Courses Offered at The Pan African University Institute for Life and Earth Sciences (Including Health & Agriculture) (PAULESI)

General Programme

Languages

N°	Course name	Course code	Credit hours	Total number of hours	Semester (1st, 2nd, 3rd)	Short description of the course
1	English Studies	PES 701	2	30	1	A basic study of English language that aims at giving learners of English as a foreign language, a good command of English language for communication and academic research. With emphasis on the practical relevance on subjects that relate to different discourses, the program enables students to interact with, and appreciate oral and written communications in English.
2	French Studies	PFS701	2	30	1	A basic study of French language that aims at giving learners of French as a foreign language, a good command of French language communication. With emphasis on the practical relevance on subjects that relate to different discourses, the program

						enables students to interact with, and appreciate oral and written communications in French.

History of Africa, Human Right and Gender

N°	**Course name**	**Course code**	**Credit hours**	**Total number of hours**	**Semester (1st, 2nd, 3rd)**	**Short description of the course**
1	History of Africa	PHA701	2	30	2	Introduction to African History; Early Centre's of Civilization in Africa; The Advent of the Europeans and the Agents of Colonization; Slavery and the Trans-Atlantic Slave Trade; Colonial Rule in Africa; Approaches to Independence in Africa; Nationalist Movements and Attainment of independence in Africa; Colonial Economy structure and the Colonial Heritage; Problems of Nation Building in Africa; Dependency and Neo Colonialism (New Colonialism); Regional Integration and Continental Free Trade.
2	Human Rights and Gender	PHG701	2	30	2	Examination of concepts and Theoretical Foundations of Human Rights; Human Rights and African traditional systems; Interrogating human rights in Contemporary times; Human Rights Enforcement

						Mechanisms; Relating the Study of Human Rights to Society and Legal Systems in Africa; Human Rights Groups and Activists. Gender and Development Theorizing Gender; Gender and the African Context of Women in relation to Men, pre-colonial history, and contemporary cases; Gender approaches to development; Selected Elements of Gender and Development; Gender in the face of Pandemic: HIV/AIDS, Ebola, COVID – 19 Pandemic in Africa and the new normal.

Entrepreneurship Skills

Nº	**Course name**	**Course code**	**Credit hours**	**Total number of hours**	**Semester (1st, 2nd, 3rd)**	**Short description of the course**

1	Entrepreneurship Skills	PEP 701	2	30	1	Introduction to entrepreneurship skills; Developing sustainable enterprises; Poverty alleviation and sustainable development; Transforming society through entrepreneurship and innovation.

Environmental Management Programme

MSc Environmental Management

Nº	**Course name**	**Course code**	**Credit hours**	**Total number of hours**	**Semester (1st, 2nd, 3rd)**	**Short description of the course**
1	Environmental Management	PEM 701	3	45	1	It examines the motivations for jurisdictions, organizations, and businesses, to carry out environmental management, the ways in which environmental impacts are assessed and the systems employed to minimize environmental problems.
2	Remote Sensing and Geographic Information System (GIS)	PEM 703	3	45	1	Introduction to remote sensing and GIS principles and scope. Remote sensing platforms, electromagnetic spectrum Elements of Image Interpretation. Interaction characteristics of electromagnetic radiation with vegetation,

						soils, water and human settlements. Vector and raster data structure and models in GIS.
3	Land Resource Management	PEM 705	3	45	1	Fundamentals of land management; the interacting systems of hydrology, climate, soils, and sediments at the various temporal and spatial scales. Threats to sustainable land management (SLM), and their biophysical and socio-economic processes.
4	Ecosystem Services and Environmental Economics	PEM 707	3	45	1	The course introduces students to the notion and rationale behind ecosystem services, their consumption, management, and conservation. The role of Earth's ecosystems in underpinning human society, identification of the hidden subsidies and feedbacks which are often not factored in human decision making, and evaluate the contribution of ecosystem services to human economy and its stability;
5	Energy Resources Consumption and Management	PEM 709	3	45	1	Contemporary environmental, social-economic, and political issues surrounding energy consumption. Interaction between the technical and socio-economic aspects of energy consumption and environmental and societal concerns. Production, supply and consumption of renewable and non-renewable energy resources, pollution, and technological changes.
6	Pollution and Waste Management	PEM 702	3	45	2	This course aims to develop an understanding of the mechanisms by which potentially toxic elements contaminate the

						environment and cause toxicity to biological organisms. It provides an understanding of the sources, transport pathways, and toxicity of key environmental contaminants.
7	Climate Change and Carbon Stock Management	PEM 704	3	45	2	This course examines natural and human-induced climate change, its impacts, and methods of adaptation, current and possible future global climatic changes. Bio-physical, economic, political, and social impacts of climate change. Social and biophysical vulnerabilities to climate change. Assessment of vulnerabilities to climate change.
8	Water Resource Management	PEM 706	3	45	2	Water catchment area processes and management. Water pollution, sources of water pollution, effects, and prevention of water pollution. In-situ and laboratory analysis of water; Integrated Water Resources Management (IWRM) – Principles and Approaches and case studies.
9	Environmental Law and Conflict Management	PEM 708	3	45	2	The course aims to demonstrate the role played by law in tackling some of the most pressing environmental issues. The need to achieve sustainable economic development and the difficulties of translating scientific concepts into legally enforceable standards.
10	Urban Ecology	PEM 710	2	30	2	The ecology of urban areas; variation in the global concept of urban areas (i.e., what is an urban area?), effects of urban areas on a range of taxonomic groups, species adaptation to urban areas; human-wildlife

						conflicts within urban areas and their management.
11	Seminar	PEM 771	1	15	3	Preparation of a report based on an in-depth study on a subject of interest in the environmental management curriculum.
12	Internship: Practical experience in field of study	PEM 714	1	15	3	Practical experience in field of study: Practical experience in field of study
13	Project/Dissertation	PEM 791	6	90	3 & 4	An original piece of research work based on the application of relevant tools and techniques to investigate and manage an environmental problem. It will involve the application of course content to the solution of an environmental Problem.

PhD Environmental Management

N°	**Course name**	**Course code**	**Credit hours**	**Total number of hours**	**Semester (1st, 2nd, 3rd)**	**Short description of the course**

1	Global Change and Environmental Management	PEM 801	3	45	1	Drivers of global environmental change; Human causes of global change; human consequences and responses; social and environmental surprises; role of institutions in managing global and local environmental change; analysis and deliberative procedure in environmental decision making.
2	Environmental and Social Impact Analysis	PEM 802	3	45	1	Principles, purpose and aims of environmental and social impacts assessment; concepts, costs and benefits; components of social and environmental assessment; the process, screening and scoping criteria; vulnerability analysis in impact assessment; impact identification and evaluation techniques.
3	Research Methods in Environmental Management	PEM 803	3	45	1	Data collection methodology. Basic descriptive methods of data analysis. Basic inferential techniques. Advanced methods of analysis – multiple correlation and regression, trend surface analysis, discriminant analysis, principal component and factor analysis canonical correlation etc.
4	GIS and Remote Sensing in Environmental Analysis	PEM 804	3	45	1	Application of Geographic Information Systems (GIS) and Remote Sensing Technologies in Environmental Management. Basic techniques. GIS data structure and algorithms. Spatial decision support systems. Digital image processing and analysis.

5	Seminar .	PEM 805	3	45	2 - 6	Preparation of a report based on an in-depth study on a subject of interest in the environmental management curriculum
6	Thesis	PEM 806	6	90	2 - 6	An original piece of research work based on the application of relevant tools and techniques to investigate and manage an environmental problem. It will involve the application of course content to the solution of an environmental Problem.

Geosciences Programme

MSc Mineral Exploration

Nº	**Course name**	**Course code**	**Credit hours**	**Total number of hours**	**Semester (1st, 2nd, 3rd)**	**Short description of the course**
1	Research Methodology and Proposal Writing	PME701	2	30	1	Lectures on the development of conceptual framework in geological research. Preparation of research proposal. Approach to geological problems. Systematic collection of field and laboratory data. Geological report writing and referencing. Ethics and common errors in research. Managing the research process and scientific creativity.

