology, life cycle and physiology of different lower invertebrates’ groups;  4. have practical experiences in laboratory and field conditions, to identify lower invertebrate taxonomic groups; and  5. communicate the role of invertebrates in the evolution of animal life to specialist and non-specialist audiences.  Introduction to the diversity of lower invertebrates. Classification of lower invertebrates. Morphology life cycle and physiology of lower invertebrates. Identification of lower invertebrates. The systematics, inter-relationship, and basic organization of the lower invertebrates, of the Phylum Protozoa, Porifera, Coelenterate, Platyhelminths, Nematoda, Entoprocta, Nemertinea, Acanthocephala, and Rotifera. | 10  15  20  35 |

|  |  |  |
| --- | --- | --- |
| Content | Remarks |  |
| Institution | Bayero University, Kano | 1 |
| Faculty | Life Sciences | 1 |
| Department | Biological Sciences | 1 |
| Programme (as listed in the CCMAS) | B. Sc. Biology | 2 |
| Indigenous Homegrown (title, status, and contact hours) | BUK-BCH 201 **General Biochemistry I** (Units = 2; Status= Core; LH=30, PH= -) | 5 |
| Senate-approved relevance to the vision, mission, strategic goals, uniqueness, and contextual peculiarities of the university | Produce graduates with the ability and skills to explain the biochemical processes in living cells of plants and animals.  Relevance is recognized in the ability of graduates from Applied Biology (BUK) to explain the chemical processes occurring in living organisms. | 10 |
| Overview  Objectives  Learning outcomes  Course contents  Minimum Academic Standard | Biochemistry is designed to enable graduates acquire broad based knowledge on chemical processes in living organisms ranging from single to multi- cellular organisms, both plants and animals.  Biochemistry provides broad based education that explains chemical processes that take place in living organisms and the causes of various deviations, which can invariably lead to pathological conditions. It also provides basis for manipulation of normal processes to achieve desired outcome.  The course is designed to expose students to basic chemical processes that take place in living cells.  The objectives of the course are to:   1. provide students with a broad and balanced foundation of biochemical knowledge; 2. develop in students the ability to apply knowledge and skills to solving basic theoretical problems in Biochemistry; 3. develop in students, a range of transferable skills that are of value in Biochemistry and related fields. 4. provide students with knowledge and skills base from which they can proceed to further studies in specialized areas of Biochemistry or multi-disciplinary areas involving Biochemistry; 5. provide, through training and orientation, an appreciation of the rewards of inter- and multidisciplinary approach to the solution of complex life problems; and 6. generate in students an appreciation of the importance of Biochemistry in industrial, economic, environmental, technological and social development.   At the end of this course, students should be able to:   1. explain the structure of different macromolecules in biological system; 2. identify types of chemical reactions involving these macromolecules; 3. explain the various methods of isolation of these macromolecules; 4. estimate the effects of acids and alkalis on the macromolecules; 5. describe purification of macromolecules; and 6. discuss quantification of the various macromolecules.   Introductory chemistry of amino acids, their properties, reactions and biological functions. Classification of amino acids: neutral, basic and acidic; polar and non-polar; essential and nonessential amino acids. Peptides. Introductory chemistry and classification of proteins. Biological functions of proteins. Methods of their isolation, purification and identification. Primary, secondary, tertiary and quaternary structures of proteins. Basic principles of tests for proteins and amino acids. Introductory chemistry of carbohydrates, lipids and nucleic acids. Nomenclature of nucleosides and nucleotides, effects of acid and alkali on hydrolysis of nucleic acids. | 10  15  20  35 |

|  |  |  |
| --- | --- | --- |
| **Content** | **Remarks** | **Maximum score** |
| Institution | Bayero University, Kano | 1 |
| Faculty | Life Sciences | 1 |
| Department | Biological Sciences | 1 |
| Programme (as listed in the CCMAS) | B.Sc. Biology | 2 |
| Indigenous Homegrown (title, status, and contact hours) | BUK-BIO 301 **Research Methodology** (2 Units; Core; LH = 15, PH = 45 | 5 |
| Senate-approved relevance to the vision, mission, strategic goals, uniqueness, and contextual peculiarities of the university | Training of high-quality graduates who are highly skilled and exposed to conducting researches in the field of biology. The students shall apply the knowledge gained for their research projects and other scientific investigations. This is in line with BUK’s vision and mission | 10 |
