

1. Forward

Availability and acquisition of sound education especially at the tertiary level has remained a mirage to most African children. The situation is further compounded by unavailability of quality and globally competitive institutions among the existing ones on the continent. The initiative of the African Union Commission (AUC) in coming up with continental university is therefore commendable and should be given the maximum support for it to achieve the intended goals of nurturing quality and exemplifying excellence in the education sector within Africa.

The main theme of the Pan African University Institute of Life and Earth Science (including Health and Agriculture) PAULESI, falls within the framework of the millennium development goals (MDG) since the impact on the African economies is expected to be significantly driven by progress in science and technology. Most of the global economies are heavily driven by progress in science and technology. As the pioneer institute, the right foundation blocks have to be set to ensure an enduring legacy for posterity. The right attitude and the right vigour should be maintained to achieve the desired goals. This implies lots of sacrifice that will be expected from both staff and students.

Students within the PAU are expected to be minimally bilingual therefore students are to undergo language programme for the first six months of arriving on campus with students from Anglophone countries learning French and those from Francophone background moderating English. The students are therefore implored to seize the opportunity to make best use of the situation by devotion to work and being law abiding.

This Prospectus has been prepared to serve as a veritable source of information. In some instances the knowledge required on some issues may not be sufficiently provided. Students have to consult other sources of information in order to have the complete knowledge on the programmes. The prospectus provides information concerning issues on admission requirements, award of degree and the course content for the different programmes. All the students are expected to critically study the contents of this book so as to have a full grasp of the programme they desire pursuing.

Prof Abatan Matthew O.
Director



2.

MASTERS PROGRAMMES

Aim and Objectives

2.1. *Duration of Training*

Not less than eighteen months and not more than three (3) academic years.

2.2. *Programme Structure*

To specify the courses offered per semester and the Course Units earned per course. Most programmes have recess terms, in addition to the two semesters, for greater focus on the practical aspects of the programmes, such as internship, teaching practice, survey projects, field attachments, industrial training, etc.

2.3. *Course Units*

- a) The programmes shall be conducted on Course Unit (CU) basis;
- b) One CU is equivalent to one contact hour a week over a semester or a series of weeks of at least 15 contact hours;
(A semester contains 17 weeks, 15 of teaching/ study/practice and two weeks of examinations).

- c) One contact hour is equivalent to one hour of a lecture /tutorial/ seminar, or two hours of practicals.

The total Course Units required at the end of a Semester must be at least 15.

The Course Units required at the end of a year must be at least 30.

2.4. Course Work and Research requirements

- a) A candidate shall not be permitted to formally start on research work unless he/she has attended a minimum of at least 2/3 of the courses offered in the first year of course work.
- b) All masters' degree programme students are also required to present at least one seminar before completing their degree programme.
- c) A candidate for the Masters degree shall undertake a research project with the guidance of at least two supervisors appointed by the Institute Board and approved by the Senate out of which one should be Principal Supervisor
- d) The Masters candidate shall present a Thesis in accordance with the general rules and regulations pertaining to all Masters Degrees submitted to the PAU.

2.5. Award

The degree of a Master of the relevant programme, shall be awarded to a candidate who has accumulated a minimum of 30 CU for the courses passed; and has successfully fulfilled the requirements of the thesis and passed the oral examination.

2.6. Oral Examination

An oral examination is compulsory for Masters Students. The oral examination for Masters Students is a closed one conducted by the appointed panel only. Oral examiners shall identify the areas to be covered during the oral examination and the kind of questions to be discussed in the examination. The panel shall examine the knowledge base on the subject matter or the research.

2.7. Grading Standards

The following marks shall be adopted for all:

Distinction 80%+

Merit 70- 79%

Pass 50- 69%

Fail Below 50%

The pass grade point per course is 2.0

- (a) No credit unit shall be awarded for any failed course.
- (b) Progression through the course shall be assessed in one of three categories

(a) Normal Progression- This occurs when a student passes all courses taken

- (b) Probationary – This is a warning and occurs if:

- (i) A student fails a core/compulsory course, or
- (ii) A student obtains a grade point average (GPA) or a cumulative grade point average (CGPA) of less than 2.0

- (c) Discontinuation – A student shall be discontinued from the programme for one of the following reasons:

- (i) Receiving two probations on the same core/compulsory course
- (ii) Receiving two consecutive probation based on GPA or CGPA

- (c) Retaking/Repeating a course:

There shall be no supplementary examination in any course of the programme. However, a student may retake any course when it is offered again in order to:

- (i) Pass if the student had failed it before.
- (ii) Improve the grade if the first pass grade was low.

- (d) Thesis: The thesis shall conform to the standing guidelines and regulations of the Pan African University on higher degrees.

- (i) A candidate shall submit a research proposal to the Faculty Higher Degree Committee before the end of the second semester of the first year. He/She will only be allowed to proceed for research upon satisfactory defence of the proposal

- (ii) At least three months before a thesis is to be presented, a candidate shall give notice in writing to the University, indicating the title of the Thesis and the actual date of submission.

- (iii) The thesis shall be examined following guidelines of University of Ibadan by at least three examiners (two internal and one external).

- (iv) A thesis submitted for the degree must be satisfactory with regard to form and literary presentation; it must also include a full bibliography of the material used in the preparation.

- (v) The candidate will be required to submit three copies of the thesis accompanied by a declaration to the satisfaction of the Senate stating that it has not been submitted for a degree at any other University.

- (vi) Approval of thesis- To obtain final approval of a thesis, the candidate shall satisfy the examiners by a written thesis and viva voce. The recommendation of the committee will be communicated to the School of Graduate Studies with a clear recommendation for award of the degree or otherwise.
- (vii) Revision of a Thesis – A candidate, who fails to satisfy the examiners, may resubmit a revised thesis in accordance with the guidance of the viva voce committee. The revision must be submitted within six months after notification.

2.8. Award of Degrees

A letter of award of the degree shall be processed by the Directorate of Graduate Studies and Scholarships (DGSS) of the PAU only when the examiners have certified in writing and with signatures that the candidate presented a meritorious thesis and passed the oral examination. Where a candidate has to make corrections on the thesis as recommended by the examination panel, the letter of award of the degree shall only be processed when the candidate has made the corrections to the satisfaction of the examiner who was entrusted by the oral examination panel to oversee the corrections. The Principal Supervisor shall write to the Director of the DGSS certifying that he/she was satisfied with the corrections.

Three copies of the thesis, in acceptable binding with a hard black cover, endorsed by the student and supervisor(s) shall be presented to the DGSS. In addition, the oral examination report shall be made available to the DGSS before the award letter is prepared.

Only those candidates who will have received their letters of award shall be eligible for inclusion in the book of graduating students and to attend the graduation ceremony.

2.9. JOINT AWARDS

Definition

Joint award qualification in a University system refers to an award that ensues from jointly executed teaching, supervision and examination or all such multiple responsibilities involving more than one unit in a given university, for instance the PAU, and other relevant and recognized Universities.

2.10. Joint Award Certificate

- (i) The name of the joint award degree shall be endorsed by the partner universities and both official languages (if different) shall be used on the award certificate by mutual consent.
- (ii) The joint Award certificate shall bear both/all the logos of the collaborating universities side by side, a lead statement of the awarding bodies in the partner universities, the title of the degree (and class, if applicable), candidate's name, date of award and signature of the relevant university authorities. The quality of paper used shall be agreed upon and the relevant university seals shall be embossed.
- (iii) The graduating candidate shall receive the joint award only once at a graduation ceremony in a partner university of his/her choice. However, the names of the candidate shall be included in the graduation lists of both the partner universities and the candidate shall be free to attend both graduation ceremonies.



3.0.**MASTER OF ENVIRONMENTAL MANAGEMENT****3.1. Course Description For Master Of Environmental Management**

Course Code	Course Title and Description	Lecture Hours	Practical Hours	Course Units	Remark
PEM 701	<p>Introduction to Environmental Management</p> <p>Man-environment interactions, components of the environment and associated problems with the use of resources. The rural and urban environments; sustainability issues in environmental management. Social and economic dimensions in environmental management. Preventive and contingency planning.</p>	45	0	3	Compulsory
PEM 702	<p>Contemporary Environmental Challenges in Africa</p> <p>Human-environment interactions. Sustainability and environmental challenges. Hydro-meteorological and geological hazards. Definitions, causes, characteristics, occurrence, processes, spatial variations. Environmental and human consequences, economic implications, management options, mapping, monitoring and policy options of hazards such as droughts, floods, tropical cyclones, coastal erosions, soil erosion, landslides, earthquakes, volcanic eruptions, etc. Deforestation, desertification and forest fires. Environment, poverty and development; Property rights and access to resources; Vulnerability and adaptation to natural hazards and climate change; Trans-boundary issues and environmental politics. Oil spills.</p>	45	0	3	Compulsory

PEM 710	<p>Environmental Assessment and Analysis</p> <p>Techniques and methods of environmental management and their application to resolving problems of sustainable development. Environmental Technology Assessment; Environmental Risk Assessment, Environmental Impact Assessment, Environmental Auditing, Corporate Reporting. Risk assessment and ethics. Overview of the strengths and limitations of the techniques and methods. Social Impact Assessment. Urban Environmental Assessment: The Urban Management Programme approach. Environmental Profile: Integrated environmental management institutions, Environmental Management Systems, Environmental Management Plan; Managing environmental impact assessments, National Environmental Contingency Plan. Economic analysis in decision-making: environment, energy, and economy. Investigation of how these tools fit within legislative and institutional frameworks. Trends in the use of particular tools at project, local, regional, national and international scales. Selected case studies - Projects that combine environmental protection and development functions.</p>	45	0	3	Compulsory
PEM 711	<p>Remote Sensing in Environmental Planning and Management</p> <p>Introduction to remote sensing, nature and definition of remote sensing. Remote Sensing (Non-Photographic Imaging Systems) - principles and scope. The remote sensing process- remote sensing of the environment, in situ data collection, remote sensing data collection. Characteristics of major imaging sensor systems – the remote sensing systems. Elements of Image Interpretation. Interaction characteristics of electromagnetic radiation with: vegetation, soils, water and human settlements. Application of remote sensing data for environmental resources mapping and degradation assessment. Field visit for ground truth survey. Aerial photography and platforms; geometric properties of aerial photographs; Photo-interpretation; application of photo-interpretation for drainage pattern, relief, land use and vegetation mapping. Using Google Earth image for data collection.</p>	30	45	3	Required