2	Ore Deposits and Regional Metallogeny	PME711	3	45	1	Classification of ore deposits in relation to genesis and tectonic environment. Main physical and chemical condition of ore formation. The shape, mineralogy, genesis and practical importance of magmatic, pegmatitic, supergene and sedimentary ore deposits. Geothermometry, paragenesis, zoning, and conceptual modelling in relation to tectonic, chemical and physical controls. Ore minerals identification in hand specimen using diagnostic features. Utilization of reflecting ore microscope and optical properties of ore minerals. Mineral deposits in Nigeria. Metallogenic Epochs and Provinces. Regional metallogeny of Africa and global Scenario.
3	Fluid Phase Petrology, Applied Geochronology and Structural Geology	PME712	3	45	1	Lectures, Seminar and Laboratory Studies on chemical reactions in rock systems. Rock-fluid interactions, mineral formation, hydrothermal alterations, and ore genesis. Origin of the H_2O-CO_2 and other fluids involved in these reactions based on studies of mineral equilibrium. Stable Isotope Geochemistry. Radiometric dating and application to geodynamic evolution. Structural elements, their study interpretation and applications related to geological investigations including mapping, dating, exploration, and geodynamics.

4	Exploration Geophysics	PME 721	3	45	1	Role of geophysics in mineral exploration, Basic physical laws, properties of rocks and minerals, instrument, field procedure, data acquisition, reduction and interpretation relating to gravity, magnetic, Self-potential resistivity, induced polarization, electromagnetic seismic reflection and refraction and radioactivity methods. Geophysical well logging. Applicability of various methods. Relative cost and survey planning. Field examples and practical demonstrations.
5	Exploration Geochemistry	PME 722	3	45	1	Introduction to the application of geochemistry in mineral exploration. Principle of geochemical dispersion and re-concentration in rock and ore systems. Primary dispersion patterns, weathering and soil formation and the migration of economic and pathfinder elements in a secondary environment. Geochemical soil and drainage survey. Biogeochemical, geo-botanical and litho-geochemical surveys. Geochemical affinity
6	Remote Sensing and Photogeology	PME 723	2	30	1	Principles of remote sensing and photogeology. Geological interpretation of aerial photographs, their application to geological mapping and exploration. Techniques of photogrammetry. Interpretation of geological features, structures and stratigraphy. Sensor principles and capabilities. Analysis of

						satellite imageries and application to mineral resources and environmental evaluation.
7	Geostatistics, Ore Evaluation and Reserve Calculation	PME 731	2	30	2	Statistical treatment of data, Definition of ore resources/reserve, classification. Geostatistical ore reserve estimation methods.
8	GIS Techniques and Interpretation	PME 732	2	30	2	Basic principles and concept of GIS. Basic theory and tools of spatial information analysis. Introductory laboratory practice in the use of ARC View GIS, Erdas Imagine, Atlas GIS, Map info, Eppd 17, TransCAD, Auto CAD, Arc CAD, Arc info, IDRISIS, etc. Discussions of case studies of integrated methods in exploration.
9	Mineral Economics	PME 741	2	30	2	A series of lectures and field events covering selection of areas, resource exploitation, feasibility studies, coordination of prospecting techniques / methods, mining methods, economic analysis, finance and management of prospecting and exploration projects. Basic principles and requirements of feasibility reports.
10	Mining Legislation and Contract Negotiation	PME 743	3	45	2	Basic ingredients of mining legislation and regulations. Corporate regulatory frameworks for mining in Africa. National mineral policy and laws of mining for comparative analysis. Introduction to law of contract. Negotiation technologies and basic principles. Case Histories.

11	Field School in Mineral Exploration	PME 752	2	30	2	Field training in techniques of geological investigation; as exemplified in mineral exploration, including geological, geophysical, geotechnical hydrogeological and geochemical methods. Field assignment and write-up of concise technical report
12	Independent Research Project	PME 753	6	90	3	Special geological investigation with reports including results and interpretation presented as an independent research project or dissertation.
13	Geoscience Research Seminar	PME 702	1	15	2	Literature study, report writing and oral presentation of an aspect of the area of specialization.
14	Internship	PME 751	1	15	3	Internship at relevant industry for practical exposure, application and hands-on

MSc Petroleum Geoscience

Nº	**Course name**	**Course code**	**Credit hours**	**Total number of hours**	**Semester (1st, 2nd, 3rd)**	**Short description of the course**
1	Research Methodology and Proposal Writing	PPG 701	2	30	1	Development of a conceptual framework in petroleum geology research, methods of data collection, laboratory analysis, statistical analysis

						(using software such as SPSS, MS excel, R etc.) and referencing.
2	Basin Evolution, Analysis and Modelling	PPG 711	2	30	1	General theory of plate tectonics. Structural/stratigraphic framework of Africa. Analysis of the African sedimentary basins including tectonic setting, stratigraphy, thermal history of the basin and hydrocarbon potential.
3	Petroleum Geochemistry	PPG 712	3	45	1	Sedimentary organic matter, hydrocarbon maturation and the generation of oil and gas, migration and reservoir geochemistry, chemical analysis of organic matter. Molecular marker compounds. Organic geochemical methods
4	Well Logging and Seismic Interpretation	PPG 714	2	30	1	Introduction to geophysical methods for Petroleum Exploration and Production. Types of Well Logs. Seismic data processing and interpretations; Reservoir Properties from Seismic data, their representation and significance. Case studies in seismic and geophysical imaging.
5	Petroleum Economics	PPG 732	2	30	1	Introduction to concept and methods of quantitative risk analysis. Profitability indicators and their use in decision making. Reserves estimation and effective appraisal development of oil and gas fields. Production forecasting and prediction.
6	Environment Impact of Petroleum Exploration and Exploitation	PPG 733	2	30	1	Environmental issues associated with petroleum exploration, production, transportation, and consumption. The environmental solution needed for its safe production and consumption. Environmental restoration after drilling and

						general safety of petroleum operation. Environmental impact assessment of an oil field.
7	Petroleum Structural Geology	PPG 746	2	30	1	Brittle and ductile deformation of rocks. Mechanisms of deformation. Folds, faults and fault-fold association. Fractured reservoirs. Effects of faulting on reservoirs. Mapping of faults and faulted surfaces. Structural style in different tectonic settings. Structures in compressional, extensional and strike-slip terrains. Gravity induced structures. Diapirism. Maps such as stratum contour and isopach maps for structural and stratigraphic interpretation of reservoir
8	Geoscience Research Seminar	PPG 702	1	15	2	Literature study, write -up and presentation on a topic in Petroleum Geoscience.
9	Subsurface Geology, Prospect Generation and Well Proposition	PPG 713	2	30	2	Subsurface data acquisition, drilling, coring, logging, fluid sampling, seismic surveys, Petrophysics and reservoir geology. Construction and interpretation of subsurface maps. Cross-sections and panel diagrams; Special topics and problems.
10	Sequence Stratigraphy	PPG 721	2	30	2	Introduction to sequence stratigraphy concepts and terminologies. Sequence stratigraphic methods of interpreting seismic data and well log. Reflection terminations and configurations, systems tract and lithofacies. Reservoir description and delineation using sequence stratigraphy. Use of biostratigraphy in sequence stratigraphy, Case Studies from African Sedimentary basins.

11	Reservoir Characterization and modelling	PPG 722	2	30	2	Reservoir varieties, geological controls, measurement techniques, special core analysis, porosity/permeability/lithology relationships, physical and chemical fluids/formation reactions. The geological components of a reservoir model, production profiles and planning, production logging. Reservoir mapping – seismic application, facies mapping, computer mapping applications. Reservoir simulation using appropriate software.
12	Basin Analysis and Modelling	PPG 723	2	30	2	Analysis of sedimentary basins based on their origin, paleogeographic evolution and tectonic setting. The geological components of a reservoir model, production profiles, planning, production and logging. Reservoir simulation. Development of interpretation skills using software. Integration of sedimentological, paleontological, stratigraphic, petrological, geophysical, and geochemical data for the evaluation of depositional environments. Case history of different types of sedimentary Basins in Africa.
13	Petrophysics and Formation Evaluation	PPG 724	2	30	2	Genesis and morphology of pores, porosity, and permeability. Influence of composition, texture and diagenesis on porosity and permeability. Description, identification, and analysis of reservoir rocks from cores and cuttings. Advanced logging techniques such as magnetic resonance, dielectric logging, and image logging. Borehole environment.
14	Introduction to Reservoir Engineering and Production Techniques	PPG 731	2	30	2	The relationships between the geology, basic reservoir rock properties, surface and interfacial phenomena, fluid flow through porous reservoir

						rock, classification of oil and natural gas reservoirs, introduction to reserve estimation principles, well-testing procedures, production strategies, and oil well completions.
15	Field Geology	PPG 734	2	30	2	Visit specific field locations within the sedimentary basins in Nigeria and producing detailed geological report
16	Project/Dissertation	PPG 743	6	90	3	Design, development and execution of an original research work, acquisition of field data, laboratory analysis and interpretation of results.
17	Internship	PPG 743	1	15	3	Internship at relevant industry for practical exposure, application and hands-on