| Overview  Objectives  Learning Outcomes  Course Contents  Minimum Academic Standard | Research methodology is a scientific method that involves technique for investigating phenomena through experimentation. It gives a clear idea on the methods or processes to be used, as well as discuss the research problems in order to be addressed. It is an important element to research studies as it clarifies all the needed steps to achieve research objectives.  The course is designed to expose students to various sampling techniques and tools available to conduct research in, and prepare reports of their finding in a standardized manner.  The objectives of the course are to:   1. explain the meaning, types and ethics of scientific research 2. review research problems and hypotheses 3. explain the various sampling techniques 4. develop the basics of writing scientific literature review, research proposal and research project 5. review the standard referencing styles in academic writing   At the end of the course, the students should be able to:   1. describe quantitative and qualitative approaches to research 2. develop research problems and hypotheses 3. state and explain at least five sampling techniques 4. demonstrate skills in scientific writing, literature review, research proposal and research project 5. use standard referencing and citation styles in academic writing   Introduction to research and research ethics, Types of research: quantitative and qualitative research, Formulating research problems and hypotheses, Null and alternative hypothesis, Literature review, Sources of literature review (journals, theses, dissertations, conference papers, books, on line sources, etc.). Sampling techniques, Simple Research design, types of research design (complete block design, randomized block design). Technique of research writing, Research writing skills. Referencing and citation. | 10  15  20  35 |

|  |  |  |
| --- | --- | --- |
| **Content** | **Remark** | **Maximum Score** |
| Institution | Bayero University, Kano | 1 |
| Faculty | Life Sciences | 1 |
| Department | Biological Sciences | 1 |
| Programme (as listed in the CCMAS) | B.Sc. Biology | 2 |
| Indigenous Homegrown (title, status, and contact hours) | BUK-BIO 302 **Environmental Impact Assessment** (Units = 2; Status = Core; LH = 15, PH = 45 | 5 |
| Senate approved relevance to the vision, mission, strategic goals, uniqueness and contextual peculiarities of the University | EIA is more than technical reports; it is a means to a larger intention – the protection and improvement of the environmental quality of life. It is a procedure to identify and evaluate the effects of activities (mainly human) on the environment - natural and social. It is not a single specific analytical method or technique, but uses many approaches as appropriate to the problem. EIA is not a science but uses many sciences in an integrated inter-disciplinary manner, evaluating phenomenon and relationships as they occur in the real world. This course captures mission and vision of Bayero University as an integrated system of functional education that is in line with the values and aspirations of its host community, the nation, Africa and beyond. | 10 |
| Course overview | This course introduces the methodology of Environmental Impact Assessment (EIA) as a vital tool for sound environmental decision-making. It provides an introduction to the concepts, methods, issues and various stages of the EIA process. The various stages of the EIA process, such as screening, scoping, EIA document preparation, public involvement, review and assessment, monitoring and auditing, appeal rights and decision-making are examined. The course mainly focuses on EIA in northern Nigeria. The variability of EIA systems within Nigeria and other countries is highlighted. | 10 |
| Objectives of the course | The objectives of the course are to:  1.explain the concept and basic process of environmental  impact assessment.  2.explain the methodologies of conducting environmental impact assessment (Scoping, Baseline data collection for air, surface water, soil and ground water, noise), biological (habitat and non-habitat), cultural (historic, archaeological, visual).  3. describe the processes of assessing impact and impact prediction using Leopard Matrix.  4. explain the processes of stakeholder engagement in environmental impact assessment.  5. explain the process of writing environmental impact assessment report. | 15 |
| Learning outcomes | At the end of the course, the students should be able to:  1. explain the major principles of Environmental Impact Assessment in Nigeria.  2. state the five steps of conducting Environmental Impact Assessment.  3. demonstrate how Leopard Matrix is used in impact prediction in EIA  4. undertake liaising process with stakeholders in the EIA process.  5. prepare simple EIA report. | 20 |
| Course contents | Definitions of terms of EIA like screening, alternatives, preliminary assessment, scoping, mitigation, monitoring. History of EIA, EIA process – identification, prediction and assessment. EIA process in Nigeria - the Department of Petroleum Resources (DPR) ACT (1969), the Federal Ministry of Environment(FMENV), Environmental Impact Assessment Act, 1992, Decree 86, the Town and Country Planning Decree 88(1992). EIA techniques-scoping-baseline studies, checklists, matrices, and network diagrams involving stakeholders. The proponents, the regulators and the community. EIA evaluation. Other types of assessment - State of the Environment (SOE), Integrated Environmental Assessment and Reporting (IEA) etc. EIA case studies in practice. | 35 |
| Minimum academic standards | Understanding the systematic identification and evaluation of the potential effects on the physical, biological, cultural, and socioeconomic components of the environment of proposed actions—projects, plans, programs, legislation |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Content | | Remarks | | Maximum score |
| Institution | | Bayero University, Kano | | 1 |
| Faculty | | Life Sciences | | 1 |
| Department | | Biological Sciences | | 1 |
| Programme (as listed in the CCMAS) | | B.Sc. Biology | | 2 |
| Indigenous Homegrown (title, status, and contact hours) | | BUK-BIO 303 **Ecological Survey** (2 Units; Core; LH = 15, PH = 45 | | 5 |