PEM 712	<p>Geographic Information Systems (GIS) Application in Environmental Planning and Management</p> <p>GIS- definition and concepts, elements and stages of a GIS; system components and hardware/software requirements. GIS data collection and requirements, vector and raster (remote sensing) data requirements; modes of data input and conversion from other digital data sources. The map as a model of geographic data: scale, geodetic datum, coordinate and projection systems; thematic maps (topographic, soil, drainage, sea vegetation etc). Using Global Positioning System (GPS) device for environmental data collection. Spatial analysis: Terminologies used in GIS spatial data analysis (spatial awareness; spatial elements; spatial reference systems; spatial patterns; spatial analysis), Spatial data structure for GIS, formalism of spatial concepts, topology and spatial relationships, Database Management Systems (DBMS), criteria for assessing a GIS. Practicals based on relevant software applications</p>	30	45	3	Required
PEM 713	<p>Techniques of Investigation in Environmental Management</p> <p>Data collection procedures, Focus Group Discussions, Internet, Surveys-observation, participant and non-participant, questionnaire administration, interviewing methods. Data management and analysis. Qualitative data- thematic, content and triangulation; Quantitative data- descriptive and inferential statistics; Data interpretation.</p>	45	0	3	Required
PEM 714	<p>Internship</p> <p>Practical experience in field of study</p>				Required

PEM 715	<p>Planning for Disaster Preparedness and Management</p> <p>Disaster Risk Management (DRM) - Introduction and definitions. Disaster Risk Management Framework, Disasters and vulnerability analysis. Environmental profiling for risk assessment. PRA Tools and field mapping. Hazard monitoring and evaluation. Mainstreaming Disaster Risk Management into development: (institutional and legal arrangements for disaster risk management). Disaster Risk Reduction and building resilient communities. Establishment of Early Warning System for DRM. Indigenous Knowledge Systems for EWS. Planning for Disaster Risk Management. Community Centred Human Resource Management. Vulnerable groups focused DRR (gender, child, disabled, etc).</p>	45	0	3	Required
PEM 716	<p>Environmental Planning Law</p> <p>Definitions of terminologies. Concept, evolution, purpose and structure of Environmental Law. International Agreements, Conventions and Treaties in Environmental Law. Environmental Law and International action on Management of Environmental Resources. Towards strengthening of International Agreements and covenants on transboundary Resource Management. Environmental Policy and Framework Law. Sectoral and functional environmental laws. The institutionalization of Environmental Policy, planning and management. Legislation on environmental policy, planning and development. Environmental Management Regimes. Environmental Law, Policy and Management: Retrospect and Prospect. Case studies of contemporary and emerging environmental legal issues</p>	45	0	3	Required

PEM 721	Air Pollution, Prevention and Control Types and measurement of air pollution; principles and control of air pollution, including: air pollution chemistry; Atmospheric diffusion modelling, climatology, biological, chemical and physical control treatment processes, air pollution effluent measurement and control, atmospheric dispersion.	45	0	3	Elective
PEM 722	Waste Management Sources, characteristics and classification of municipal, industrial, agricultural and hazardous waste. Hazards of different types of waste, waste audit process, waste minimization and elimination techniques, and processes for pollution prevention, treatment, and recovery. Pollution impact on land due to non – biodegradable waste matters (glass, polythene bags, P.V.C. & other plastic materials, etc. Biological processes for environmental control; biological basis of wastewater treatment; river systems and wastewater treatment works analogy. Clinical waste management. Waste economic evaluation method, existing practices and their hazards Case studies.	45	0	3	Elective
PEM 723	Surface and Ground Water Management Water pollution, sources of water pollution, effects and prevention of water pollution. In-situ and laboratory analysis of water; Land pollution, sources of land pollution, effects and prevention of land pollution	45	0	3	Elective
PEM 750	Climate Change Impacts, Adaptation and Mitigation Climate change- science and policy. Current and possible future global climatic changes. Bio-physical and social impacts of climate change. Climate change and disease epidemiology. Social and biophysical vulnerabilities to climate change. Mitigation and adaptation to climate change. Policies and measures for minimizing the impacts of climate change. Climate change and global/national economies. Mitigation-technological options, policies, and socio-economic impacts of mitigation measures. Climate change and national response. Carbon financing (REDD, CDM, PES).	45	0	3	Elective

PEM 751	<p>Marine and Coastal Zone Management</p> <p>Coastal environments, processes and management strategies. Climate change and sea-level rise, Coastal biota as environmental proxies. The African coastline. Defining the coastal zone. Importance of the coastal zone and the need for management. Environmental consideration and coastal dynamics. Preparation of action plans and implementations. Coastal Zone Management Framework and coastal management planning process. Expectations of Integrated Coastal Zone Management (ICZM). Local and international constraints/challenges of ICZM, policy, legislation and institutional framework.</p>	45	0	3	Elective
PEM 752	<p>Indigenous Knowledge and Environmental Management</p> <p>The evolution of indigenous knowledge system (IKS), structures, institutions and customary laws traditional beliefs and practices that incorporate environment management from the direct relationship between the indigenous community and the natural environment. Cultural and spiritual values of the natural environment. The interlinkages between indigenous livelihood, health, conservation and utilization of natural resource. Indigenous communities and the governance of natural resources-property right, access to natural resources and benefit sharing. The conflicts between indigenous knowledge system and intellectual property right e.g. patenting of traditional medicinal plants. Emerging approaches to environment management- co-management, indigenous peoples and protected area, nomadic peoples and transboundary natural resources management. Indigenous peoples and knowledge in African environment management policies</p>	45	0	3	Elective

PEM 753	Urban Planning and Environmental Management Historical evolution of urban and regional planning thoughts. Urban and regional planning. Concepts, principles and techniques. The structure and function of planning agencies. Urban planning legislations: Formulation, enforcement, challenges. Integration of environmental management in planning education and practice. Urban planning tools and their application to environmental planning and management. The role of urban planning in disaster risk reduction and climate change adaptation. Development control strategies in disaster prone areas, improving planning of cities to meet environmental challenges. Case studies of planning strategies and action toward effective environmental management.	45	0	3	Elective
PEM 754	Social and Ethical Dimensions of Environmental Management Social and ethical issues in environmental management. Disaster myths. Roles of stakeholders, information, movies and print media. Perception and preparedness. Emergency managers. Non-Governmental Organizations. Role of policy. Relief Organizations.	45	0	3	Elective
PEM 755	Environment Conflict Resolution and Management Meaning, types and causes of conflicts. Conflicts over resources. Conflict management and prevention: A typology of conflict prevention measures/conflict management methods. Constructive versus destructive conflict management. People-centred conflict management. The role of environmental information system and communication skills in conflict resolution and management. Managing conflict in integrated environmental management. Types of negotiations: interpersonal skills, techniques and guidelines for negotiations. Case studies.	45	0	3	Elective

PEM 756	Energy Resources Planning and Management Energy resources inventory; consumption and conservation of energy types; economics of energy use	45	0	3	Elective
PEM 781	Seminar Preparation of a report based on an in-depth study on a subject of interest in the environmental management curriculum.			2	Compulsory
PEM 782	Project/Dissertation An original piece of 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.			6	Compulsory



4.0. MASTER IN GEOSCIENCE

The programme of Master's Degree (M.Sc.) in Geosciences have two options in line with the area of specialization as follows:

- a) Master of Science (M.Sc) in Petroleum Geoscience and
- b) Master of Science (M.Sc) in Mineral Exploration

4.1. MASTER IN PETROLEUM GEOSCIENCE

1st Year- Part I

1st Semester	Course code	Contact Hours	Theory Hours	Practical Hours
Core 1	Introduction To Upstream E & P Business	3 x 8 weeks	1	2
General 1	Skills Acquisition	3 x 4 weeks	1	2
General 2	Human Rights and Gender	3 x 4weeks	3	0
Core 2	Reservoir Modelling and Reserves Calculation	3 x 8 weeks	1	2
Supportive 1	Research Design and Proposal	3 x 8 weeks	3	0

2nd Semester	Course code	Credits Hours	Theory Hours	Practical Hours
Core 3	Geology and Field Development Planning	3 x 8 week	1	2
Supportive 2	Research Analysis and Dissemination	3 x 8 weeks	1	2
Supportive 3	Geoscience Seminar	3 x 8 weeks	0	3
Elective	Specialized study	3x4 weeks	1	2
General 3	Governance, Peace and Conflict	3x4 weeks	3	

2nd Year- Part II

3 rd Semester	Course code	Credits – Contact Hours
Supportive 2	Field Work / Internship;	45
Core 4	Mini Thesis	30

4 th Semester	Course code	Credits – Contact Hours
Core 4	Mini Thesis	30

- The first semester will consist of two core modules and one supportive course of eight weeks duration each and two general courses of 4 weeks duration.
- The second semester will consist of one core module and two supportive courses of eight weeks duration each and one elective course of 4 weeks duration.
- Part II will be a research project lasting 44 weeks, leading to a dissertation, to make a total of 24 months full study time.
- Part II will only be embarked upon on successful completion of Part I.

4.1.1. Course Outline for Master in Petroleum Geoscience

Module 1: Introduction To Upstream E & P Business

- Basin Delineation & Stratigraphic Framework
- Stratigraphy & Reservoir Sedimentology
- Geophysical Methods For Petroleum Exploration & Production
- Basin Delineation: Basin Style & Basin Framework
- Hydrocarbon Maturation and Occurrence.
- Generating Prospects and Proposing a Well.
- Sub-Surface Data (Direct- & Indirect Data)
- Direct Subsurface Data:
- Indirect Sub-Surface Data : Logging

Module 2: Reservoir Modelling and Reserves Calculation

- Delineating The Reservoir & Making The Reservoir Model
- Building A (Computer Assisted) Static Reservoir Model.
- Production Geology Practices

Module 3: Geology and Field Development Planning

- Introduction To Reservoir Engineering Principles
- Introduction To Surface And Subsurface Production Techniques
- Development Geology
- Basic Petroleum Economics & Risk Assessment: An Introduction
- Cash flow Elements and Profitability Indicators
- Sensitivity Parameters and Risk Perception
- Investment Decisions
- Unconventional Resources

Module 4: MSc Mini-Thesis

- Research Proposal writing and approval
- Appointment of Supervisors
- Research implementation
- Research dissemination and examination

Electives: Specialized Topics

Candidates study any of the three above topics in greater details as electives. These will be specialized topics to be taken after a discussion with the course coordinator and field experts. The elective allow an in-depth of specialized areas that may relate to the Project module.