PhD Mineral Exploration

Nº	**Course name**	**Course code**	**Credit hours**	**Total number of hours**	**Semester (1st, 2nd, 3rd)**	**Short description of the course**
1	Geochemistry of Ore Genesis	PME 811	2	30	1	Geochemical and isotopic studies in relation to Ore Genesis, with examples
2	Metallogeny	PME 812	2	30	1	Major metallogenic provinces and epochs. Distribution, composition, character, and origin of specific mineral deposits in the world. Specific attention is given to mineral deposits and examples from Africa

3	Advanced Studies in Mineralogy of Deposits	PME 813	2	30	1	Techniques in mineralogical and chemical studies of particular types of industrial minerals and ore deposits, with examples.
4	Special Topics in Applied Geochemistry	PME 823	2	30	1	Geochemistry Discussions and Essays on the applications of geochemistry in detailed investigations such as mineral exploration, agriculture, health, environmental, mining. Case histories.
5	Mineral Exploration Techniques and Data management	PME 826	2	30	1	Review of different methods of mineral exploration. Boulder exploration, geological mapping in the field, geophysical surveys, geochemical sampling and drilling. Examples of different techniques. Concept of GIS. Tools of spatial information analysis. GIS geo-databases.
6	Environment Impact of mining industry and challenges of sustainable development	PME 827	2	30	1	Environment Impact of mining industry and challenges of sustainable development
7	Seminars	PME 830	3	45	2 - 6	Seminar Presentations by the PhD Research Students on (i) Research Proposal on PhD research topic (ii) Presentation of the progress Report on the PhD Research (iii) Final Seminar Presentation on the PhD Research prior to oral Defense
8	Research thesis	PME 900	6	90	2 - 6	A presentation of detailed write-up of the PhD research and the Oral Defense of same before the constituted panel of examiners

PhD Petroleum Geoscience

Nº	Course name	Course code	Credit hours	Total number of hours	Semester (1st, 2nd, 3rd)	Short description of the course
1	Techniques in Structural Geology	PPG 811	3	45	1	Structural elements, their study, interpretation, and application to related geological investigations, including mapping, dating, hydrocarbon exploration and geodynamics, including Case histories. Fault mapping, seal and fault analysis.
2	Special Topics in Sedimentology	PPG 814	3	45	1	Principles and processes of sedimentological analyses, with reference to particular sedimentary basins.
3	Special Studies in Micropaleontology and Biostratigraphy	PPG 821	3	45	1	Case histories in paleontological and biostratigraphic studies, in relation to specific geologic/sedimentary basins.
4	Basin Analysis	PPG 823	3	45	1	Integration of sedimentological, paleontological, stratigraphic, petrological, geophysical and geochemical data, for unraveling geological history of sedimentary basins in Africa

5	Geoscience Research Seminar	PPG 881	3	45	2 - 6	Forum for doctoral presentations of Geoscience research proposal (L1), presentation of preliminary/progress reports (L2), and final presentation of data (L3).
6	Special Geological Research Project	PPG 882	6	90	2 - 6	Design, development, and execution of original research work involving literature study, acquisition of field and laboratory data, analyses, and interpretation of results. The findings must add value to existing knowledge.

MSc Medicinal Plants Research and Drug Development Programme

N°	**Course name**	**Course code**	**Credit hours**	**Total number of hours**	**Semester (1st, 2nd, 3rd)**	**Short description of the course**
1	Introduction to Medicinal Plant Research	PMR 711	2	30	1	History of medicinal plant research Overview of drug development from medicinal plants; Phytotherapy of herbs in relation to healing; Medicinal plants as source of drugs for common tropical diseases and as source of raw materials; Identification, collection, and processing of medicinal plants; advantages and disadvantages of each method.

2	Separation Techniques and Bioassay Methods in Natural Product Research	PMR 712	2	30	1	Natural product bioassays techniques Bioassay-guided phytochemical separations relevant to drug discovery from nature. Processes that lead from plants to pharmacologically active pure compounds. Principles and methods of extraction, detection, isolation, and purification of secondary metabolites of medicinal interest.
3	Bioethics and Policy Issues in Medicinal Plant Research	PMR 713	2	30	1	Biodiversity and conservation Endangered medicinal plants: Protection of endangered species. Need for conservation of African medicinal plants: International Trade; Local Market; Health and Livelihood Environmental/Socio-Economic Interface; Bioethical and Legal Dimensions in conservation;
4	Medicinal Plants as Source of Drugs and Raw Materials	PMR 714	3	45	1	Microorganisms, plants, and animals as sources of novel bioactive natural products. Medicinal plant phytochemistry: Primary and secondary metabolites (Alkaloids, terpenoids, anthraquinones, etc.)
5	Medicinal Plant Taxonomy and Ethnobotany	PMR 715	2	30	1	Classical Taxonomy: Classification of plants (origin, history etc.); Systems of Taxonomy (Natural and Artificial); Taxonomic Hierarchy; Subspecific Taxonomy; Vegetative characters and terminology Chemotaxonomy and contribution of secondary metabolites and DNA as taxonomic markers.
6	Advanced Laboratory Course I	PMR 716	2	30	1	Advance laboratory technique (I)

						Full practical on developing pharmacopeia standard. General Description Scientific Name with Author, Synonyms, Family, Vernacular Names, Botanical Description, Origin and Distribution, Plant Part Used, Major Ethno pharmacological Uses, Other Relevant Uses, Compounds, Identification, Organoleptic Properties, Macroscopic Characteristics, Microscopic Characteristics, Solubility, Adulterants and Adulterations, Standard Preparations
7	Basic Statistical Procedures	PMR 727	2	30	1	Role of statistics in biomedicine; Variation in measurements; How to summarize biomedical data; Probability; Statistical Inference; Hypothesis testing; Correlation analysis; Basic experimental designs
8	Structural Elucidation of Biologically Active Compounds	PMR 717	3	45	2	Classical spectroscopic techniques: nuclear magnetic resonance (NMR), infrared (IR), ultraviolent-visible (UV) and mass spectrometry (MS) utilized in structural elucidation and assessment of natural product purity and quality. Other non-spectroscopic methods including boiling point, melting point determination, polarimetry (novel molecules), etc.
9	Seminar and Direct Reading	PMR 718	1	15	2	Seminar presentation on current topics in medicinal plant research. Students are also assigned a directed reading/literature review on current trends and participate in focused group discussions.

10	Standardization and Quality Assurance of Natural Products	PMR 719	3	45	2	Herbal medicine regulatory requirements and relevant Agencies; Simple quality-assurance and validation tests and in-process quality monitoring for efficacy and safety; preservation, labeling, packaging, doses; stability/expiry, shelf-life, storage of finished products and general signs of deterioration: effects of light, heat, moisture, air, microbes, heavy metals, insects, moulds, rodents;
11	Clinical Pharmacognosy and Nutrition Therapy	PMR 720	2	30	2	Introduction to, Scope and Role of Clinical Pharmacognosy Challenges of Clinical Pharmacognosy Diagnosis, Prevention and Herbal Treatment Strategies. Case Taking, Clinical Practice and Examinations.
12	Advanced Laboratory Course II	PMR 721	2	30	2	Full practical on drug development up till formulation/packaging Research methods to be used include: Identification Chemical analysis (Phytochemical analysis, chromatographic finger prints including TLC and HPLC, TLC, Column Chromatography)
13	Herbal Product Development	PMR 722	2	30	2	Presentation of herbal products: Herbal liquid dosage forms (decoction, emulsion, suspension, tincture, lotion, syrup etc); Herbal solid dosage forms (powder, capsule, tablet, medicinal soap, suppository, ointment, etc). Good Herbal Preparation Practice (GHPP),

						Herbal business and herbal processing technology.
14	Cultivation, Propagation and Conservation of Medicinal Plants	PMR 723	2	30	2	Cultivation and Plant Propagation Tissue Culture Techniques and Genetics Possibility and Prospects of Medicinal Plant Production in Africa Methods of Cultivation and Propagation Good Agricultural Practice for Medicinal Plants Threats to Propagation and Environmental Factors affecting Growth (e.g. soil, climate, genetics) for high quality crude drugs
15	Project	PMR 724	6	90	3	Students are to undergo a research project in medicinal plant research on an approved topic by supervisors.
16	Internship	PMR 732	1	15	3	Students are given opportunity of a six-month internship period to acquire practical and relevant experiences in established Herbal Centre's.