| Senate approved relevance to the vision, mission, strategic goals, uniqueness, and contextual peculiarities of the university | | Produce graduates with the ability and skills to conduct phase one habitat surveys and prepare environmental reports. Prepare students to apply the knowledge gained to real situations (case studies) through biological conservation and ecosystem management examples. This is in line with BUK’s objective and mission to address the problem of biodiversity conservation and ecosystem management in a semi-arid environment. Relevance is recognized in the ability of graduates from Applied Biology (BUK) to conduct phase one habitat surveys, prepare a report and recommend strategies to reduce biodiversity loss and improve ecosystem management. | | 10 |
| Overview  Objectives  Learning outcomes | | Ecological surveys through phase one habitat surveys of terrestrial and aquatic habitats are essential in reducing biodiversity loss and improving the ecosystem due to habitat fragmentation as a result of urbanization and climate change in semi-arid Nigeria. This emphasizes the need of training students with the knowledge of ecological surveys and skills in Applied Biology to protect biodiversity and protect the ecosystem in semi-arid Nigeria.  The course is designed to expose students to essential skills and knowledge to conduct an ecological survey and prepare ecological survey reports.  Retrieve, select and critically analyze information and standards from a variety of sources that are relevant to problems in the field of Biology and Ecosystem Management. Demonstrate knowledge of specific methods and techniques for habitat survey and management of ecosystems. Demonstrate a critical understanding and reasoning of application of scientific methods in biodiversity conservation and ecosystem management.  The objective of the course are to:   1. explain the concept and basic principles of ecological survey. 2. introduce the students to the different sampling strategies for phase habitat survey. 3. explain the approaches to surveying vegetation, mammals, reptiles and birds. 4. train the students on the application of phase one habitat survey in terrestrial and aquatic environment. 5. review the basic and standard protocol for writing ecological survey reports.   At the end of this course students should be able to:   1. list the basic principles of ecological survey 2. outline different sampling strategies for phase habitat survey 3. demonstrate skills for the survey of mammals, reptiles, birds and vegetation 4. state the application of different techniques for the phase one habitat survey. 5. develop basic ecological survey report writing skills. | | 10  15  20 |
| Course contents | | Introduction to Phase I habitat survey. Basic considerations. Defining the principles, Designing a sampling strategy or protocol: Standard protocols, random, systematic and stratified samples. Line transects and quadrats. Mapping and trapping. Approaches to surveying vegetation (structural and floristic methods). Vegetation monitoring (permanent quadrats and vegetation mapping). Mammals and Reptiles survey. Choosing a survey technique (direct and indirect techniques) -Trapping, noosing, hand capturing, marking individuals. Birds survey techniques -passive and non-passive techniques. Birds survey design and consideration. Reporting results/reports on bird survey. | | 35 |
| **Content** | **Remarks** | | **Maximum Score** | |
| **Institution** | Bayero University, Kano | | 1 | |
| **Faculty** | Life Sciences | | 1 | |
| **Department** | Biological Sciences | | 1 | |
| **Programme (as listed in the CCMAS)** | B.Sc. Biology | | 2 | |
| **‘’Indigenous’’/’’Homegrown’’ Course (Title, status and contact hours)** | BUK-BIO 304  **Introduction to Ecotoxicology,** (2 Units; Elective; L=15;P=45 | | 5 | |
| **Senate-approved relevance to Vision, Mission, Strategic goals, Uniqueness and Contextual peculiarities of the University** | Training of high-quality graduates who are highly skilled and knowledgeable in the field of toxicology of ecotoxins that threaten the human survival and the Ecosystem at large especially in urban Kano and its closed-settled peri-urban neighborhoods. It is imperative to know that knowledge on the health and ecological effects of air, soil/land and water of ecotoxins and their movement through the environmental matrix will empower the graduates of Applied Biology in terms of contributing to the development of the society. Relevance is seen in public health and ecological capacity of Applied Biologists from BUK who will greatly contribute in the project of implementing hazard assessment of ecotoxins in cosmetics, bottled drinks, toilet products and electronics and modeling of their effects in order to understand the extent of their damage. These values are in agreement with vision and mission of BUK of addressing ecological problems that stem out of overpopulation of the urban Kano and its peri-urban neighbourhood. | | 10 | |
| **Overview** | Ecotoxicological studies are vital in the area of assessment and modeling risk of ecotoxins with the aim of solving their hazards and threats to humans and the entire ecosystems.  This course is designed to expose students on the types and sources of ecotoxins; their movement through ecological matrix; ecotoxins effects on the biochemistry and physiology of exposed organisms; acute, sub-chronic and chronic techniques and result interpretations; resistance and evaluation of toxicity; radiation biology and exposure assessment. | | 10 | |
| **Objectives** | The objectives of the Course are to:   1. describe the concept of ecotoxicity; 2. enumerate and explain types of ecotoxins; 3. conduct and interpret acute, sub-chronic and chronic toxicity tests; 4. explain the types and health effects of ecotoxins; 5. identify the preventive measures against ecotoxins. 6. list the types, sources and effects of radiation in biological systems. | | 15 | |