Supportive Courses

1. Research Design and Proposal
2. Research Analysis and Dissemination
3. Geoscience Seminar

General Courses

1. Human Rights and Gender
2. Skills Acquisition
3. Governance, Peace and Conflict

4.1.2. Detail Course Description for Master in Petroleum Geoscience

Course Code	Course Title and Description	LH	PH	CU	Remarks
MODULE 1: INTRODUCTION TO UPSTREAM E & P BUSINESS					
PPG 711	Basin Delineation and Stratigraphic Framework The theory of plate tectonic and habitats in Africa. Tectonic synthesis in petroleum exploration. Evolution of structural / stratigraphy framework of Africa. Analysis of the African sedimentary basins.	30	15	3	C
PPG 712	Petroleum Geochemistry Molecular marker compounds, sedimentary organic matter, Hydrocarbon maturation and degeneration of oil and gas, migration and reservoir geochemistry, chemical analysis of organic matter.	30	15	3	C
PPG 713	Subsurface Geology, Prospect and Well Proposition Subsurface data acquisition, drilling, coring, logging, fluid sampling and seismic surveys, petrophysics, reservoir characteristics and geology. Construction and interpretation of subsurface maps. Cross sections and panel diagrams; seismic stratigraphic data processing and interpretations; special topics and problems.	30	15	3	C
PPG 714	Well Logging and Seismic Interpretation Introduction to geophysical methods for Petroleum Exploration and Production. Practical and theoretical aspects of the extraction of structural, stratigraphical, lithological and pore fluid information from seismic data, their representation and significance. Case studies in seismic and geophysical imaging.	30	15	3	R
MODULE 2: RESERVOIR MODELLING AND RESERVOIR CALCULATION					
PPG 721	Sequence Stratigraphy Introduction to Sequence stratigraphy concepts. Sequence stratigraphic methods of interpreting Seismic data, reflection terminations, systems tracts and lithofacies. Reservoir description and delineation using sequence stratigraphy. Use of Biostratigraphy in sequence stratigraphy, Case	30	45	3	R

PPG 722	Reservoir Characterisation and modelling Their varieties, the effects of 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 softwares.	30	45	3	R
PPG 723	Basin Analysis and Modelling Analysis of sedimentary basins based on their origin, paleogeographic evolution and tectonic setting. The geological components of a reservoir model, production profiles and planning, production logging. Reservoir simulation. Development of interpretation skills using softwares. 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.	30	15	3	R
PPG 724	Petrophysics and Formation Evaluation The morphology and genesis of porosity and permeability and their relationships to rock composition, texture and diagenesis. Description, identification and analysis of reservoir rocks from cores and cuttings. Types of logs and information obtainable from them. Self potential, resistivity, induction, sonic and cement band, radiation, temperature, micro-resistivity and others. Quantitative log interpretation and determination of rock parameters.	30	45	3	R
MODULE 3: GEOLOGY AND FIELD DEVELOPMENT PLANNING					
PPG 731	Introduction to Reservoir Engineering and Production Techniques Introduction to reservoir engineering techniques, surface and subsurface production techniques	30		2	E
PPG 732	Petroleum Economics, Management and Risk Analysis 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.	30	15	3	R

PPG 733	Petroleum in the Environment Environmental issues associated with Petroleum exploration, production, transportation and consumption. The environmental solution needed for its safe production and consumption. Recycling and re-use of petroleum, restoration after drilling and safety of petroleum operation in onshore and offshore areas. Conservation of petroleum resources and balancing energy use. Study of environmental issues relating to oil exploitation in Africa. Environmental impact assessment of an oil field.	45	0	3	E
PPG 734	Field Geology Visit specific field locations on the sedimentary basins within Nigeria and reporting on the visitation.		30	2	R

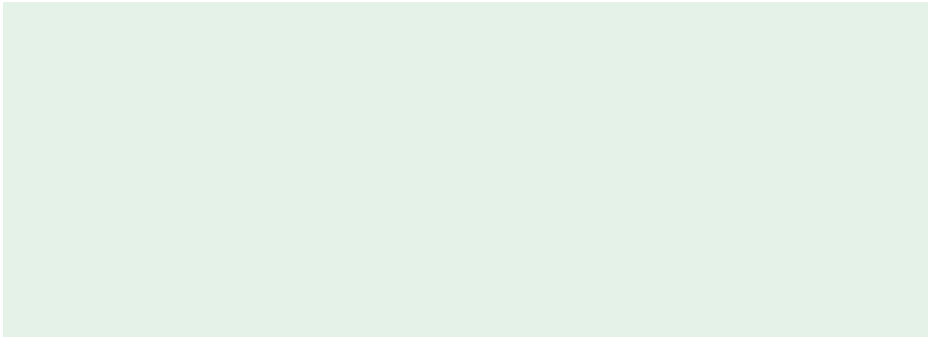
MODULE 4: MSc. MINI-THESIS AND SUPPORTIVE

PPG 741	Research Design and Proposal Writing Development of a conceptual frame petroleum geology research, methods collection, laboratory analysis and analysis, referencing and the use of skills.
PPG 742	Geoscience Research Seminar Literature search, write-up and presentation topic in Petroleum Geology
PPG 743	Project/Dissertation Design, development and execution of the research work, acquisition of field and lab data, analysis and interpretation of results.

C = Compulsory; R = Required; PH = Practical Hours; LH = No. of Theory Hours; CC = Credit Units

5.0. MASTER IN MINERAL EXPLORATION

1st Year- Part I



2nd Semester	Course code	Credits Hours	Theory Hours	Practical Hours
Core 3	Data Analysis and Integration	3 x 8 week	0	3
Supportive 2	Geoscience Research Seminar	3 x 8 weeks	0	3
Core 4	Exploration Project Management	3 x 8 weeks	1	2
Elective	Specialized study	3x4 weeks	1	2
General 3	Governance, Peace and Conflict	3x4 weeks	5	0

2nd Year- Part II

3 rd Semester	Course code	Credits – Contact Hours
Supportive 2 / Elective	Field Work / Internship	45
Core 5	Mini Thesis	15
4 th Semester	Course code	Credits – Contact Hours
Core 5	Mini Thesis	15

- The first semester will consist of two core modules and one supportive course of eight weeks duration each and two general courses of 4 weeks duration.
- The second semester will consist of one core module and two supportive courses of eight weeks duration each and one elective course of 4 weeks duration.
- Part II will be a research project lasting 44 weeks, leading to a dissertation, to make a total of 24 months full study time.
- Part II will only be embarked upon on successful completion of Part I.

5.1. Course Outline for Master in Mineral Exploration

The course work will consist of four modules plus two electives each of which should have a field work component, which together with the research project will comprise the degree. Detailed course outline to be worked out by experts as follows:

Module 1: Concepts and Principles

- Ore deposit Modelling
- Regional Metallogeny
- Fluid-phase Petrology
- Applied Geochronology
- Applied Structural Geology

Module 2: Prospecting Techniques

- Exploration Geophysics
- Exploration Geochemistry
- Remote Sensing and Photogeology

Module 3: Data Analysis and Integration

- Ore Evaluation and Reserve Calculation
- Geostatistics
- Data Management, Databases and GIS
- Integrated Methods in Exploration and Discovery

Module 4: Exploration Project Management

- Mineral Economics
- Resource Exploitation and Feasibilities Studies
- Environmental Impact Assessment/ Evaluation
- Regulatory and Legislative Framework Analysis
- Contract Negotiation

Module 5 MSc Mini-Thesis

- Research Proposal writing and approval
- Appointment of Supervisors

- Research implementation
- Research dissemination and examination

Electives: Specialized Topics

Candidates study any of the two above topics in greater details as electives, provided the first elective is chosen from modules one and two and the second from the remaining two modules. These will be specialized topics to be taken after a discussion with the course coordinator and field experts. The elective allow an in-depth of specialized areas that may relate to the Project module.

Supportive Courses

1. Research Design and Proposal
2. Geoscience Research Seminar

General Courses

3. Human Rights and Gender
4. Skills Acquisition
5. Governance, Peace and Conflict

5.2. Course Description for Master in Mineral Exploration

Course Code	Course Title and Description	LH	PH	CU	Remark
MODULE 1: CONCEPT AND PRINCIPLES					
PME 711	Ore Deposits Modeling and Regional Metallogeny Classification of ore deposits in the relation to genesis and tectonic environment. Main physical and chemical condition of ore formation, shape, mineralogy ,genesis and practical importance of magmatic, pegmatitic, supergene and sedimentary ore deposits, geothermometry, paragenesis and zoning conceptual modelling in relation to tectonic, chemical and physical controls ore minerals identification in hand specimen and diagnostic features. Utilization of reflecting ore microscope and optical properties of ore minerals. Mettalogenic Epochs and Provinces. Regional metallogeny of Africa and global Scenario.	30	15	3	C

PME 712	Fluid Phase Petrology, Applied Geochronology and Structural Geology Lectures, Seminar and Laboratory Studies on chemical reactions in rock systems. Rock-fluid interactions, mineral formation, hydrothermal alteration and ore genesis. Origin of the H ₂ O-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 geological investigations including mapping, dating, exploration and geodynamics.	30	15	3	C
MODULE 2: PROSPECTING TECHNIQUES					
PME 721	Exploration Geophysics 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.	30	45	3	R
PME 722	Exploration Geochemistry Introduction to 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 secondary environment. Geochemical soil and drainage survey. Biogeochemical, geo-botanical and litho-geochemical surveys. Geochemical affinity and geochemistry of important ores and pathfinder elements. Instrumental analysis XRF, AAS, ICPMS, ICPAES and other advanced instrumentation.	30	45	3	R
PME 723	Remote Sensing and Photogeology Principles of geological interpretation of aerial photographs, their application to geological mapping and exploration. Techniques of photogrammetry. Interpretation of geological features, structures and stratigraphy. Remote sensing In geology. Sensor principles and capabilities. Analysis of satellite imageries and application to mineral resources and environmental evaluation.	30	15	3	R