Plant Breeding Programme

MSc Plant Breeding

Nº	Course name	Course code	Credit hours	Total number of hours	Semester (1st, 2nd, 3rd)	Short description of the course
1	Advanced Statistics & Biometrics	PPB 710	3	45	1	Descriptive Statistics; Introduction to hypothesis testing; Design of experiments (on-station and On-farm) Design of surveys (Field, social/economic and agricultural surveys; identification of target populations, data attributes and population parameters. Field sampling techniques, design of survey instruments and data collection procedures); Experimental designs (completely randomized design, randomized complete block, Latin square, Split-plot, split-split plot, factorial experiments); Introduction to statistical modelling –(ANOVA, Regression, Fixed and Mixed Models, Chi-Square); Introduction to statistical modelling –(ANOVA, Regression, Fixed and Mixed Models, Chi-Square); Path Analysis; Introduction to multivariate analysis; Data management (Spreadsheets); Data Analysis (GENSTAT, SAS, R), including

						meta-analysis of data; Presentation and interpretation of research results.
2	Principles of Cultivar Development	PPB 711	3	45	1	Review of Genetic Principles; Plant Genetic Resources; Population Development; Line Development and Recurrent Selection; Maximizing Genetic Gain, Multiple and Correlated traits; Stability Analysis, Principal Component Analysis and Factor and Genetic; Homogeneity Analysis; Plant Breeding Methods – Backcrossing, Cultivar Development Methods for Dicot and Monocot Crop Plants; Mutation Breeding and Hybridization; Introduction to Genetic Engineering; Exploiting Cytological and Genetic Methods in Crop Improvement (Induction and Utilization of Male Sterility, Polyploidy, Double Hapolid Breeding, and Apomixes); New Frontier in Cultivar Development e.g. MAS and Reverse Genetic Approaches, Variety Release and variety integrity
3	Physiological Genetics	PPB 712	3	45	1	Introduction-Historical; background of physiological genetics of crop yield; System analysis of phenotypic expression of yield and applications in plant breeding; Environmental factors and plant responses - Light and its role in photosynthesis, maximising photosynthetic active radiation (PAR) to maximise economic yield; C3, C4 and CAM photosynthesis; Photosynthetic

						efficiency of different pathways as influenced by gas exchange methods; DNA – structure, replication, transcription and translocation, gene expression and regulation of expression; Special topics – chemical taxonomy, photoperiodic response, temperature effects, isozymic substitution; Cytoplasmic inheritance and self-incompatibility; Mutations and their effects; Growth analysis–specific growth analysis (SGA), partial growth analysis (PGA), Translocation and partitioning of photosynthate. Note mineral 10 elements physiological genetics of heterosis.
4	Advanced Plant Breeding	PPB 713	3	45	1	Evolution of plant breeding; Setting plant breeding goals; Self- and Cross-pollinated crops; Vegetatively propagated crops; Inbreeding and its consequences; Types of seeds (orthodox seeds and recalcitrant seeds); Physiological maturity –black layer in maize; Seed Processing for storage; Incomplete block designs –applicability in plant breeding; Symbols used in breeding nurseries (crossing, selfing and sib-mating); Pollination and making of crosses (e.g. maize, rice, cowpea, cassava)– Synchronization of flowering; Diallel crosses –methods for field planting of diallels; usefulness of diallels; Writing pedigree –Old notation and Purdy, Notations for the development of lines from crosses and

						populations; Methods of maintaining genetics stocks; Scoring of important traits; Aids to selection; characteristics of good aids 11 to selection
5	Molecular Biology, Biotechnology and Tissue culture	PPB 714	3	45	1	Introductory history of plant tissue culture; Laboratory organization; Media, media components and media preparation, aseptic manipulation; Basic aspects of cell growth, cell culture, cellular totipotency, cell cycle and population dynamics, growth patterns differentiation; Mutation and differentiation processes in plant culture; Organogenesis; somatic embryogenesis, genetic control of culturability; Applications to plant breeding, haploid-triploid production, invitro fertilization zygotic embryo culture, Applications to plant breeding, somatic hybridization and cybridisation, genetic transformation, somaclonal and gametoclonal variant selection; Application to horticulture and forestry and industry; Biosynthesis of hormones and elicitor molecules, gib12berellins; abscisic acid, iindole-3-acetic acid; Molecular physiology of micronutrient acquisition, plant responses to mineral toxicity; Plant cell cultures for plant transformation, agrobacterium co-cultivation, direct DNA uptake; Societal issues in plant biotechnology; Commercialization and Entrepreneurship.

6	Graduate Seminar	PPB 715	1	15	1	Preparation, presentation, discussion and evaluation techniques and skills in seminars, meetings, workshops, and conferences; Presentation preparation- content, setting, Literature search, preparation of presentation aids, presentation skills, evaluation, etc. Writing research grant proposal; Scientific writing (publication and technical reports); Technical reviewing of reports and papers. Scientific/Literature critiquing; Communication and dissemination of research results to different stakeholders; Marketing oneself and institution/enterprise.
7	Quantitative Genetics & Plant Breeding.	PPB 718	2	30	2	Quantitative genetics and statistical tools; Population distributions, covariance, 14 regression, correlation analysis; Causes of genetic variation: Properties of single loci, the Hardy-Weinberg equilibrium mechanisms that generate and dissipate gametic disequilibrium; Sources of genetic variation for multi-locus traits, genetic linkage, recombination, linkage maps, Components for phenotypic variation, single locus expectation, partitioning components of phenotypic variation; Genotype x environment interaction, genetic correlations across environments, two-way analysis of variance, the concept of

						phenotypic stability; Resemblance between relatives; Measures of relatedness Resemblance between relatives; Measures of relatedness: pedigrees, genetic covariances between relatives; The concept of heritability, parent of offspring regression, response to selection, selection index; Analysis of line crosses: expectations for line cross means, heterosis, inbreeding depression Analysis of mating designs, North Carolina (NC) Designs I, II, and III, diallel mating designs; Hayman-Jinks analysis; Effect on the mean and variance, inbreeding depression and heterosis; Sib analysis, Maximum likelihood function, genome scanning
8	Bio-policy, Bio-safety, and Bio-ethics	PPB 719	2	30	2	Review of national and international bio-policies and implications for cross border movement of germplasm; Development of bio-policy, Bio- policy design and analysis. Policy assistance processes and requirements for sustainable policy assistance processes; Bio-safety and bio-hazards; recapitulation of general principles for laboratory and Review of national and international bio-policies and implications for cross border movement of germplasm; Development of bio-policy, Bio- policy design and analysis. Policy assistance processes and requirements for sustainable policy assistance processes; Bio-safety and

						bio-hazards; recapitulation of general principles for laboratory and environmental bio-safety development, Biosecurity principles, conflicts between biosafety and Biosecurity, Bioethics: Principles and theories of bioethics, Bioethics, and plant Biotechnology; Genetic erosion, application of population genetics to estimate the impacts of gene flow, immigration, and emigration on genetic drain and introduction of exotic pests and diseases. environmental bio-safety development, Biosecurity principles, conflicts between biosafety and biosecurity, Bioethics: Principles and theories of bioethics, Bioethics and plant biotechnology; Genetic erosion, application of population genetics to estimate the impacts of gene flow, immigration, and emigration on genetic drain and introduction of exotic pests and diseases; Biosafety general principles for laboratory and environmental bio-safety development as pertain to GMOs, Cartagena Protocol on Biosafety (CPB), Codex Alimentarius and International Plant Protection Convention, Biosafety risk assessment and risk management of GMOs. Case studies on genetically modified organisms handling and monitoring, Stewardship as pertain to biotech products. Plant breeders' rights, UPOV convention and

						intellectual property rights, materials transfer agreements, access, and benefit sharing.
9	Programme Planning and management	PPB 720	2	30	2	Fund sourcing; Proposal development, scheduling of simple planning tools; Gantt Charts and road maps; Critical path analysis for simple and complex events, the planning cycle, team building; Stakeholder analysis tools and stakeholder management including communicating for advocacy; Monitoring and evaluation frameworks, impact assessment; Elements of soft skills and personal mastery specifically, personal development and leadership skills
10	Crop Pest and Disease Management	PPB 721	2	30	2	Concepts of Crop pest, diversity and ecology; Insect development, life history and nutrition; Plant -Insect interactions; Insect pest population dynamics; Insect pest population regulation and key factor analysis; Pest monitoring and forecasting; Pest management decision making tools; Pest management options (this includes ecological management, biological management, cultural approach, chemical control, plant resistance, use of biorationals, etc.); Integrated pest management.
11	Environmental Impact Assessment	PPB 722	2	30	2	Selection and gene flow in natural and artificial ecologies; Models for prediction, studying adaptability and micro-evolutionary change; Variability and uncertainty of crop-to-wild and wide

						hybridization; Sources of gene escape; Ecological risks of genetically modified plants (virus and insect resistance). Human health and other potential hazards; Response to climate change (Mitigation); Response to climate change (Tools); Development in a changing climate
12	Practical Plant Breeding	PPB 723	2	30	2	Evolution of plant breeding, Setting plant breeding goals; Self- and Cross-pollinated crops, vegetatively propagated crops; Inbreeding and its consequences; Types of seeds (orthodox seeds and recalcitrant seeds), Physiological maturity –black layer in maize, Seed Processing for storage; Incomplete block designs –applicability in plant breeding; Symbols used in breeding nurseries (crossing, selfing and sib-mating); Pollination and making of crosses (e.g. maize, rice, cowpea, cassava) – Synchronization of flowering; Diallel crosses –methods for field planting of diallels, usefulness of diallels; Writing pedigree –Old notation and Purdy, Notations for the development of lines from crosses and populations; Evolution of plant breeding; Setting plant breeding goals; Self- and Cross-pollinated crops; vegetatively propagated crops
13	Population and Evolutionary Genetics	PPB 724	2	30	2	Introduction to population biology; Gene structure, genetic codes and mutation; Evolutionary processes in populations; Neo