| **Learning Outcomes** | At the end of this Course, students should be able to:   1. differentiate the three main types and sources of ecotoxins; 2. carry out basic toxicity tests like acute, sub-chronic and chronic; 3. conduct assessment of ecotoxin along the ecological matrix and be able to draw an inference; 4. Proffer at least four solutions/ways of preventing exposure to the risk of ecotoxins; 5. state and explain at least four effects of radiation in biological system. | | 20 | |
| **Course Contents** | Types of ecotoxins. Sources of exposure to toxins - natural and man-made toxins. Toxins in the Nigerian environment. Bioassay for ecotoxins. Resistance and evaluation of toxicity. Radiation biology. Reactive Oxygen Species (ROS). Generation and health effects of ecotoxins. Toxic metals and their ecological and health effects. Endocrine disruptors - tier 1 and tier 2 testing. Mutagens and oncogens. Introduction to ecotoxigenomics. Probit analysis. Histological examinations. Use of laboratory animals in toxicity Testing. Bioaccumulators as sentinel organisms. | | 35 | |
| **Minimum Academic Standards** | Basic understanding of ecotoxicological process; types and sources of ecotoxins; physiological and biochemical markers of ecotoxin exposure; conducting toxicity tests (acute, sub-chronic and chronic) *in vitro, in vivo, ex vivo* etc.; basic histological examinations of test animals; heavy metals (toxic) analyses; types of radiation and their effects on biological system; ability to critically assess and tests ecotoxins that are endocrine disruptors; principles of tier 1 and tier 2; mutagens and oncogens and their effects on exposed organisms. | |  | |

|  |  |  |
| --- | --- | --- |
| **Content** | **Remark** | **Maximum score** |
| Institution | Bayero University, Kano | 1 |
| Faculty | Life Sciences | 1 |
| Department | Biological Sciences | 1 |
| Programme (as listed in the CCMAS) | B. Sc. Biology | 2 |
| “Indigenous”/ “Homegrown” (title, status, and contact hours) | BUK-BIO 305, **Introductory Nematology** (Units = 2, Status = C, LH = 15, PH = 45) | 5 |
| Senate-approved relevance to the vision, mission, strategic goals, uniqueness, and contextual peculiarities of the University | Training of high quality graduates, highly skilled and knowledgeable in identification of plant parasitic nematodes by using appropriate and standard techniques with the view to proffer solutions for their control, which will play a significant role towards ensuring food security at local and international levels in line with the vision, mission, strategic goals of the University, situated in the tropical region, where different crop plants are grown at both subsistence and commercial quantities. | 10 |
| Overview | The course is designed to expose students to the diversity of plant parasitic nematodes, with specific attention to those in the tropical and subtropical regions of the World, due to the economic damage they cause to crop plants and reducing the quality and quantity of food produced to feed the ever-increasing population of the World.  The knowledge acquired in the course will go a long way towards ensuring that appropriate steps are taken to reduce damages nematodes cause to below threshold levels, thus, working toward attaining global food security, especially in the tropical and subtropical regions of the World. | 10 |
| Objectives | The objectives of the course are to:   1. define the term Nematology 2. list and explain different morphological and anatomical features of Nematodes 3. introduce the students to classification of plant parasitic nematodes in the tropical and subtropical regions 4. discuss the morphology, biology, life cycle, damages caused and explain control measures against representative species of plant parasitic nematodes in the tropical and subtropical regions 5. define Nematological Technique and explain various field and laboratory techniques for studying plant parasitic nematodes associated with soil and plant tissues 6. list and explain different control measures against plant parasitic nematodes and the principles involved in each case | 15 |
| Learning Outcomes | At the end of the course, students should be able to:   1. explain the meaning of the term Nematology 2. draw, label and explain the generalized morphological and anatomical features of plant parasitic nematodes 3. classify plant parasitic nematodes in the tropical and subtropical regions into different orders, suborders, families, genera and species 4. explain the morphology, biology, life cycle, damages caused and control approaches against some representative plant parasitic nematodes of significance in the tropical and subtropical regions 5. conduct standard experiments for the collection, storage, analyses and identification of plant parasitic nematodes from soil and plant tissue samples 6. list and explain general control measures and principles involved in controlling plant parasitic nematodes associated with soil and plant tissues | 20 |
| Course Contents | Definition of Nematology. Principle characteristics of nematodes. Morphology, position and outline of classification of nematodes. Morphology, biology and life cycle of important plant parasitic nematodes of the genera *Aphelenchoides*, *Heterodera, Meloidogyne, Longidorus, Trichodorus,* etc., Economic importance and control of plant parasitic nematodes. Nematological techniques – Collection from soil, collection from plant samples. General principles and methods of controlling plant parasitic nematodes e.g. cultural, biological, chemical, physical, resistant varieties/cultivars. | 35 |

|  |  |  |
| --- | --- | --- |
| **Content** | **Remarks** | **Maximum Score** |
| **Institution** | Bayero University, Kano | 1 |
| **Faculty** | Life Sciences | 1 |
| **Department** | Biological Sciences | 1 |