MODULE 3: DATA ANALYSIS AND INTERPRETATION					
PME 731	Geostatistics, Ore Evaluation and Reserve Calculation Statistical treatment of data, methods of interpretation of geochemical data including computer programs and technologies. Definition of ore resources/reserve, classification and calculations.	30		2	C
PME 732	Data Management, GIS Techniques and Interpretation Methods 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.	30	15	3	R
MODULE 4: EXPLORATION PROJECT MANAGEMENT					
PME 741	Mineral Economics, Resource Exploitation and Feasibility Studies A series of lectures and field events covering selection of areas, coordination of prospecting techniques / methods, mining methods, economic analysis, finance and management of prospecting and exploration projects. Basic principles and requirements of feasibility reports.	30	15	3	R
PME 742	Environment Impact Assessment / Evaluation Trace elements in natural systems (including groundwater) and the requirement by plants and animals. Toxic elements, their mobilization, immobilization and effect in water, plants and animals. Pollution of the atmospheric, surface and ground water systems. Environment pollution and mitigation methods. Requirements for comprehensive EIA studies. Case histories in environmental pollution.	30	15	3	C
PME 743	Regulatory / Legislative Frame Works and Contract Negotiation Basic ingredients of mining legislation and regulations. Corporate regulatory frame works 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.	30	15	2	C

MODULE 5: MSc. MINI-RESEARCH PROJECT AND SUPPORTIVE COURSES					
PME 751	Research design and proposal Research proposal writing and research implementation. Lectures on development of conceptual frame work in geological research. Preparation of research proposal. Approach to geological problems. Systematic collection of field and laboratory data. Data retrieval and use of information and communication technology. Geo-writing and referencing. Ethics and common errors in research. Managing the research process and scientific creativity.	30	15	2	C
PME 752	Geosciences Research Seminar Literature study, method of data evaluation and writing up as well as oral presentation of an aspect of the area of specialization.	0	45	2	R
PME 753	Independent Research Project Special geological investigation with report including results and interpretation presented as independent research project or dissertation.	0	90	6	C

C = Compulsory; R = Required; E= Elective

LH = No. of Theory Hours; PH = No. of Practical Hours; CU = Credit Units



6.0. MASTERS IN REPRODUCTIVE HEALTH SCIENCES

- Master of Health Science (MHS) degree in Reproductive Health
- Master of Science (MSc) degree in Reproductive Biology

Whereas the MHS is public health oriented and open to individuals with academic background in health, biological and social sciences field, the MSc is targeted at a narrower group of health-related and biological science professionals.

6.1. MASTER OF HEALTH SCIENCES (MHS) COURSE IN REPRODUCTIVE HEALTH

1) Course Syllabus For Full Time Students

1st Semester

COURSE CODE	COURSE TITLE	COMPULSORY/ ELECTIVE	HOURS OF LEC.	HOURS OF PRACTICAL	TOTAL HOURS	UNIT
PRH 701	Principle of Epidemiology	Compulsory	30	-	30	2
PRH 703	Biostatistics	“	30	-	30	2
PRH 705	Fundamentals of Reproductive Health	“	30	-	30	2
	Required Courses					
PRH 707	Demographic Methods	Required	30	-	30	2
PRH 709	Behavioural Issues & Intervention in Reproductive Health and Public Health Communication	“	30	-	30	2
PRH 713	Reproductive Health Surveillance	“	15	-	15	1
	Elective Courses					
PRH 715	Health Policy Development & Advocacy	Elective	30	-	30	2
PRH 717	Community Organisation & Community Development	“	30	-	30	2
PRH 719	Public Health Principles & Practice	“	30	-	30	2
PRH 721	Socio-Cultural & Economic Aspects of Reproductive Health	“	30	-	30	2
PRH 723	Public Health Genomics	“	30	-	30	2

2nd Semester

COURSE CODE	COURSE TITLE	COMPULSORY/ ELECTIVE	HOURS OF LEC.	HOURS OF PRACTICAL	TOTAL HOURS	UNIT
PRH 702	Gender Issues in Reproductive Health Practice	Compulsory	30	-	30	2
PRH 704	Monitoring & Evaluation in Reproductive Health	“	20	10	30	2
PRH 706	Contemporary Issues in Reproductive Health Practice	“	30	-	30	2
PRH 708	Research Methodology	“	30	-	30	2
PRH 710	Strategic Leadership & Management	“	30	-	30	2
PRH 714	Public Health Informatics	“	15	-	15	1
PRH 718	Adolescent Reproductive Health	“	30	-	30	2
Required Courses						
PRH 712	Ethics, Law & Reproductive Health	Required	30	-	30	2
PRH 716	Maternal & Newborn Health	Required	30	-	30	2
PRH 720	Fertility Management	“	30	15	45	3
PRH 724	Statistical Methods in Epidemiology	“	30	-	30	2
Elective Courses						
PRH 722	Public Health Aspects of Reproductive Tract Infections	Elective	30	-	30	2
PRB 710	Reproductive Tract Oncology	“	30	15	45	3
PRB 714	Reproductive Failure	“	30	15	45	3

3rd Semester

Course code	Course Title	No. of hours of Theoretical Instructions	No. of hours of Practical Instructions	Total No. of Units
Compulsory Course				
PRH 725	Internship	-	45	3

4th Semester

Course code	Course Title	No. of hours of Theoretical Instructions	No. of hours of Practical Instructions	Total No. of Units
Compulsory Course				
PRH 726	Research project	15	75	6

6.1.2. Course Description

PRH 701: PRINCIPLES OF EPIDEMIOLOGY

History of Epidemiology. Definition, basic principles, uses and application of epidemiology. Introduction to epidemiological studies. Measures of association. Inferential epidemiology and statistics. The concept of multiple determinants of diseases. Notification and Surveillance. Concepts of association and causation. Epidemics and Epidemics curve. Evaluation of diagnostic and screening tests – specificity, sensitivity, validity and predictive values. The application of epidemiology to health care delivery and systems development.

PRH 702: GENDER ISSUES IN REPRODUCTIVE HEALTH

The concept of gender versus sex, gender analysis frameworks. Gender-related concerns in reproductive including gender-based violence, male preference, widowhood rites, male sexual and reproductive health issues. The role of

gender-disaggregated data in evidence-based programming. Empowerment of females and interventions to address gender-related reproductive problems. Engendering reproductive health service delivery.

PRH 703 BIOSTATISTICS

Descriptive statistics. Use of summary indices. Probability theory. Probability distribution. Binomial terms. Sampling distribution. Statistical hypothesis. Choice of test statistics. Analysis of variance. Correlation analysis.

PRH 704: MONITORING AND EVALUATION OF REPRODUCTIVE HEALTH PROGRAMMES

Introduces students to the concepts, study, design and method for monitoring and evaluation of reproductive health programmes. Equips students with tools to undertake real life monitoring and evaluation of programmes. Establishes a framework, rationale and basic concept essential to conducting needs assessment to guide programme implementation and process and outcome evaluation. Develops skills in identification of data sources, collection of primary data using qualitative, quantitative and mixed methods.

PRH 705: FUNDAMENTALS OF REPRODUCTIVE HEALTH

The course introduces students to the technical and public health aspect of each of the key elements of reproductive health, including safe motherhood; family planning and contraceptive services; unsafe abortion; adolescent sexual and reproductive health; reproductive tract infections; gender-based violence, female genital cutting and other reproductive rights issues. Managerial and policy issues relating to reproductive health field will also be critically analysed and discussed.

PRH 706: CONTEMPORARY ISSUES IN REPRODUCTIVE HEALTH

This course will address contemporary issues in reproductive health and will also provide opportunities to consider evolving themes relevant to advancing reproductive health in Africa. The course may take various forms, including topic presentation by faculty members, students' presentation, guest lecture, field trips, case studies and other participatory approaches that will foster student learning.

PRH 707: DEMOGRAPHIC METHODS

Sources of demographic data. Rates and Standardization. Measurement of Mortality, Fertility, Migration, Reproduction, Family Planning and Nuptiality. Life table theory and techniques for their construction. Multiple Decrement Tables. Competing Risks. Following Follow-up Survivorship Tables Applications. Stationary and stable Populations Model Life Tables. Parity Progression Ratios. Birth Interval analysis. Population estimates and Projection Methods.

PRH 708: RESEARCH METHODOLOGY

Types of research investigation. General and specific purposes of research. The research process. Data processing. Interpretation of results. Report writing. Ethical issues in research.

PRH 709: BEHAVIOURAL ISSUES AND INTERVENTIONS IN REPRODUCTIVE HEALTH

The course will consider the foundations of human behaviour, cultural and social influences on human behaviour, social-psychological determinants of human behaviour, and relevant behaviour change theories and intervention frameworks. It will also discuss approaches in behaviour change communication and related interventions.

PRH 710: STRATEGIC LEADERSHIP AND MANAGEMENT

Core leadership disciplines of personal mastery, mental models, shared vision, systems thinking and team learning. Promoting institutional (community) change through analysis of critical constraints, establishing strategic objectives and key moves and developing a learning organisation for program implementation and management in RH. Managing the health team. Promoting household production and health.

PRH 711: PUBLIC HEALTH COMUNICATION

Use of communication methods to positively influence health-related behaviour of individuals, populations and organisations for the purpose of promoting reproductive health. Specific approaches in health communication, including social marketing, risk communication, enter-educative approaches, decision theories, and media advocacy. Use of appropriate materials for low literate populations and public speaking.

PRH 712: ETHICS, LAW & REPRODUCTIVE HEALTH

Health Policies. Health Care Laws. Legal Considerations in cases of Rape, Incest, Abortion, Adoption, Spousal abuse etc. Reproductive Health and the Constitution. Ethical principles and application, ethical dilemmas in Reproductive Health

PRH 713: REPRODUCTIVE HEALTH SURVEILLANCE

Concept of surveillance and fundamentals of effective surveillance system. Basic challenges in organising effective reproductive health surveillance in sub-Saharan Africa. The application of surveillance principles to priority reproductive health issues, including maternal health, adolescent reproductive health and reproductive tract infections.

PRH 714: PUBLIC HEALTH INFORMATICS

The focus of the course is the systematic application of information and computer science and technology to public health practice, research, and learning. It will deal with the issues of collection, storage, analysis of public health data and the application of data for surveillance and health interventions.

PRH 715: HEALTH POLICY DEVELOPMENT AND ADVOCACY

Definitions of health policy, types of policies, and frameworks for policy development. Building coalitions and networks for advocacy.

PRH 716: MATERNAL AND NEWBORN HEALTH

Maternal and perinatal morbidity and mortality. Health care practices utilised to prevent, diagnose and treat the morbidities/mortalities. Review of fundamental components of strategies to reduce maternal/perinatal morbidity/mortality including behaviour change intervention. Development of community level intervention including use of community health extension workers (CHEWs), traditional birth attendants (TBAs) etc. Policy and programmatic interventions.