						Darwinian and Neutral theories of evolution; DNA polymorphisms in populations; Measures of polymorphism (neutral and selective markers); Origin of genetic variation in populations; Gene flow, mating types, selection and adaptation; Population biology: analytical methods and tools; Population structure: analytical considerations, Hierarchical population structure, analysis of molecular variation, exact tests, gene diversity etc.; Molecular tools for analysis of variation (neutral versus selective markers); Phylogenetics: Basic concepts in molecular phylogenetics; Networks: (Quartets of species) split decomposition and related methods; Planning experiments to detect genetic variation in populations
14	Thesis	PPB 730	7	105	3	Design, development and execution of original research work involving literature study, acquisition of field and laboratory data, analyses and interpretation of results

PhD Plant Breeding

N°	Course name	Course code	Credit hours	Total number of hours	Semester (1st, 2nd, 3rd)	Short description of the course
1	Breeding for Resistance/Tolerance to Biotic and Abiotic Stress	PPB 810	3	45	1	Students are expected to present case Studies on breeding for resistance/tolerance to biotic and abiotic stress
2	Special Topics	PPB 811	3	45	1	Invited speakers from other fields of crop production for broad knowledge outside breeding
3	Current Trends in Plant Breeding Research	PPB 812	3	45	1	Students are to familiarize themselves with current trends in Plant Breeding Research
4	Advanced Experimental Design, Data Analysis and Interpretation	PPB 813	3	45	1	This entails advanced experimental design, data analysis and interpretation in Plant Breeding
5	Seminar	PPB 814	3	45	2 - 6	Thesis Pre-field Proposal presentation. Thesis Post-field presentation
6	Project	PPB 815	6	90	2 - 6	This involves the design, development and execution of original research work involving literature study, acquisition of field and laboratory data, analyses, and interpretation of results

Reproductive Health Sciences Programme

MSc Reproductive Health

Nº	Course name	Course code	Credit hours	Total number of hours	Semester (1st, 2nd, 3rd)	Short description of the course
1	Principle of Epidemiology	PRH 701	2	30	1	Introduction to Epidemiology. Descriptive studies. Case control studies. Practical exercises on case-control study. Cohort studies. Practical exercises on Cohort study. Intervention studies and Clinical Trials. Association and Causation.
2	Research Methodology and Experimental Designs	PRH 702	2	30	1	Introduction to Research Methodology. Research Problems. Observational. Experimental Quasi-experimental studies. Clinical Research Methods. Sample size Determination. Sampling in Medical Research. Data Collection Procedures: Questionnaire Design. Data Management in Research. Ethics in Medical Research. Qualitative Research Methods: In-depth Interviews, FGD (Design & Analysis).
3	Fundamentals of Reproductive Health including Gender related Issues	PRH 703	3	45	1	Overview of Reproductive Health. Sexuality and Reproductive Health. Measurement of Fertility. Morbidity and Mortality. Infant and Child Health Care. Reproductive Health Status of men and women in Africa. Female

						Genital Mutilation. HIV/AIDS and its Impact on Reproductive Health. The Psychological Health of Women and Mothers.
4	Public Health Informatics	PRH 704	1	15	1	Introduction to public health informatics as a paradigm shift. Use of Informatics to define Public Health problems. Using informatics to Determine Understand of Public Health Problem. Using Informatics to Develop Interventions/Prevention Strategies of Public Health Problem. Using Informatics to Determine Set Policy/Priority of Public Health Problem Using Informatics to Determine Implement and Evaluate Public Health Problem. Principles of geospatial analysis in epidemiology.
5	Demographic Methods, Socio-Cultural & Economic Aspects of Reproductive Health growth and resource allocation.	PRH 705	3	45	1	Introduction to Demography. Vital Statistics. Rates, Ratio, Proportion and Percentages. Measurement of fertility and reproduction. Measurement of nuptiality. Measurement of mortality. Measurement of migration. Standardisation of rates. Detecting and correcting errors in demographic data. Measurement of Population Growth.
6	Behavioral Issues & Intervention in Reproductive Health and Public Health Communication	PRH 706	2	30	1	Foundations of human behavior. Cultural and social determinants of behavior. Social and psychological determinants of behavior. Health Communication. Behavior Change Theories - Health Belief Model, Precede - Proceed Model, Force Field Analysis Theory, JOHARI Window Theoretical Model etc.

7	Adolescent Reproductive Health	PRH 707	2	30	2	Nature and characteristics of adolescence. Growing- up Girl. Rights of a girl-child. Changing pattern of a girl's reproductive system. Skills acquisition. In-school and out of school outreach programmes. Balanced gender relationship. Values and decision-making.
8	Strategic Leadership & Management in Reproductive Health	PRH 708	2	30	2	Overview of leadership. Leadership concept. Mental models and household production of health. Systems thinking and the health system. Creating a learning organization. Inspiring a shared vision. Opportunities and constraints. Current situation analysis and reality tree. Strategic design and strategic objectives. Personal mastery and team learning. Implementation with accountability.
9	Ethics, Law & Reproductive Health	PRH 709	2	30	2	Definition of Health Law, Ethics and Policy. History of Research Ethics and Principles of Research Ethics. Case Study of two Ethically Wrong Research. Informed Consent. Role of Research Ethics Committees and R E B's. Reproductive Health laws, the Constitution and Human Rights.
10	Maternal & Newborn Health	PRH 710	2	30	2	Organization of Antenatal Care. Maternal and perinatal morbidity and mortality. Health care practices utilized to prevent, diagnose, and treat the morbidities / mortalities. Review of fundamental components to reduce maternal/perinatal

						morbidity/mortality including behaviors change intervention.
11	Monitoring & Evaluation in Reproductive Health	PRH 711	2	30	2	Overview of population and health program evaluation. Utilizing evaluation results. Evaluation frameworks. Data systems and sources. Data types. Indicators. Routine health information systems. Demographic and Health Surveys. Evaluation designs. Building M&E plans. Maternal health program M&E.
12	Fertility Management	PRH 712	3	45	2	Population Dynamics and National development in Nigeria. Natural Family Planning Methods. History of Contraception. Traditional Methods of Contraception. Global Trends in Contraception. Family Planning Client Assessment. Oral Contraceptives & Injectables. Emergency Contraception. Intrauterine Contraceptive Devices. Barrier Methods of Contraception. Implant Contraceptives.
13	Seminar	PRH 713	2	30	2	Forum for students to present seminars on recent developments in reproductive health. Includes time for preparation of research proposal and presentation of preliminary reports on same; presentation of preliminary data. Each student is expected to present the research proposal before embarking on field work essentially for collection of data for the research

						activity. This will be carried out towards the end of the second semester.
14	Internship	PRH 714	1	15	3	Each student is required to embark on twelve weeks internship during the third semester at a facility/governmental agency/non-governmental organization/hospital where activities relevant to the programme of study and or research interest are carried out. Each student will have a Logbook where the student's activities will be recorded and certified by the supervisor/executive officer/programme officer/consultant-in-charge of the facility. This record of activity will include the weekly progress report, internship performance assessment and performance rating among other things.
15	Research	PRH 715	6	90	3	Each student is expected to choose a research topic relevant to the programme of study for the dissertation after discussing with the supervisors. The research title and the proposal are expected to be presented at a seminar after which it will be approved before proceeding with the actual research. At the end of the study, the dissertation will be prepared and presented for the oral defense examination. This will be conducted during the third semester.