| **Programme (as listed in the CCMAS)** | B. Sc. Biology | 2 |
| **‘’Indigenous’’/’’Homegrown’’ Course (Title, status and contact hours)** | BUK-BIO BOT305 **Mycology,** (2 Units; Core; L=15;P=45) | 5 |
| **Senate-approved relevance to Vision, Mission, Strategic goals, Uniqueness and Contextual peculiarities of the University** | Training of high-quality graduates who are highly skilled and knowledgeable in the study of fungi that are of economic and medical importance. It is worthy of note that knowledge on the edible and harmful fungi will build more capacity of graduates of Applied Biology in terms of contributing to the development of the society. Relevance is seen in fungal ecological and health/medical knowledge of Applied Biologists from BUK who will greatly contribute in the conduct of researches aimed at exploring the economic potentialities of edible fungi as well as addressing the damages caused by the pathogenic fungi. These values are in agreement with vision and mission of BUK of addressing problem of food security and public health impact of fungi.' | 10 |
| **Overview** | Fungi are an important organism in any ecosystem in terms of their role as saprophytes, food to many fauna and the damages they cause to plant and animals either as food spoilers or as pathogenic organisms. Their study is vital to students of Applied Biology because they are indispensable members of trophies thus carving their ecological niche as saprophytes. | 10 |
| **Objectives** | The objectives of the Course are to:  1. describe the morphology and life cycles of fungi;  2. identify fungi of economic importance;  3. enumerate and explain different classes of fungi;  4. explain metabolites and physiology of fungi;  5. mention industrial benefits of fungi;  6. classify and know fungi of medicinal importance;  7. understand classification and taxonomy of fungi; and | 15 |
| **Learning Outcomes** | At the end of the course, students should be able to:  1. identify the structure and life cycles of fungi;  2. state the economic importance of fungi;  3. explain different classes and life cycle of fungi;  4. identify metabolites of fungi;  5. describe the application of fungi in industries;  6. identify and explain fungi use for medicinal purposes;  7. explain the morphology and physiology of fungi. | 20 |
| **Course Contents** | Fungal morphology-structure of septate and coenocytic fungi. Fungal cytology Different life cycles in fungal groups, Fungal physiology. Classification of fungi. Fungal nomenclature. Characteristics of fungi. Fungi of economic importance. Metabolites of fungi, industrial uses of fungi. Fungi in medicine. | 35 |
| **Minimum Academic Standards** |  |  |

|  |  |  |
| --- | --- | --- |
| **Content** | **Remark** | **Maximum Score** |
| Institution | Bayero University, Kano | 1 |
| Faculty | Life Sciences | 1 |
| Department | Biological Sciences | 1 |
| Programme (as listed in the CCMAS) | B. Sc. Zoology | 2 |
| “Indigenous”/ “Homegrown” (title, status, and contact hours) | BUK-ZOO303 **Basic Immunology** (Units = 2; Status= E; LH=30) | 5 |
| Senate-approved relevance to the vision, mission, strategic goals, uniqueness, and contextual peculiarities of the University | Training high quality graduates who are skilled and knowledgeable in trials, tracking pathogens that are either resistant or able to produce substances with immunological properties in Nigeria are in agreement with BUK's mission to address Africa’s developmental challenges in diseases causation, diseases establishment and multiple approaches of containing pathogens. Relevance is seen in Zoologists from BUK being able to learn host defense mechanisms, defects in system resulting in host vulnerability, the role of innate and adaptive immunity, immunogenicity, antigenicity and immunological assays, for effective control of pathogens. | 10 |
| Overview | Immunology is the study of cells and proteins that function to protect the skin, respiratory passages, intestinal tract and other areas from foreign antigens, such as microbes, cancer cells and toxins. Basic immunology exposes students to basic terms in immunological studies, the mechanisms of immune response as well as the various techniques used in immunological assays.  The course is anchored by theoretical/ conceptual framework and, application of the knowledge gained to solve problems affecting immune complexes. | 10 |
| Objectives | The objectives are to:  1. define the concept of immunology;  2. discuss immunogen, antigen, antibody, haptens, epitopes and adjuvant;   1. explain the immune system cells and organs; 2. discuss active and passive immunity; 3. explain mechanisms of the immune response; 4. describe immunological assays and the use of immunological reagents as experimental tools. | 15 |
| Learning Outcomes | At the completion of this course. students should be able to:   1. define at least five concepts of immunology; 2. discuss the at least one principle each of immunogen, antigen, antibody, haptens, epitopes and adjuvant; 3. explain at least ten immune system cells and organs; 4. discuss three methods of both active and passive immunity; 5. explain at least three mechanisms of the immune response; 6. describe at least two principle of immunological assays and the use of immunological reagents as experimental tools. | 20 |
| Course Contents | Immunology and immunological terms. Immunogen. Antigens. Antibody. Haptens. Epitopes. Adjuvant. T-Dependent antigens. T-Independent antigens. Hapten carrier adducts. Mechanisms of protein binding. Methods of hapten conjugation. Cells and Organs of the immune system. Active immune immune system. Passive immune system. Cellular immunity. Humoral immunity. Immunogenicity. Antigenicity. Immunological assays. | 35 |