PRH 717: COMMUNITY ORGANISATION AND COMMUNITY DEVELOPMENT

Discussion of key concepts, including community, community organisations, community development, community engagement and involvement

Community entry approaches, and community engagement. Use of stakeholder analysis in community development efforts, frameworks and principles for community engagements, bottom-up approaches in community reproductive health programming.

PRH 718: ADOLESCENT REPRODUCTIVE HEALTH

Growing-up Girl. Rights of a girl-child. Changing pattern of a girl's reproductive system. Skills acquisition; In-school & out-of-school outreach programmes. Balanced gender relationship. Values and decision-making. Communication skills. Leadership skills. Economic empowerment. Child labour; abuse; trafficking; prostitution. Youth friendly services. Teenage pregnancy. Stakeholders' responsibilities in adolescent reproductive health. Financing ARH.

PRH 719: PUBLIC HEALTH PRINCIPLES AND PRACTICES

Global review and historical trends in Public Health. History, organisation and functions of international health organisations. International health regulations. Port health services. Foundation of health education. Application of health education theories and concepts. Development of social welfare services in Africa. Social security and the provision of social services for the aged. The nature of behavioural science – concept of culture, society and self – including process of socialisation, personality, symbolic interactionism, primary group formation and the structure of action. Community structure, culture and health. Social class and health disorders. Social disorganisation and health. Family health.

PRH 720: FERTILITY MANAGEMENT

Population Dynamics and National development in African countries. History of Contraception. Traditional Methods of Birth control. Periodic Abstinence as a method of Birth Control. Spermicides. Barrier Methods of Contraception. Oral Hormonal contraceptives. Injectable Hormonal Contraceptives. Hormone Implants.

PRH 721: SOCIO-CULTURAL AND ECONOMIC ASPECTS OF REPRODUCTIVE HEALTH

Analyse the correlates of fertility and other reproductive health behaviour in societies and child bearing in individuals and couples including differences

in timing of first birth, and family size, ethnic groups, zones etc. Theories of fertility changes at societal levels. Macro and micro economic models within and between households, implications of these models on policies, programs relating to population and its dynamics. Mortality, health, fertility and how they influence the understanding of demographic transition economic growth and resource allocation. It also includes an economic appraisal of reproductive health programmes.

PRH 722: PUBLIC HEALTH ASPECTS OF REPRODUCTIVE TRACT INFECTIONS

Overview of RTIs, including their epidemiology and public health burdens. Classification and detection of infectious agents related to the reproductive tract infections. Treatment modalities of RTIs, including syndromic and laboratory-based management. Prevention and public health control of RTIs.

PRH 723: PUBLIC HEALTH GENOMICS

History of public health genetics, gene and inheritance, gene-environment interactions, metabolic disorder and screening in public health, impact of genetics on primary, secondary, and tertiary prevention, phenotypic versus genotypic prevention.

PRH 724: STATISTICAL METHODS IN EPIDEMIOLOGY

Epidemiological methods in the investigation of aetiology of diseases. Design in the control of case control studies. Prevalence and longitudinal studies including controlled trials. The collection and analysis of vital statistical and of morbidity data. Measuring mortality, morbidity, disability and quality of life. Quantitative measures to determine risks. Epidemiologic and statistical association. Standardization of rates and life tables. Use of registers. Record linkages and general practice records. Examples of the use of epidemiological methods in the study of particular diseases. Validity of diagnostic tests.

6.2. MASTER OF SCIENCE (MSc.) COURSE IN REPRODUCTIVE BIOLOGY

1) Course Syllabus for Full Time Students

1st Semester Courses

COURSE CODE	COURSE TITLE	COMPULSORY/ ELECTIVE	HOURS OF LEC.	HOURS OF PRACTICAL	TOTAL HOURS	UNIT
PRH 701	Principle of Epidemiology	Compulsory	30	-	30	2
PRH 703	Biostatistics	“	30	-	30	2
PRB 701	Fundamentals of Human Reproduction	“	30	-	30	2
PRB 703	Embryology & Anatomy of Reproductive Organs	“	30	-	30	2
	Required Courses					
PRB 705	Reproductive Endocrinology	Required	30	15	45	3
	Elective Courses					
PRH 705	Fundamentals of Reproductive Health	Elective	30	-	30	2
PRB 709	Introduction to Molecular Biology	“	30	15	45	3
PRB 711	Fetal Medicine	“	30	15	45	3
PRH 721	Sociocultural & Economic Aspects of Reproductive Health	“	30	-	30	2
PRH 723	Public Health Genomics	“	30	-	30	2

2nd Semester Courses

NO.	COURSE CODE	COURSE TITLE	COMPULSORY/ ELECTIVE	HOURS OF LEC.	HOURS OF PRACTICAL	TOTAL HOURS	UNIT
1.	PRB 702	Human Genetics	Compulsory	30	-	30	2
2.	PRB 704	Contemporary Issues in Reproductive Biology	“	30	-	30	2
3.	PRH 706	Research Methodology	“	30	-	30	2
4.	PRH 710	Strategic Leadership & Management	“	30	-	30	2
5.	PRH 714	Public Health Informatics	“	15	-	15	1
6.	PRB 714	Reproductive Failure	“	30	15	45	3
Required Courses							
7.	PRH 712	Ethics, Law & Reproductive Health	Required	30	-	30	2
8.	PRB 707	Principles of Immunology	“	15	-	15	1
9.	PRB 710	Reproductive Tract Oncology	“	30	15	45	3
10.	PRB 712	Assisted Reproduction	“	30	-	30	3
Elective Courses							
11.	PRB 708	Principle of Toxicology	Elective	30	-	30	3
12.	PRH 724	Statistical Methods in Epidemiology	“	30	-	30	3

3rd Semester

Course code	Course Title	No. of hours of Theoretical Instructions	No. of hours of Practical Instructions	Total No. of Units
Compulsory Course				
PRB 713	Internship	45	-	3

4th Semester

Course code	Course Title	No. of hours of Theoretical Instructions	No. of hours of Practical Instructions	Total No. of Units
Compulsory Course				
PRB 715	Research Project	15	75	6

6.2.1. Course Description

PRB 701: REPRODUCTIVE BIOLOGY

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.

PRB 702: HUMAN GENETICS

The structure and behaviours of DNA. DNA: replications, mutations, gene expression. Regulation of gene transcription. DNA processing. Translation. Chromosomal autosomal anomalies. Abnormalities of sex chromosomes. Gene abnormalities producing diseases. Disorders with polygenic inheritance. Population genetics. Sickle cell and other haemoglobinopathies. Prenatal diagnosis.

PRB 703: EMBRYOLOGY AND ANATOMY OF REPRODUCTIVE TRACT

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. The inguinal region. The male and female genitalia. The breast.

PRB 704: CONTEMPORARY ISSUES IN REPRODUCTIVE BIOLOGY

This course will address contemporary and emerging issues in the field of reproductive biology with relevance to Africa. The course may take various forms, including topic presentation by faculty members, students'

presentation, guest lecture, field trips, case studies and other participatory approaches that will foster student learning.

PRB 705: REPRODUCTIVE ENDOCRINOLOGY

Biochemistry of steroid hormones. Gonadotrophic hormones. Biochemistry of pregnancy and the puerperium. Contraception. Control of gonadal development in males and females. Biochemistry of the semen. Laboratory investigations of male and female infertility.

PRB 706: RESEARCH METHODOLOGY

Types of research investigation. General and specific purposes of research. The research process. Data processing. Interpretation of results. Report writing. Ethics in medical research

PRB 707: PRINCIPLES OF IMMUNOLOGY

Immunology concepts. Antigens. The lymphoid system. Immune system. Immunoglobulins. Diagnostic serological tests. Fractionation procedures. Immuno electrophoresis. Viral immunology. Immunosuppression. Immune complex diseases. Complement system. The major histocompatibility system.

PRB 708: PRINCIPLES OF TOXICOLOGY

This course introduces students to the properties of toxic substances, the toxic mechanisms of drugs and chemicals, common and uncommon side effects of drugs and medicines, the fate and reactions of foreign chemicals in human bodies, clinical toxicology, the identification and evaluation of toxicity, and health risk assessment methodologies

PRB 709: INTRODUCTION TO MOLECULAR BIOLOGY

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.

PRB 711: FETAL MEDICINE

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. Maternal mortality. Perinatal mortality. Physiology of lactation. Breast milk and artificial infant formulae.

PRB 712: ASSISTED REPRODUCTION

The human semen. Semen analysis. Artificial insemination. Fertilization by micro-insemination. Super ovulation and its monitoring. Methods of polypeptide hormone assays. Methods of steroid hormone assays. Other laboratory assays in Obstetrics and Gynaecology. In vitro fertilization and embryo transfer. Gamete donation. Other assisted reproductive technologies.

PRH 714: REPRODUCTIVE FAILURE

Overview of infertility. Evaluation of infertile couples. Ethical issues in embryo manipulation. Human cloning and ethics. Abortion. Abortion laws. Post abortion care. Adoption. Fostering.



7.0. MASTERS IN PLANT BREEDING

7.1. Course Syllabus (Course Outline)

7.2. List of Courses and Course Codes

Core Courses		LH	TH	PH	CH	CU
Year 1: Semester I						
PPB 710	Applied Statistics and Biometry	30	-	30	45	3
PPB 711	Principles of Cultivar Development	30	-	30	45	3
PPB 712	Physiological Genetics	15	-	30	45	3
PPB 713	Practical Plant Breeding Methods	15	-	30	30	2
Electives						
PPB 714	Utilization and Conservation of Plant Genetic Resources	15	-	30	30	2
PPB 715	Plant Ecology and Evolution	15	-	30	30	2
PPB 716	Principles of Population & Evolutionary Biology	30	-	30	45	3
PPB 717	Plant Cell and Tissue Culture	30	-	30	45	3
PAU 718	Agronomy And Crop Physiology	30	-	30	45	3
PPB 719	Climate Change and its Impacts	30	-	30	30	2
Year I: Semester II						
<i>Core courses</i>						
PPB 720	Graduate Seminars and Research Implementation Skills	15	-	30	30	2
PPB 721	Quantitative and Biometrical Genetics	30	-	30	45	3
PPB 722	Bio-policy, Bio-safety and Bioethics	15	-	30	30	2
PPB 723	Molecular Plant Breeding	30	-	30	45	3

Electives

PPB 724	Management of Soil Fertility	30	-	30	30	2
PPB 725	Crop Pest Ecology and Management	30	-	30	45	3
PPB 726	Disease Management and Epidemiology	30	-	30	45	3
PPB 727	Environmental Impact Assessment	15		30	30	2
PPB 728	Programme Planning and Management	15	-	30	30	2

Year 2:

Semester 1

PPB 729 Thesis Proposal Presentation 3

Semester 2

PPB 730 Thesis (Submission and Defence) 7

Course Description

Research skills related courses

PPB 710: Applied Statistics and Biometry (3 CU)

Course outline:

1. Descriptive statistics.
2. Introduction to hypothesis testing.
3. Design of experiments (On-station and On-farm).
4. 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).
5. Data management.
6. Introduction to statistical modelling – (ANOVA, Regression, Mixed models)
7. Introduction to multivariate analysis.
8. Presentation and interpretation of research results.