MSc Reproductive Biology

N°	**Course name**	**Course code**	**Credit hours**	**Total number of hours**	**Semester (1st, 2nd, 3rd)**	**Short description of the course**
1	Principle of Epidemiology	PRB 701	2	30	1	Introduction to Epidemiology. Descriptive studies. Case control studies. Practical exercises on case-control study. Cohort studies. Practical exercises on Cohort study. Intervention studies and Clinical Trials. Association and Causation. Practical exercises on Calculations on causes and effects relationships, p-values, confidence intervals. Screening. Practical exercises on case study on screening.
2	Research Methodology and Experimental Designs	PRB 702	2	30	1	Introduction to Research Methodology. Research Problems. Observational. Experimental Quasi-experimental studies. Clinical Research Methods. Sample size Determination. Sampling in Medical Research. Data Collection Procedures: Questionnaire Design. Data Management in Research. Ethics in Medical Research. Qualitative Research Methods:
3	Human Reproduction and Genetics	PRB 703	3	45	1	The course will cover an in-depth discussion of male and female reproductive system. Anatomy and physiology of Hypothalamo-pituitary-ovarian axis and menstrual cycle.

						The structure and behaviors of DNA. DNA: replications, mutations, gene expression. Regulation of gene transcription. DNA processing.
4	Embryology & Anatomy of Reproductive Organ	PRB 704	3	45	1	This course will discuss overview of embryonic development. Development of the urinary system. Sexual differentiation. Development of the gonads (Male and Female). The genital duct systems. Differentiation of the urogenital sinus, bladder, urethra etc. The differentiation of the external genitalia. Anatomy of the abdominal wall.
5	Reproductive Endocrinology	PRB 705	3	45	1	This course will include biochemistry of the gonadotrophic hormones and sex steroid hormones; introduction to contraception and ethical issues in contraception; recent advances in contraception; non-hormonal contraception; hormonal contraception; Biochemistry of pregnancy and puerperium;
6	Principles of Immunology	PRB 706	2	30	2	The course will cover immunology concepts; antigens; the lymphoid system; immune system; immunoglobulins; diagnostic serological tests; fractional procedures; immune electrophoresis; viral immunology; immunosuppression; immune complex diseases; complement system and the Major Histocompatibility system
7	Introduction to Molecular Biology	PRB 707	2	30	2	Basic Concepts in molecular epidemiology, Hereditary Material. DNA Replication, Transcription and Translation, Gene Expression, Mutations and Polymorphisms, Somatic versus Germline Mutations, Types of Mutations, Causes

						of Mutations, Mendelian and Non-Mendelian Inheritance Patterns Population Genetics.
8	Strategic Leadership & Management in Reproductive Health	PRB 708	2	30	2	Overview of leadership. Leadership concept. Mental models and household production of health. Systems thinking and the health system. Creating a learning organization. Inspiring a shared vision. Opportunities and constraints. Current situation analysis and reality tree. Strategic design and strategic objectives. Personal mastery and team learning.
9	Reproductive Tract Oncology	PRB 709	2	30	2	Molecular Basis of Carcinogenesis. Carcinogenesis in the Female Genital Tract. Influence of Genes and Environmental Factors on Carcinogenesis. Mechanisms of Tumor Invasion and Metastasis. Epidemiological Factors Contributory to Female Genital and Breast Cancers.
10	Assisted Reproductive Technology	PRB 710	4	60	2	This course will cover overview of assisted reproduction; history of assisted conception techniques; Artificial insemination/intrauterine insemination; Superovulation and its monitoring; In-vitro fertilization and embryo transfer; Fertilization by micro-insemination and methods of sperm retrieval; Gamete donation; Surrogacy; Complications of ART.
11	Fetal Medicine	PRB 711	2	30	2	Principles of monitoring maternal well-being. Drugs and pregnancy. Biophysical methods of fetal assessment. Biochemical methods of fetal wellbeing and fetal scalp blood sampling.

						Physiology of lactation. Neonatal hyperbilirubinaemia including bilirubin assays.
12	Seminar	PRB 713	1	15	2	Forum for students to present seminars on recent developments in reproductive health. Includes time for preparation of research proposal and presentation of preliminary reports on same, presentation of preliminary data. Each student is expected to present the research proposal before embarking on field work essentially for collection of data for the research activity. This will be carried out towards the end of the second semester.
13	Internship	PRB 714	1	15	3	Each student is required to embark on twelve weeks internship during the third semester at a facility/governmental agency/non-governmental organization/hospital where activities relevant to the programme of study and or research interest are carried out. Each student will have a Logbook where the student's activities will be recorded and certified by the supervisor/executive officer/programme officer/consultant-in-charge of the facility. This record of activity will include the weekly progress report, internship performance assessment and performance rating among other things.
14	Research	PRB 715	6	90	3	Each student is expected to choose a research topic relevant to the programme of study for the dissertation after discussing with the supervisors. The research title and the proposal is expected to be presented at a seminar after which it will be

						approved before proceeding with the actual research. At the end of the study, the dissertation will be prepared and presented for the oral defense examination. This will be conducted during the third semester.

PhD Reproductive Health

Nº	**Course name**	**Course code**	**Credit hours**	**Total number of hours**	**Semester (1st, 2nd, 3rd)**	**Short description of the course**
1	Advanced Research Methodology	PRH 801	3	45	1	Introduction to statistics in biological and related life sciences Types of data Organization and presentation of data. Measures of central tendency & dispersion. Vital statistical rates. Probability and probability distributions. Confidence intervals and hypothesis testing. Comparing groups of Continuous Data using parametric and non-parametric statistics:
2	Data Analysis, Interpretation and Manuscript Preparation in Reproductive Health	PRH 802	3	45	1	Data Quality; Screening & Cleaning of Data; Introduction to Computer Programmes for Statistical Analysis (SPSS, STATA, NVIVO, Epi Info, etc.); Bivariate and Multivariate Analyses; Introduction to Complex Modelling (Multi -Level Models, Scenario

						Building, Dynamic Models, Simulation Methods, etc.);
3	Introduction to Critical Thinking in Reproductive Health Research	PRH 803	3	45	1	Introduction to Existing Seminal. Writings on Reproductive Health; Epistemology and Critical Thinking; Basic Concepts in Public and Population Health; Intersection of Human Behavior and Reproductive Health; Literature Review and Sources of Literature
4	Demography, Fertility & Population Issues	PRH 804	3	45	1	Population Dynamics and National development in African countries. Principles of population changes. Elements of demography and health implications of key population issues and concerns. Demographic principles and maternal/child survival and mortalities.
5	Seminar	PRH 805	3	45	2 - 6	Forum for students to present seminars on recent developments in reproductive health. Includes time for preparation of research proposal and presentation of preliminary reports on same, presentation of preliminary data. Each student is expected to present the research proposal before embarking on field work essentially for collection of data for the research activity. There shall be a post-field seminar during which the student is expected to present the results of the research activity before submitting the thesis for the oral defense examination.

6	Research	PRH 806	6	90	2 - 6	Each student is expected to choose a research topic relevant to the programme of study for the thesis after discussing with the supervisors. The research title and the proposal is expected to be presented at a seminar after which it will be approved before proceeding with the actual research. At the end of the study, the thesis will be prepared and presented for the oral defense examination.

PhD Reproductive Biology

Nº	**Course name**	**Course code**	**Credit hours**	**Total number of hours**	**Semester (1st, 2nd, 3rd)**	**Short description of the course**
1	Advanced Research Methodology	PRB 801	3	45	1	Introduction to statistics in biological and related life sciences Types of data Organization and presentation of data. Measures of central tendency & dispersion. Vital statistical rates. Probability and probability distributions. Confidence intervals and hypothesis testing. Comparing groups of Continuous Data using parametric and non-parametric statistics:

2	Data Analysis, Interpretation and Manuscript Preparation in Reproductive Health	PRB 802	3	45	1	Data Quality; Screening & Cleaning of Data; Introduction to Computer Programmes for Statistical Analysis (SPSS, STATA, NVIVO, Epi Info, etc.); Bivariate and Multivariate Analyses; Introduction to Complex Modelling (Multi -Level Models, Scenario Building, Dynamic Models, Simulation Methods, etc.);
3	Human Genetics	PRB 803	3	45	1	The structure and behaviors of DNA. DNA Chromosomal autosomal anomalies. Abnormalities of sex chromosomes. Mutations and Gene Expression. Regulation of Gene Transcription. RNA Processing. Gene abnormalities producing diseases. Genetics of Neoplastic Growths.
4	Advanced Reproductive Biology, Assisted Conception & Endocrinology	PRB 804	3	45	1	An in-depth survey of male and female reproductive processes including neuroendocrine system. Pituitary and gonadal control mechanisms, as well as the physiology of pregnancy and parturition. Biochemistry of steroid hormones. Gonadotrophic hormones. Biochemistry of pregnancy and the puerperium.
5	Seminar	PRB 805	3	45	2 - 6	Forum for students to present seminars on recent developments in reproductive health. Includes time for preparation of research proposal and presentation of preliminary reports on same, presentation of preliminary data. Each student is expected to present the research proposal before embarking on field work essentially

						for collection of data for the research activity. There shall be a post-field seminar during which the student is expected to present the results of the research activity before submitting the thesis for the oral defense examination.
6	Research	PRB 806	6	90	2 - 6	Each student is expected to choose a research topic relevant to the programme of study for the thesis after discussing with the supervisors. The research title and the proposal are expected to be presented at a seminar after which it will be approved before proceeding with the actual research. At the end of the study, the thesis will be prepared and presented for the oral defense examination.