| Minimum Academic standard |  |  |

|  |  |  |
| --- | --- | --- |
| Content | Remarks | **Maximum Score** |
| Institution | Bayero University, Kano | 1 |
| Faculty | Life Sciences | 1 |
| Department | Biological Sciences | 1 |
| Programme (as listed in the CCMAS) | B. Sc. Biology | 2 |
| Indigenous Homegrown (title, status, and contact hours) | BUK-BIO 401 **Weed Biology** (Units = 2; Status C; LH =30) | 5 |
| Senate- approved relevance to the vision, mission, strategic goals, uniqueness, and contextual peculiarities of the university | Training of graduates with the ability and skills to identify and understand the biology and ecology of weed plants and their economic importance to the environment. This is in line with BUK's objectives and mission to address the problem of weed in our aquatic environment and agricultural area in semi arid region. Graduate of Applied Biology (BUK) can take part in weed management and recommend strategies to weed control in the semi arid region. | 10 |
| Overview | The course is designed to expose students to essential skills and knowledge of weed seed production, growth characteristics and weed management strategies. | 10 |
| Objectives | The objectives of the course are to:  1.  introduce the students to the concept of weed plant species.  2. explain the process of weed seed dissemination.  3.  identify growth characteristics of weed plants  4. identify the major classes of weed plants, based on their life cycle and reproduction.  5. explain the processes of weed management | 15 |
| Learning outcomes | At the end of the course, the students should be able to:  1. describe at least five weed plant species and their structures.  2. explain the three major classes of weed species based on their life cycle  3.list and explain at least four conditions favourable for weed germination.  5. explain at least five ecological roles of weed plants in an ecosystem.  6. list and explain at least three processes of weed management. | 20 |
| Course contents |  | 35 |
|  | An introduction to weed plants. Classification of weed plants (annuals, biennials and perennials). Biodiversity of weeds. Growth characteristics of weed (grasses, broadleaf, ferns and herbaceous or woody weeds). Weed seed production. Weed dissemination (seed dormancy). Conditions favourable for weed germination. Processes of weed germination. Weeds of semi arid zones. Weed-crop competition. Economic importance of weeds. Ecological roles of weeds. Weed management. Weed control - biological, chemical and cultural). |  |
| Minimum Academic Standard |  |  |

|  |  |  |
| --- | --- | --- |
| **Content** | **Remarks** | **Maximum Score** |
| **Institution** | Bayero University, Kano | 1 |
| **Faculty** | Life Sciences | 1 |
| **Department** | Biological Sciences | 1 |
| **Programme (as listed in the CCMAS)** | B. Sc. Biology | 2 |
| **‘’Indigenous’’/’’Homegrown’’ Course (Title, status and contact hours)** | BUK-BIO 403  **Human and Social Biology, (**2 Units; Core; L=15; PH= 45) | 5 |
| **Senate-approved relevance to Vision, Mission, Strategic goals, Uniqueness and Contextual peculiarities of the University** | Training of high-quality graduates who are highly skilled and knowledgeable in the field of relationship between Sociobiology, lifestyle and health. The knowledge that is drawn from this Course will enhance capacities of graduates of Biology in terms of contributing to the development of the society. Relevance is seen in public health, hygiene and psycho-social enlightenment of Biologist from Bayero University, Kano. These values are in agreement with vision and mission of BUK of broadening the scope of graduates of Biology to compete favourably in the society and industry. | 10 |
| **Overview** | Human and social biology study is vital in the areas of nutrition, current public health problems, personal hygiene and environmental sanitation, lifestyle and health relationship. The course will change the behavior of the students in the knowledge of the relationship between nature and nurture in modifying human lifestyle.  This course is designed to expose students on the types of food, macro and micronutrients, personal hygiene and cleanliness, genetic disorders and pedigree analysis, basic principles of vital signs and measurement, impact of climate as well as issues on emerging and re-emerging diseases. | 10 |
| **Objectives** | The objectives of the Course are to:   1. describe the basic principle of nature and nurture interaction; 2. enumerate and explain types of foods, nutrient content and their functions; 3. explain the impact of climate change and issues of emerging and re-emerging diseases; 4. explain genetic disorders and design of the Pedigree chart; 5. measure and evaluate vital signs; 6. explain the principles of hygiene and environmental sanitation | 15 |
| **Learning Outcomes** | At the end of this Course, students should be able to:   1. explain concept of nature, nurture and their interaction in modifying human lifestyle; 2. list the five types food and their functions; 3. describe impact of climate change in relation to emerging and re-emerging diseases; 4. explain at least four genetic disorders and design of Pedigree chart; 5. measure and interpret at least four vital signs 6. address issues related to hygiene and environmental sanitation. | 20 |
| **Course Contents** | Concept of nature. The concept of nurture. How nature and nurture interact (biological, geographical and societal). Human nature and the biosphere. Evolution of eusociality. Classification of food types (macro- and micronutrients). Functions of macro- and micronutrients. Definition of climate change. Impact of climate change on public health. Ecological impact of climate change on emerging and re-emerging diseases. Genetic disorders. Pedigree analysis. Vital signs. Hygiene and Environmental sanitation. | 35 |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| Content | Remarks | **Maximum Score** |