PPB 720: Graduate Seminars and Research Implementation Skills

Course outline:

1. Preparation, presentation, discussion and evaluation techniques and skills in seminars, meetings, workshops and conferences.
2. Presentation preparation- content, setting, literature search, preparation of presentation aids, presentation skills, evaluation, etc.
3. Writing research grant proposals
4. Scientific writing (publication and technical report),
5. Technical reviewing of reports and papers.
6. Scientific/Literature critiquing.
7. Communication and dissemination of research results to different stakeholders.
8. Marketing one self and institution/enterprise

7.3. Plant Breeding and Genetics Related Courses

PPB 711: Principles of Cultivar Development (3 CU)

7.3.1. Course objectives:

7.3.2 Course outline:

1. Review of genetic principles,
2. Plant Genetic resources,
3. Population development,
4. Line development and recurrent selection,
5. Maximizing genetic gain, multiple and correlated traits,
6. Stability analysis, principal component analysis and factor and genetic homogeneity analysis,
7. Plant breeding methods-backcrossing, cultivar development methods for dicot and monocot crop plants,
8. Mutation breeding and hybridisation.
9. Introduction to genetic engineering.
10. Exploiting cytological and genetic methods in crop improvement (induction and utilization of male sterility, polyploidy, double haploids breeding, apomixes).
11. New frontiers in cultivar development e.g. MAS and reverse genetic approaches.
12. Variety release and variety integrity maintenance.

PPB 712: Physiological Genetics

Course Outline

1. Basic Plant Breeding
2. Relationship between Genetic and Plant Physiology
3. Biochemical and Molecular Influences on the variation in the plant physiological processes
4. The role of environmental factors and their mediation through biochemical and molecular processes in phenotypic expression.
5. Application of these aspects to plant breeding

PPB 713: Practical Plant Breeding Methods (2 CU)

Course outline:

1. Practical aspects of crop improvement from a commercial and applied perspective.
2. Laboratory and field techniques used in breeding of field crops (self pollinated versus open pollinated crops, population improvement methods, and maintaining economic crops).
3. Managing commercially oriented plant breeding in a wide range of crop plants
4. Managing a Seed enterprise.

PPB 714: Utilization and Conservation of Plant Genetic Resources (2 CU)

Course outline:

1. Centers of origin and diversity for major crops.
2. Use of wild germplasm in crop improvement.
3. Methods of conservation: *in-situ* conservation, ex situ, cryopreservation, gene bank technology.
4. Collection and utilization of wild germplasm; explorations; gene pools and their use in crop improvement.
5. Domestication of wild germplasm for various purposes.
6. Local and international conventions governing acquisition and management of wild and domesticated germplasm

PPB 715: Plant Ecology and Evolution (2 CU)

Course objective:

Course outline:

1. Ecology of plants and their communities.
2. Effects of biotic and Climatological factors influencing global distribution of plant communities.
3. Community structure and function.
4. Processes of evolutionary change in plants and microbes.
5. Comparisons of agro-systems and natural ecologies and implications for crop improvement, pests and disease management.
6. Overview of evolutionary processes in natural and agro-ecological settings.

PPB 716: Principles of Population and Evolutionary Biology (3CU)

Course outline:

1. Introduction to population biology
2. Gene structure, genetic codes and mutation
3. Evolutionary processes in populations
4. Neo Darwinian and Neutral theories of evolution
5. DNA polymorphisms in populations
6. Measures of polymorphisms (neutral and selective markers)
7. Origin of genetic variation in populations
8. Gene flow; mating types; selection and adaptation
9. Population biology: analytical methods and tools
10. Population structure: analytical considerations; Hierarchical population structure, Analysis of molecular variation, exact tests, gene diversity etc
11. Molecular tools for analysis of variation (neural versus selective markers)
12. Phylogenetics: Basic concepts in molecular phylogenetics
13. Networks: Quartets of species (Split decomposition and related methods;
14. Planning experiments to detect genetic variation in populations

PPB 721: Quantitative and Biometrical Genetics (3 CU)

Course outline:

1. Quantitative genetics and statistical tools
2. Population distributions; Covariance, Regression, Correlation analysis
3. Causes of genetic variation: Properties of single loci; The Hardy Weinberg equilibrium; Mechanisms that generate and dissipate gametic disequilibrium
4. Sources of genetic variation for multi-locus traits: Genetic Linkage; Recombination; Linkage Maps
5. Components of phenotypic variation: Single locus expectation; Partitioning components of phenotypic variance
6. Genotype x Environment interaction: Genetic correlations across environments; Two way analysis of variance; Concept of phenotypic stability
7. Resemblance between relatives
8. Measures of relatedness; Pedigrees; Genetic covariances between relatives
9. The concept of heritability: Parent-offspring regression; Response to selection; Selection index
10. Analysis of line crosses: expectations for line cross means; Heterosis; inbreeding depression;
11. Analysis of mating designs: North Carolina (NC) Designs I, II, and III; diallel mating designs; Hayman-Jinks analysis;
12. Effect on the mean and variance; Inbreeding depression and heterosis
13. Marker-based analysis. Molecular markers; Genetic maps; Marker-trait association; Recombinant inbred lines.
14. Sib Analysis; Maximum likelihood functions; Genome scanning

PPB 723: Molecular Plant Breeding

Course Outline

1. Principal types of molecular markers
2. Construction of genetic linkage maps
3. Linkage tests and estimation of recombination rates
4. Fundamentals of genetic and physical maps

5. Principles of Quantitative Trait Loci(QTL) mapping
6. Genetic and Molecular basis for QTL variation
7. Marker Assisted Recurrent Selection

PPB 727 : Environment Impact Assissent (2 CU)

Course outline:

1. Selection and gene flow in natural and artificial ecologies.
2. Models for prediction, studying adaptability and micro-evolutionary change.
3. Variability and uncertainty of crop-to wild and wide hybridisation.
4. Sources of gene escape.
5. Ecological risks of genetically modified plants (virus and insect resistance). Human health and other potential hazards.
6. Case studies of escaped genes into non targets.
7. Survival persistence and transfer of escaped gene. Assessment of ecological risks.

7.4. Plant Biotechnology Related Courses

PPB 717:Plant Cell and Tissue Culture (2 CU)

Course outline:

1. Introductory history of plant tissue culture; Laboratory organization
2. Media, media components and media preparation; aseptic manipulation
3. Basic aspects of cell growth: Cell culture; cellular totipotency; cell cycle and population dynamics; Growth patterns differentiation.
4. Mutation and differentiation processes in plant cultures:
5. Organogenesis; Somatic embryogenesis; Genetic control of culturability
6. Applications to plant breeding: Haploid-Triploid production; In vitro fertilization; Zygotic embryo culture.
7. Applications to plant breeding: Somatic hybridisation and cybridisation; Genetic transformation; Somaclonal and gametoclonal variant selection.
8. Application to horticulture and forestry and industry
9. Biosynthesis of hormones and elicitor molecules: Gibberellins; Absciscic acid; Cytokinins; Indole-3-acetic acid

10. Molecular physiology of micronutrient acquisition; Plant responses to mineral toxicity.
11. Plant cell cultures for plant transformation: Agrobacterium co-cultivation; Direct DNA uptake.
12. Societal issues in plant biotechnology

PPB 722: Biopolicy, Biosafety and Bioethics (2 CU)

Course outline:

1. Review of national and international bio-policies and implications for cross border movement of germplasm.
2. Development of bio-policy.
3. Bio-safety and bio-hazards: recapitulation of general principles for the laboratory and environmental bio safety development.
4. Sources of 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. Case studies on genetically modified organisms handling and monitoring.
5. Plant breeders' rights, UPOV convention and intellectual property rights.

7.5. Plants and their Management

PPB 724: Management of Soil Fertility

Course Outline

1. Soil fertility and productivity
2. Plant nutrient requirements
3. Addition of nutrients in agricultural systems
4. Nutrient loss from the system
5. Mechanism of nutrient uptake
6. Nutrient cycles
7. Soil organic matter and soil acidity
8. Nutrient antagonism in soils and in plants
9. Fertility assessment and procedures
10. The use of models in soil fertility assessment

PPB 718: Agronomy and Crop Physiology (3 CU)

Course outline:

1. Farming systems in diverse agro-ecologies
2. Crop growth factors (crop growth duration, length of grain filling, harvest index, tillering potential, lodging, resistant cultivars, etc)
3. Crop growth and development including dry matter production and partitioning.
4. Concepts of Leaf Area Index and Leaf Area Duration and the interception of PAR
5. Crop ideotype and energy exchange in a typical green crop.
6. Analysis of the yield/density response curves.
7. Critical examination of photosynthetic pathways., assimilate production and partitioning
8. Crops responses to stress and Stress Physiology (moisture stress and salinity).
9. Improvement of drought adaptation and water use efficiency.
10. Crop growth simulation models.
11. Major cropping systems and biological basis of their productivity.