Sport Management and Policy Development Programme

MSc Sport Management and Policy Development

Nº	Course name	Course code	Credit hours	Total number of hours	Semester (1st, 2nd, 3rd)	Short description of the course
1	Strategic Management in Sport	PSD 701	2	30	1	This course will focus on general principles of strategic management in sport including but not limited to governance, organizational relations, conflict management, human resource management and will specifically relate these to sport.
2	Sport Development Policy, Monitoring and Evaluation	PSD 702	3	45	1	The focus of this unit will be on the examination of policies and practices used in the administration and management of sport. Contemporary social changes processes such as structuralism, people-oriented development among others will be examined. Importantly, African Union Policies will be examined with the view to develop sport in the regions.
3	Sport Security, Law & Conflict Management (Practicum & Theory)	PSD 703	3	45	1	This unit presents the opportunity for students to articulate the importance of security in sport involvement. This unit will also examine the threat of terrorism to sport and various security policies put in place by

						international and national sport governing bodies to ensure that development of sport is not hindered in Africa.
4	Sport Science and Technology	PSD 704	2	30	1	The course will examine how the healthy human body works during exercise, and how sport and physical activity promote health physically, mentally and socially. The course will incorporates many other academic studies and areas, like physiology, psychology, anatomy, engineering and chemistry.
5	Sport Economic & Financial Management	PSD 705	2	30	1	This course addresses the impact of both micro and macroeconomic variables to sport in Africa. Students must analyse economic trends, demand and supply trends and economic scarcity in relationship to sport and its sustenance. The course also explores the principles of general financing management to sport -specific financial issues. It takes holistic financial accounting to the organization and the management of sport business.
6	Sport Facilities and Event Management (Practicum & Theory)	PSD 706	4	60	1	It focuses on the major components of both facilities and event management. This will include planning, financing, marketing, implementation and evaluation in sports. The course will also examine sports events management agencies across Africa and beyond.

7	Sport Marketing & Entrepreneurial Management	PSD 707	3	45	2	Sport Marketing and Entreprenueral Management focuses on how to expose students to create powerful media and marketing platform. The course also discusses marketing rights and communication and entreprenural skills. This course must address, trends, determinants and the value of sports commerce. Students must understand the essential elements of sports marketing and commercialization strategies and how they apply in the management of sport
8	Talent Identification and Development (Practicum & Theory)	PSD 708	4	60	2	The focus of this course will introduce the students to various models of talent identification, development, management and education. Students will appreciate the longitudinal approach to talent identification, development, management, education and supporting in young sport participants through early developmental stages all the way to elite sport.
9	Research Methodology & Statistics	PSD 709	3	45	2	This unit will examine research methodological designs. Both qualitative and quantitative approaches will be emphasized. It will also involve the formulation of research question and hypothesis, review of literature, sample and sampling techniques as well as data collection procedures and analysis. Ethical standard procedures in research will also be emphasized.

10	Sociology of Sport and Development	PSD 711	3	45	2	This unit presents opportunity for students to understand the role of sport as it influence people, groups, institutions, human activities and social order within the society. This unit is also concerned about institutions in the society such as religion, family, government and judiciary.
11	Seminar in Sport Science and Management	PSD 712	1	15	2	Discussion of current research and literature related to selected problems. Topics will be selected on the basis of current trend as well as students' interest and needs. The course is all about students' individual presentation of research project report. This is compulsory
12	Internship	PSD 710	1	15	3	This unit will focus on giving students an opportunity for field experience in some sport organization for three (3) months. The field experience will be presented in form of a seminar.
13	Project Work	PSD 713	6	90	3 & 4	Each student is expected to select a problem in his area of specialization in conjunction with his/her supervisors, carry out some investigation and present a well-documented report. This report must show hypothesis tested (if any), the results obtained and the implications of the study.

Veterinary Medicine Programme

MSc Avian Medicine

Nº	Course name	Course code	Credit hours	Total number of hours	Semester (1st, 2nd, 3rd)	Short description of the course
1	Advanced Diagnostic Medicine	PAM 711	3	45	1	Decontamination and Lab waste management; Lab quality management; Biosecurity in field and safety in Lab; General introduction to laboratory diagnosis. Sample collection, transportation, processing, storage, and choice of assay; Guide for sampling (faecal, cloacal, pharyngeal and tissue) at ante- and postmortem levels in avian species for diagnosis; Diagnostic bacteriology: Media preparation, reagents, and handling of specimen for microbiological investigations with special reference to avian patients; Identification of major avian coccidia, fungi, major ecto and endoparasites and haemoparasites and use of avian embryo in laboratory diagnosis.
2	Advaned Clinical Practice I	PAM 712	3	45	1	Disease investigation and management; History taking; Clinical examination; Sampling.

						Assessment for dehydration, fluid therapy. Blood loss and blood transufion. Cross matching
3	Avian Internal Medicine I	PAM 713	3	45	1	Functional and neoplastic disorders in aviary birds; Diseases of the digestive system, vomitting and regurgitating birds. Overview of clinical implications of liver disease: aetiologies, clinical signs, diagnosis, treatment; Chlamydiosis, Pacheco's disease, etc. Disorders of the pancreas; Pancreatic insufficiency, pancreatitis, neoplasia, diabetes mellitus; Common conditions affecting the respiratory system in poultry and aviary birds: Bacterial, viral, protozoan and fungal diseases such as brooder pneumonia, pnuemovirus infections, infectious laryngotracheitis, etc.; Common conditions affecting the reproductive system in poultry and aviary birds: Bacterial, viral and protozoan diseases; Investigating reproduction problems in an avian species: cessation of egg production, infertile eggs, embryonic deaths, etc.
4	Avian Immunology	PAM 719	2	30	1	Avian immune organs; Structure and features of the Avian immune system; Adaptive and non-adaptive immunity in avian species; Cellular (avian T cells, antigen recognition and lineages; avian cytokines and chemokines) and humoral immunity (B cells, the Bursa of Fabricius and the generation of antibody repertoires); Steps of

						immune response; Immunosuppression; Vaccines and vaccination; Avian immunosuppressive diseases and immune evasion.
5	Advanced Avian Pathology	PAM 727	3	45	1	Pathogenesis, gross and microscopic manifestations of bacterial, fungal and parasitic infections in avian species; Pathogenesis, gross and microscopic manifestations of viral infections in avian species; Pathogenesis, gross and microscopic manifestations of metabolic and nutritionally related diseases of avian species; Pathogenesis, gross and microscopic manifestations of toxins in avian species; Changes in hematology and clinical chemistry induced by infectious and non-infectious conditions in avian species; Cytology and immunohistochemistry.
6	Poultry Breeder Health	PAM 735	2	30	1	Management aspects of poultry breeder's health; Housing and management of parent stocks; Vaccination of poultry breeders; Poultry flock immune profiling; Care of hatchable eggs; Parental chick immunity; Egg borne diseases; Incubation of hatchable eggs; Egg incubation problems; Procedure for investigation of hatchability problems; Biosecurity in breeder farms, hatcheries and feed mills.
7	Advanced Internal Medicine II	PAM 714	2	30	2	Overview of disorders of the integument, cardiovascular, haemopoietic, nervous and urinary systems of avian species.