| Institution | Bayero University, Kano | 1 |
| Faculty | Life Sciences | 1 |
| Department | Biological Sciences | 1 |
| Programme (as listed in the CCMAS) | B. Sc. Biology | 2 |
| Indigenous Homegrown (title, status, and contact hours) | **BUK-BIO 404 Embryology (3 Units; Core; L=30)** | 5 |
| Senate-approved relevance to the vision, mission, strategic goals, uniqueness, and contextual peculiarities of the university | To produce high quality graduates with highly skilled knowledge of embryology and its applications in the field of biology, anatomy, obstetrics and gynecology and other medical aspects. This is in line with BUK’s objective and mission to address the impact of embryological study on the development of humans, and animals etc. This will provide the graduates from Applied Biology (BUK) with the ability to conduct researches that are related to biology and to address and solve the issues of embryology. | 10 |
| Overview  Objectives  Learning outcomes  Course contents  Minimum Academic Standard | Embryology is a course designed to teach students the concept of embryology from the formation of gametes, different types of the gametes, to fertilization of the gametes and the implantation of the zygote. It will also educate students on the different types of cleavage that occur on the diploid zygote so as to form the embryo, fetus and full developed organisms. The course will also educate the students on embryology of different types of organisms and how they are related by evolution. They will also learn the basic knowledge on how to manage different types of organisms at poultry farm, fish farm, at hospitals etc.  This emphasizes the need of training students with the knowledge of embryology as it can help students manage organisms like fish (fish farming), chicken (poultry farming), animal husbandry and humans (in health related issues), frogs, lizards etc. and conduct biological researches in different fields of biology.  The objectives of the course are to:   1. introduce the students to the concept of embryology 2. list and explain the different type of cell divisions 3. explain cell differentiation and how it affects the embryological development 4. state the importance of morphogenesis and gametogenesis as they affect the development of embryo 5. define the terms fertilization and implantation. 6. differentiate the types of embryological development that occur in different types of organisms 7. explain the concepts of blastulation, gastrulation and neurulation   At the end of the course, the students will be able to:   1. explain the concept of embryology 2. list and explain the two types of cell division 3. list and explain at least six stages of cell division. 4. explain the processes involved in fertilization and implantation 5. enumerate at least three different types of cleavage that take place after fertilization 6. compare and contrast the embryological features in six classes of vertebrates with specific examples 7. explain the process of gametogenesis.   Introduction to the concept of Embryology. Types of cell division. Stages of cell division. Stages of cell cycle. Definition of Cleavage. Types of cleavage. Gametogenesis. morphogenesis. Fertilization. Implantation. Stages of embryonic development. Blastulation. Gastrulation. Neurulation. Somatogenesis. Comparative embryogenesis of fish, frog, lizard, chicken and human | 10  15  20  35 |

|  |  |  |
| --- | --- | --- |
| **Content** | **Remarks** | **Maximum Score** |
| **Institution** | Bayero University, Kano | 1 |
| **Faculty** | Life Sciences | 1 |
| **Department** | Biological Sciences | 1 |
| **Programme (as listed in the CCMAS)** | B. Sc. Biology | 2 |
| **‘’Indigenous’’/’’Homegrown’’ Course (title, status and contact hours)** | BUK-ZOO 424 **Fish Biology and Aquaculture,**  ( Units = 2; Status = Core; LH = 15; PH = 45) | 5 |
| **Senate–approved relevance to the vision, mission, strategic goals, uniqueness and contextual peculiarities of the university** | Training of high-quality graduates who are highly skilled and knowledgeable in biology, ecology, physiology and anatomy of fishes, fishes of West Africa, fish farming techniques and hatchery management. This is in agreement with BUK’s mission to address African developmental challenges in producing graduates who are able to meet labor market demands and provide significant contribution to the community development. Relevance is seen in the ability of graduates from B. Sc. Biology (BUK) to manage and increase fish production through best practices. | 10 |
| **Overview** | Fishes and aquaculture provide a vital source of food and is very significant to Nigeria’s economy in terms of employment creation, income generation, poverty alleviation, foreign exchange earnings and provision of raw materials for the animal feed industry.  Shortage in the supply of animal protein precipitated the prominence of fish in the diet of most Nigerians. Over the years the demand for fish has been on the increase with supply never up to demand.  This therefore, highlights the importance of training students on how to identify different fishes, know the biology, food and feeding habits of the fishes and skills on how to grow and harvest healthy fishes in a sustainable manner. | 10 |