PPB 719: Climate Change and its Impacts(2CU)

Course Outline

- Introduction to Climate Systems
- Weather Forecasting and Prediction
- Methods and Tools for Assessment of Climate Impacts and Predictions
- Projected Climate Changes and their Impacts:
- Response to Climate Change (International Negotiations)
- Response to Climate Change (Adaptation)
- Response to Climate Change (Mitigation)
- Response to Climate Change (Tools)
- Development in a changing Climate
- Overview of Financial Mechanisms to Address Climate Change

PPB 726: Disease Management and Epidemiology (3CU)

Course outline:

1. Review of major pathogenic groups
2. Pathogenesis and the crop plant
3. Overview of key concepts of epidemiology and crop loss assessment.
4. Temporal and spatial assessment of epidemics and relevant models
5. Evolution of novel plant pathotypes versus new varietal development (boom and burst cycles) – the intervention and mitigation steps.
6. Genetic and physiological basis of plant resistance to diseases
7. Design of disease management strategies

PPB 725: Crop Pest Ecology and Management (3CU)

Course outline:

1. Concepts of insect pest plant ecology
2. Pest management decision making tools
3. Ecological insect pest management,
4. Biological control and natural enemy behavioural ecology,.
5. Insect pest population dynamics
6. Insect pest population regulation and key factor analysis
7. Insect life tables
8. integrated pest management

PPB 728: Programme planning and management (2CU)

Course outline:

1. Funds sourcing;
 2. Proposal development, scheduling of simple planning tools; Gantt Charts and road maps.
 3. Critical path analysis for simple and complex events, the planning cycle, team building,
 4. Stakeholder analysis tools and stakeholder management including communicating for advocacy.
 5. Monitoring and Evaluation frameworks; Impact assessment
 6. Elements of soft skills and personal mastery specifically: personal development and leadership skills will be covered.
- 10.3 Teaching and Learning strategies

8.0 DOCTOR OF PHILOSOPHY (PH.D) PROGRAMMES

8.1. Admission Requirements

Candidates to be admitted for the Ph.D programme would be expected to have a first degree at a grade not below the Second Class upper Division and a Master' degree at a grade that qualifies them to proceed for a Ph.D.

8.2. Programme Structure

The Ph.D. programme will basically be by course work and research. Where it is considered that a candidate is deficient in courses relevant to his research work, such a candidate will be advised to take the appropriate courses at the M.Sc. level from the appropriate department in addition to the Ph. D courses.

8.3. Programme Duration

The programme is expected to be run on a full time basis and candidates are expected to complete their programme in a minimum of six semesters and maximum of ten semesters. Where a candidate cannot complete the programme within ten semesters, such registration shall laps and the candidate withdrawn from the programme.

COURSES FOR DOCTOR OF PHILOSOPHY (Ph. D) ENVIRONMENTAL MANAGEMENT

S/No	Course Code	Course Title and Description	Course Unit
1.	PEM 801	<p>Global Change and Environmental Management</p> <p>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.</p>	3
2.	PEM 802	<p>Environmental and Social Impact Analysis</p> <p>Principles, purpose and aims of environmental and social impact 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.</p>	3
3.	PEM 803	<p>Research Methods in Environmental Management</p> <p>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.</p>	3
4.	PEM 804	<p>GIS and Remote Sensing in Environmental Analysis</p> <p>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</p>	3

10.0. DOCTOR OF PHILOSOPHY (Ph. D) IN GEOSCIENCES

The programme of Doctor of Philosophy (Ph.D) in Geosciences have two options in line with the area of specialization as follows:

- Doctor of Philosophy (Ph. D) in Petroleum Geosciences and
- Doctor of Philosophy (Ph. D) in Mineral Exploration

10.1. DOCTOR OF PHILOSOPHY (Ph. D) IN PETROLEUM GEOSCIENCES

Course Code	Course Title and Description	LH	PH	CU	Remark / Pre-requisite
PPG 821	Special Studies in Micropalaeontology and Biostratigraphy Case histories in palaeontological and stratigraphic studies, in relation to specific geologic / sedimentary domains.	30		2	PPG 721
PPG 814	Problems in Sedimentology Principles and processes of Sedimentological analyses, with reference to particular sedimentary terrains or basins.	30		2	PPG 714
PPG 823	Basin Analysis Integration of Sedimentological, palaeontological, stratigraphic, petrological, geophysical and geochemical data, for the evaluation of depositional environments.	15	30	2	PPG 723
PPG 811	Techniques in Structural Geology Structural elements, their study, interpretation and application to related geological investigations, including mapping, dating, exploration and geodynamics, including Case histories.				PPG 711
PPG 832	Special Topics in Unconventional Resources Discussions and essays on the application of unconventional resources. Case histories.				PPG 732
PPG 882	Special Project in Geological Research Design, development and execution of the initial stages of the original research work involving literature study, acquisition of field and laboratory data, analyses and interpretation of results.				—

LH = No. of Theory Hours; PH = No. of Practical Hours; CU = Credit Units

10.2. DOCTOR OF PHILOSOPHY (Ph. D) IN MINERAL EXPLORATION

PME 811	Geochemistry of Ore Genesis Geochemical and isotopic studies in relation to Ore Genesis, with examples.	30		2	PME 711
PME 812	Metallogeny Major metallogenic provinces and epochs. Distribution, composition, character and origin of specific mineral deposits in the world.	30		2	PME 711
PME 813	Advanced Studies in Mineralogy of Deposits Techniques in mineralogical and chemical studies of particular type of industrial minerals or ore deposits, with examples.	15	30	2	PME 711
PME 822	Special Studies in Geochemistry Advanced geochemical principles in relation to the distribution of elements in rocks, soils and minerals; and bearing on their evaluation. Aspects of isotopic geochemistry	30		2	PME 722
PME 823	Special Topics in Applied Geochemistry Discussions and Essays on the applications of geochemistry in detailed investigations such as mineral exploration, agriculture, health, environmental, mining. Case histories.	30		2	PME 722
PME 852	Special Project in Geological Research Design, development and execution of the initial stages of the original research work involving literature study, acquisition of field and laboratory data, analyses and interpretation of results.				–

LH = No. of Theory Hours; PH = No. of Practical Hours; CU = Credit Units

11.0. DOCTOR OF PHILOSOPHY (Ph, D) IN REPRODUCTIVE HEALTH SCIENCES & REPRODUCTIVE BIOLOGY

11.1. DOCTOR OF PHILOSOPHY (Ph, D) IN REPRODUCTIVE HEALTH SCIENCES

1st Semester Courses

Course code	Course Title	No. of hours of Theoretical Instructions	No. of hours of Practical Instructions	Total No. of Units
<i>Compulsory Courses</i>				
PRH801	Advanced Research Methodology	15	30	3
PRH 802	Human Genetics	30	15	3
PRH 803	Seminar	0	45	3
PRH 804	Project	0	90	6
	<i>Required courses</i>			
PRH 805	Introduction to Critical Thinking in Reproductive Health Research	30	15	3
PRH 806	Data Analysis in Reproductive Health	30	15	3
PRH 807	Data Interpretation & Manuscript Preparation in Reproductive Health	30	15	3

<i>Elective Courses</i>				
PRH 808	Reproductive Tract Oncology			
PRH 809	Fertility and Population Issues	30	15	3
PRH 810	Maternal & Newborn Health	30	15	3
PRH 811	Genitourinary medicine	30	15	3
PRH 812	Assisted conception	30	15	3
PRH 813				

Code	Course Contents	Status	Hours of Lectures	Hours of Practical	Course Units
PRH 801	<p><i>Advanced Research Methodology:</i></p> <p>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: T -Test, ANOVA, Mann-Whitney U test; Wilcoxon rank -sum test, Wilcoxon matched pairs signed-rank test Kruskal-Wallis test, <i>Friedman's test</i> Multiple Comparisons; Tukey's Test, Student Newman -Keul's test , for Kruskal-Wallis statistics. Testing for Homogeneity of variances; Bartlett's test, and Normality; D'Agostino and Pearson test, Shapiro-Wilk test</p>	Compulsory	30	15	3

	<p>Multiple Comparisons; Tukey's Test, Student Newman -Keul's test , for Kruskal-Wallis statistics. Testing for Homogeneity of variances; Bartlett's test, and Normality; D'Agostino and Pearson test, Shapiro-Wilk test</p> <p>Data transformation Measures of Association; regression, Pearson and Spearman correlation</p> <p>Comparing groups of Categorical data; Chi –Square Distribution, the log-likelihood ratio, McNemar's test</p> <p>Analysis of Survival data</p> <p>Writing a Research Proposal and Literature review</p> <p>Thesis, report and scientific writing</p> <p>Literature review</p> <p>Academic and non-academic presentations</p>				
PRH 802	<p><i>Human Genetics</i></p> <p>The structure and behaviours of DNA. DNA Chromosomal autosomal anomalies. Abnormalities of sex chromosomes. Gene abnormalities producing diseases. Disorders with polygenic inheritance. Population genetics. Sickle cell and other haemoglobinopathies. Prenatal diagnosis.</p>	Compulsory	30	15	3
PRH 803	<p>Introduction to Critical Thinking in Reproductive Health Research</p> <p>Introduction to Existing Seminal Writings on Reproductive Health; Epistemology and Critical Thinking; Basic Concepts in Public and Population Health; Intersection of Human Behaviour and Reproductive Health; Literature Review and Sources of Literature – including Online Bibliographic Resources and Databases; Conceptualization of Research Questions; Identification of Testable Hypotheses; Development of Research Instruments; Sources of Secondary Data; Research Ethics; etc.</p>	Compulsory	30	15	3

PRH 804	Data Analysis in Reproductive Health 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); Identifying Appropriate Models to Answer Research Questions i n Reproductive Health; Use of Online Tutorials to Learn Specific Analytic Methods; Common Analytic Errors; Assumptions Underlying Specific Types of Models; Analysis of Qualitative Data; etc.	Compulsory	30	45	3
PRH 805	Data Interpretation & Manuscript Preparation in Reproductive Health Moving from Statistics to Evidence: interpretation of Research Findings; Writing for Scientific Audiences; Writing for Policy Audiences; Identifying Appropriate Media for Publication; Ethical Issues in Scientific Writing; Ge neral Approach to Scientific Writing in the Life Sciences; The IMRAD Approach; The Peer Review Process; Interacting with Journal Editors; Preparing Theses or Dissertations; Technical Reports; Preparing Conference Abstracts; Effective Presentation Skills; etc	Compulsory	15	45	3
PRH 806	Seminar Forum for doctoral students to present	Compulsory	0	45	3
	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.				
PRH 807	Project The doctoral research proposal; registration of title; thesis preparation and defence	Compulsory	0	90	6