						Diseases of skin and feathers, disorders of the beak and cere Congenital heart disease, endocardial, myocardial, and pericardial diseases, arrhythmias, and congestive heart failure. Atherosclerosis, hypertension. Clinical presentations, diagnosis, and management of cardiac diseases. Disorders of the nervous system in aviary birds; history taking, distant and physical examination for nervous signs. Central and peripheral nervous systems disorders caused by different aetiologies and management. Disorders of the urinary system. Inflammatory and non-inflammatory conditions of the kidneys. Clinical presentations, diagnosis, and management. Urolithiasis and other conditions affecting the urinary system
8	Trauma management in Avian Species	PAM 715	3	45	2	Brief review of Avian anatomy. Introduction to orthopedic problems in avian species (possible sources and causes, effects in different avian species); Injuries and sources in poultry, zoo and fancy birds; Wound management in birds; Sequential diagnosis and management of various orthopedic problems in in zoo and poultry birds; Orthopedic facilities in use for various avian species (including various implants in fixing fractures); Traumatic and non – traumatic problems of arthrodial joints in birds; Diagnostic protocol and management

						of lameness in avian species. Diagnostic imaging.
9	Advanced Clinical Practice II	PAM 725	3	45	2	Clinical diagnosis and clinical and pathological study of cases from poultry farms, caged and zoo birds.
10	Disease Surveillance and Emergency Preparedness	PAM 738	2	30	2	Definitions, classification of diseases of avian species; Disease patterns, disease surveillance; Role of international organizations in disease surveillance; Maps and grid references, uses of GIS in disease mapping, Risk assessment; National Animal Disease Information System (NADIS info), Epi-Info, TAD in the diagnosis; Treatment and control of transboundary avian diseases, travel diseases of man, past and present disease; Trans boundary avian diseases; Characteristics of avian diseases subject to mandatory reporting; Surveillance (objectives, types, data collection, case definition & classification, premises calcification, back forward and contact tracing, biosecurity and biosafety, interaction with stakeholders); Surveillance plan; Emergency preparedness and response plan; Good emergency management practices; Disease reporting (types of reports, channel and tools of reporting); National Animal Disease Information System (NADIS); Uses of GIS in disease mapping; Risk assessment and risk management

11	Research Methods & Experimental Design	PAM 739	2	30	2	Introductory statistics; Study designs; Scales of measurement, quality of measurement, statistical variable/data; Qualitative and quantitative data sources; Sampling methods and sample size determination; Data organization: Statistics Charts, Tables, Graphs Frequency Tables, Frequency distribution; Histogram, Stem and leaf plot, box plot; Summary indices: Mean, Median, Modes Variance Standard Deviation; Probability distributions: Normal, Binomial, Poisson distribution, Descriptive statistics, frequency table, tables for qualitative and quantitative data, diagrams, types of diagrams; Data summarization: Summary indices, measures of central tendency and dispersion; Test of statistical hypothesis; Confidence intervals; Parametric and non-parametric tests: Z-test for proportions, Chi-square test, Fischer's exact test and T-test. Analysis of variance, Regression and correlation, Spearman rank and Kendal correlation; Modeling, scientific writing, hypothesis testing
12	Seminar	PAM 746	1	15	3	Detailed study and analysis of any selected subject of clinical or clinic-pathological interest in avian medicine and presentation in form of seminars for scored assessment.
13	Research Internship in Avian Medicine	PAM 747	1	15	3	Hands-on experience/practical experience in any area of avian medicine

14	Research Thesis	PAM 748	6	90	3 & 4	Student to select project topic in any area of avian medicine.

MSc Veterinary Vaccine Production and Quality Control

N°	**Course name**	**Course code**	**Credit hours**	**Total number of hours**	**Semester (1st, 2nd, 3rd)**	**Short description of the course**
1	Advanced Parasitology	PVP 703	2	30	1	Characteristics of relevant parasites; Principles of vaccine manufacture using parasites; Production of Parasitic vaccines; Quality control and challenges in parasitic vaccines; DNA, Recombinant and sub-unit parasitic vaccine
2	Advanced Bacteriology	PVP 711	2	30	1	General principle of bacteria taxonomy; Classification of bacteria; Characteristics and structures of bacteria; Overview of bacterial diseases of animals including zoonosis; Emerging and re-emerging bacterial diseases of domesticated and wild animals; Bacterial genetics; General biochemical background of bacteria.; Isolation and Identification methods of common bacteria of veterinary importance.; Pathogenesis of bacterial diseases including molecular basis of host- bacterial relationship.

3	Advanced Virology	PVP 713	2	30	1	Understanding the principle and uses of different medium for viral cultivation; Classification of viruses; Characteristics and structures of viruses; Isolation, cultivation, replication, concentration, and purification of viruses; Pathogenesis of viral diseases including molecular basis of host-viral relationship; Serological, molecular, and other techniques used for viral identification.
4	Laboratory Animal Managment	PVP 716	2	30	1	History of animal use in research. Infectious and non-infectious diseases of laboratory animals, with special emphasis on their control by management practices and therapy.Factors affecting the use of experimental animals in research.
5	Advanced Immunology	PVP 719	3	45	1	Overview of immunity in animals; Body defence mechanism; Humoral and cellular immunity; Complement system; Techniques for measuring immunity; Hypersensitivity reactions; Immune mechanism to specific pathogens; Immune response to parasites, bacteria, viruses, parasites and fungi; Immunotherapy/ Immunoprophylaxis.
6	Veterinary Vaccine Production	PVP 723	4	60	1	Preparation of seed virus stock; Generation of viral sub-units and antigens; Inactivation/Purification of viral antigens; Formulation of viral vaccine; Lyophilisation processes; Product purity, safety, and potency testing; Packaging; Preparation of seed bacteria stock; Generation of bacterial sub-units and antigens; Inactivation/Purification of bacterial antigens; Formulation of the vaccine; Lyophilisation processes.

7	Laboratory biosafety and Biosecurity	PVP 702	2	30	2	Introduction to laboratory safety; Good laboratory practices; Use of personnel protective equipment; Laboratory bio-containment; Decontamination; Waste management and disposal; Laboratory hazards; Safety equipment in the laboratory; Bio risk assessment and mitigation
8	Vaccine Registration Process	PVP 704	2	30	2	Structure of registration dossier; Product information; Quality, manufacture, and control; Safety; Efficacy; Bibliography and references; Harmonization of vaccine registration
9	Vaccine Quality Control & Quality Management System	PVP 710	3	45	2	History of vaccination; Type of Vaccines; Pathway to vaccine development; Mechanism of vaccine protection; Vaccine construction; Measurement to immune response to vaccination; Vaccine efficacy and safety; Adjuvant in making vaccines immunogenic; DNA vaccines. Introduction to quality manual; Quality policy; Organization; Management of Lab equipment; Purchasing and inventory; Process management; Assessment/audit; Customer focus
10	Mycology	PVP 717	2	30	2	Classification and general characteristics of pathogenic fungi: Special reference to fungal contaminants; Reproduction in fungi; Isolation and identification of fungi: Emphasis on media, staining and diagnostic techniques; Beneficial and detrimental effects of fungi; Possible mycotic contaminants of vaccines of Veterinary and Medical importance and their prevention; Prevention of mycotic contaminations; Possible advances in vaccine production

11	Research Methods & Experimental Design	PVP 718	2	30	2	Statistics; Study designs; Scales of measurement, quality of measurement, statistical variable/data; Qualitative and quantitative data sources; Sampling methods and sample size determination; Data organization: Statistics Charts, Tables, Graphs Frequency Tables, Frequency distribution; Histogram, Stem and leaf plot, box plot; Summary indices: Mean, Median, .Modes Variance Standard Deviation; Probability distributions: Normal, Binomial, Poisson distribution, Descriptive statistics, frequency table, tables for qualitative and quantitative data, diagrams, types of diagrams; Data summarization: Summary indices, measures of central tendency and dispersion; Test of statistical hypothesis; Confidence intervals; Parametric and non-parametric tests: Z-test for proportions, Chi-square test, Fischer's exact test and I-test. Analysis of variance, Regression and correlation, Spearman rank and Kendal correlation.
12	Seminar	PVP 720	1	15	2	Detailed study and analysis of any selected subject of interest in veterinary vaccinology. The presentation in form of seminars for scored assessment.
13	Handling & Shipment of Biological Materials/Cold Chain	PVP 722	2	30	2	Classification of dangerous materials; Characterization of dangerous materials; Packaging and packaging materials; The cold chain; IATA regulations on the shipment of dangerous materials; Documentation and transport of dangerous materials

14	Internship in Veterinary Vaccine Production & Quality Control	PVP 721	1	15	3	To expose students to hands-on experience in all aspects of vaccine production.
15	Project	PVP 724	6	90	3 & 4	Detailed investigation (research) and documentation of any subject of clinical interest in vaccine production and presentation in the form of a Dissertation for both internal and external assessments.