| **Objectives** | The objectives of the course are to:   1. learn the biology, ecology, physiology and anatomy of fishes; 2. describe the concept and tools of age determination in fishes; 3. learn biological parameters related to fisheries management; 4. explain the basic principles in fish nutrition; importance of classes of nutrient to fish diet, health and growth, optimum fish nutrients for efficiency of aquaculture; 5. expound fishing gears and the basic operation of different methods of fishing in relation to management strategies for effective and sustainable fisheries; 6. elucidate aquaculture, aquaculture practices and feeds to the aquatic environment; 7. explain production and fish feeding practice; 8. describe the importance of careful evaluation of feeding, water and relevance to good fish production. | 15 |
| **Learning outcomes** | At the end of this course, students should be able to:   1. explain the biology, ecology, physiology and anatomy of fishes; 2. describe three concepts and tools of age determination in fishes; 3. explain the use of at least five biological parameters in relations to fisheries management; 4. explain the one basic principles in fish nutrition; importance of classes of nutrient to fish diet, health and growth, optimum fish nutrients for efficiency of aquaculture; 5. describe at least seven fishing gears and the basic operation of different methods of fishing in relation to management strategies for effective and sustainable fisheries; 6. describe aquaculture, aquaculture practices and feeds to the aquatic environment; 7. explain at least three production and fish feeding practice; 8. explain at least one importance of careful evaluation of feeding, water and relevance to good fish production; 9. apply various concepts in the course as tool for management of commercial fisheries and the science of fisheries management. | 20 |
| **Course contents** | Fisheries biology. Fish and its economic benefits. Fish identification/anatomy and physiology. Review of fish fauna of West Africa with special reference to Nigeria. Methods used in fisheries (sampling and examination, determination of age and growth, length – weight relationship, back calculation, reproduction, fish seed multiplication, production and productivity, estimation of population number, biomass and mortality and food analysis). Aquaculture. Assessment and management of fisheries. Fish farming. Principles and practice of aquaculture. Farm design and construction. Fish farm management. Elements of fish nutrition. Diseases and breeding. Overview of aquaculture in Global food security. | 35 |
| **Minimum Academic Standards** |  |  |

|  |  |  |
| --- | --- | --- |
| **Content** | **Remarks** | **Maximum Score** |
| **Institution** | Bayero University, Kano | 1 |
| **Faculty** | Life Sciences | 1 |
| **Department** | Biological Sciences | 1 |
| **Programme (as listed in the CCMAS)** | B.Sc. Biology | 2 |
| **‘’Indigenous’’/’’Homegrown’’ Course (title, status and contact hours)** | BUK-ZOO407: Ornithology (2 Units E: LH =15; PH= 45) | 5 |
| **Senate–approved relevance to the vision, mission, strategic goals, uniqueness and contextual peculiarities of the university** | Training of high-quality graduates who are highly skilled and knowledgeable in the study of birds. It is worthy of note that knowledge of our avian species would enhance our understanding on biodiversity and the role they played as components of our ecosystem. Relevance is seen in conservation studies for Biologists from BUK who will greatly contribute in the conduct of researches aimed at exploring the economic potentials of birds, as well as addressing the problem of loss of our avian fauna. These values are in tandem with vision and mission of BUK of addressing problem that would promote the well-being of our ecosystem.' | 10 |
| **Overview** | Ornithology is the systematic study of birds including their evolution, ecology, physiology, habits, habitats, behavior and conservation. The course underscores the role played by birds in our ecosystem and trains Zoologists on the various methods of ornithology as a carrier.  The course gives highlight of all types of birds, from tiny hummingbirds to large, flightless ostriches. It includes the methodological study and consequent knowledge of birds with all that relates to birds in Nigeria. | 10 |
| **Objectives** | 1. learn the basic concepts of ornithology.  2. describe the taxonomy and morphology of birds;  3. learn the anatomy and physiology of some savannah birds;  4. describe the social behavior, conservation and ecology of savannah birds;  5. demonstrate practical skills on the various techniques used to study bird population;  6. appreciates the role of zoology in the conservation of birds;  7. identify important bird areas (IBM) in Nigeria and their conservation status.  8. explore ornithology as a future career. | 15 |
| **Learning outcomes** | At the end of the course, students should be able to:  1. explain the basic concepts of ornithology.  2. describe the taxonomy and morphology of birds;  3. explain the anatomy and physiology of some savannah birds;  4. describe the social behavior, conservation and ecology of savannah birds;  5. demonstrate practical skills on the various techniques used to study bird population;  6. appreciates the role of Zoology in the conservation of birds;  7. identify important bird areas (IBA) in Nigeria and their conservation status.  8. explore Ornithology as a career. | 20 |
| **Course contents** | Basic concepts of ornithology. Avian biodiversity/classification. Biogeography. Bird communities. Migration. Birds population studies. Life history. Evolution/speciation and macroecology. Ecology and evolution of vocal behavior. Mechanisms of vocal behavior. Social behavior. Foraging behavior. Mating and breeding behavior. Avian conservation. Citizen science in conservation. Important bird areas (IBA) in Nigeria. Molecular techniques in ornithology and introduction to data visualization and analyses. | 35 |
| **Minimum Academic Standards** |  |  |