PRH 808	<p>Reproductive Tract Oncology: Epidemiology and aetiology of gynaecological cancers. Epidemiologic consideration of female genital tract malignancies, Carcinogenesis of these malignancies. Influence of genes and environmental factors in aetiology of cancers. Molecular basis of carcinogenesis. Mechanisms of tumour invasion and metastasis. Management and control of gynaecological cancers. Tumour markers in pre-invasive and early stage disease. Screening for pre-malignant diseases. Early diagnosis of genital tract malignancies Principle of cancer, chemotherapy of genital cancers. Other adjuvant therapies. Monitoring of response to cancers. Immunization against gynaecological cancers.</p>	Elective	30	15	3
PRH 809	<p>Fertility and Population Issues</p> <p>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. Demography of social and economic inequality and the role of women, urbanisation, migration, and infertility. Sources of demographic data. Rates and Standardization. Measurement of Mortality, Fertility, Migration, Reproduction, Family Planning and Nuptiality. Life table theory and techniques for their construction. Multiple Decrement Tables. Competing Risks. Following Follow-up Survivorship Tables Applications. Stationary and stable Populations Model Life Tables. Parity Progression Ratios. Birth Interval analysis. Population estimates and Projection Methods.</p>	Elective	30	15	3

PRH 810	Maternal & Newborn Health. Prenatal care and Antepartumfetal monitoring. Medical condition in pregnancy and their management	Elective	30	15	3
PRH 812	Assisted conception: Advances in the management of reproductive failure. Ethical issues in embryo manipulation. Human cloning and ethics. Abortion. Abortion laws. Post abortion care. Adoption. Fostering.	Elective	30	15	3
PRH 814	Genito-urinary Medicine Sexually transmitted infections including HIV infection in women, children, and adolescents Diagnostic serological tests. Fractionation procedures. Immunoelectrophoresis. Viral immunology. Immunosuppression. Immune complex diseases. Complement system. The major histocompatibility system.	Elective	30	15	3

11.2 DOCTOR OF PHILOSOPHY IN REPRODUCTIVE BIOLOGY

1st Semester Courses

Course code	Course Title	No. of hours of Theoretical Instructions	No. of hours of Practical Instructions	Total No. of Units
<i>Compulsory</i>	<i>Courses</i>			
PRB 801	Advanced Research Methodology	15	30	3
PRB 801	Human Genetics	30	15	3
PRB 802	Seminar	0	45	3

PRB 803	Project	0	90	6
	<i>Required courses</i>			
PRB804	Introduction to Critical Thinking in Reproductive Health Research	30	15	3
PRB 805	Data Analysis in Reproductive Health	30	15	3
PRB 806	Data Interpretation & Manuscript Preparation in Reproductive Health	30	15	3
<i>Elective Courses</i>				
PRB 808	Reproductive Tract Oncology	30	15	3
PRB 809	Fertility and Population Issues	30	15	3
PRB 810	Maternal & Newborn Health	30	15	3
PRB 814	Genitourinary medicine	30	15	3
PRB 812	Assisted conception	30	15	3
PRB 813	Advanced reproductive biology and endocrinology	30	15	3

11.3. PhD in Reproductive Biology:

Code	Course Contents	Status	Hours of Lectures	Hours of Practical	Course Units
PRB 801	<p><i>Advanced Research Methodology:</i></p> <p>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: T-Test, ANOVA, Mann-Whitney U test; Wilcoxon rank - sum test, Wilcoxon matched pairs signed-rank test Kruskal-Wallis test, <i>Friedman's test</i> Multiple Comparisons; Tukey's Test, Student Newman-Keul's test, for Kruskal-Wallis statistics. Testing for Homogeneity of variances; Bartlett's test, and Normality; D'Agostino and Pearson test, Shapiro-Wilk test Data transformation .Measures of Association; regression, Pearson and Spearman correlation Comparing groups of Categorical data; Chi – Square Distribution, the log-likelihood ratio, McNemar's test Analysis of Survival data Writing a Research Proposal and Literature review Thesis, report and scientific writing Literature review Academic and non-academic presentations</p>	compulsory	30	15	3

PRB 802	<p><i>Human Genetics</i></p> <p>The structure and behaviours of DNA. DNA Chromosomal autosomal anomalies. Abnormalities of sex chromosomes. Gene abnormalities producing diseases. Disorders with polygenic inheritance. Population genetics. Sickle cell and other haemoglobinopathies. Prenatal diagnosis.</p>	Compulsory	30	15	3
PRB 802	<p>Introduction to Critical Thinking in Reproductive Health Research.</p> <p>Introduction to Existing Seminal Writings on Reproductive Health; Epistemology and Critical Thinking; Basic Concepts in Public and Population Health; Intersection of Human Behaviour and Reproductive Health; Literature Review and Sources of Literature – including Online Bibliographic Resources and Databases; Conceptualization of Research Questions; Identification of Testable Hypotheses; Development of Research Instruments; Sources of Secondary Data; Research Ethics; etc.</p>	Compulsory	30	15	3
PRB 803	<p>Data Analysis in Reproductive Health</p> <p>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); Identifying Appropriate Models to Answer Research Questions in Reproductive Health; Use of Online Tutorials to Learn Specific Analytic Methods; Common Analytic Errors; Assumptions Underlying Specific Types of Models; Analysis of Qualitative Data; etc.</p>	Compulsory	30	15	3

PRB 804	<p>Data Interpretation & Manuscript Preparation in Reproductive Health</p> <p>Moving from Statistics to Evidence: interpretation of Research Findings; Writing for Scientific Audiences; Writing for Policy Audiences; Identifying Appropriate Media for Publication; Ethical Issues in Scientific Writing; General Approach to Scientific Writing in the Life Sciences; The IMRAD Approach; The Peer Review Process; Interacting with Journal Editors; Preparing Theses or Dissertations; Technical Reports; Preparing Conference Abstracts; Effective Presentation Skills; etc</p>	compulsory	30	15	3
PRB 805	<p>Seminar</p> <p>Forum for doctoral 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.</p>	Compulsory	0	135	3
PRB 806	<p>Project</p> <p>The doctoral research proposal; registration of title; thesis preparation and defence</p>	compulsory	0	90	6
PRB 808	<p>Reproductive Tract Oncology:</p> <p>Epidemiology and aetiology of gynaecological cancers. Epidemiologic consideration of female genital tract malignancies, Carcinogenesis of these malignancies. Influence of genes and environmental factors in eotiology of cancers. Molecular basis of carcinogenesis.</p>	Elective	30	45	3

	<p>Mechanisms of tumour invasion and metastasis.</p> <p>Management and control of gynaecological cancers. Tumour markers in pre-invasive and early stage disease. Screening for pre-malignant diseases. Early diagnosis of genital tract malignancies Principle of cancer, chemotherapy of genital cancers. Other adjuvant therapies. Monitoring of response to cancers. Immunization against gynaecological cancers.</p>				
PRB 809	<p>Assisted reproduction.</p> <p>The human semen. Semen analysis. Artificial insemination. Fertilization by micro-insemination. Super ovulation and its monitoring. Methods of polypeptide hormone assays. Methods of steroid hormone assays. Other laboratory assays in Obstetrics and Gynaecology. In vitro fertilization and embryo transfer. Gamete donation. Other assisted reproductive technologies</p>	Elective	30	45	3
PRB 81	<p>Fertility and Population Issues</p> <p>Population Dynamics and National development in African countries. Principles of population changes.</p> <p>Methods of family planning. Advances in Contraception including delivery systems. Effects and risks of contraception on morbidities. Sources of demographic data. Rates and Standardization. Measurement of Mortality, Fertility, Migration, Reproduction, Family Planning and Nuptiality. Life table theory and techniques for their construction. Multiple Decrement Tables. Competing Risks. Following Follow-up Survivorship Tables Applications. Stationary and stable Populations Model Life Tables. Parity Progression Ratios. Birth Interval analysis. Population estimates and Projection Methods.</p>	Elective	30	45	3

PRB 813	<p>Advanced reproductive biology and endocrinology</p> <p>An in-depth survey of male and female reproductive processes including neuroendocrine system.</p>	Elective	30	45	3
	<p>Pituitary and gonadal control mechanisms, as well as the physiology of pregnancy and parturition.</p> <p>Biochemistry of steroid hormones. Gonadotrophic hormones. Biochemistry of pregnancy and the puerperium. Contraception. Control of gonadal development in males and females. Biochemistry of the semen. Laboratory investigations of male and female infertility.</p>				
PRB 809	<p><i>Maternal & Newborn Health:</i></p> <p>Prenatal care and Antepatumfetal monitoring. Medical condition in pregnancy and their management</p>	Elective	30	45	3
PRB 815	<p><i>Genitourinary medicine</i></p> <p>Sexually transmitted infections. Diagnostic serological tests. Fractionation procedures. Immuno-electrophoresis. Viral immunology. Immunosuppression. Immune complex diseases. Complement system. The major histocompatibility system.</p>	Elective	30	45	3

12.0. DOCTOR OF PHILOSOPHY IN PLANT BREEDING PROGRAMME

12.1. Course Work

PBR 810: Breeding for Resistance/Tolerance to Biotic and Abiotic Stresses – Case Studies (3 Units -Compulsory)

Definition, characteristics and peculiarities of biotic and abiotic stresses. Importance of breeding for resistance to biotic stresses and tolerance to abiotic stresses. Methodologies of breeding for stresses: detailed specific examples of screening procedure and aids to selection (at least two cases of each of the stresses to include *Striga* and drought). Data collection. Challenges in breeding for resistance/tolerance to stresses.

PBR 820: Special Topics (3 Units -Compulsory)

Experts will be invited to speak and share practical experiences on a wide range of relevant subjects. These will include (i) Seed business development, (ii) Participatory Rural Appraisal, Geographic Information System (GIS) in Agricultural Research, (iv) Leadership Training (v) Use of Library Electronic resources, Setting up and Managing a Plant Breeding Research Programme, and (vii) Scientific Communication.

PBR 830: Current Trends in Plant Breeding Research (3 Units –Elective)

The course will engage students in literature search on current trends in plant breeding research. In particular, the integration of molecular techniques in plant breeding will be demonstrated with extensive practical sessions and hands-on experience. This will include the use of several genomics software.

PBR 840: Current Trends in Crop Science Research (3 Units –Elective)

The course will engage students in extensive literature search on current trends in crop science research and provide guidance on how to stay at the cutting edge of research. The use and advantages of simple techniques and up-to-date instrumentation in assaying plant responses and characteristics will be demonstrated.

Minimum Course Work for the PhD Programme

PhD candidates are required to take the two compulsory courses and a minimum of six units at the 800 Level, but may not take more than one additional course. Consequently, number of units registered for should not be more than 9, given that candidates are expected to develop their proposals during the period.