

# MAKERERE



# UNIVERSITY

**College of Veterinary Medicine, Animal Resources and Biosecurity  
School of Biosecurity, Biotechnical and Laboratory Sciences  
Department of Biosecurity, Ecosystems and Veterinary Public Health.**

**Title of the taught PhD programme: PhD in Global Biosecurity and Ecosystems Health (PhD GLOBECO)**

### **Executive Summary**

In collaboration with national and international partners, Makerere University College of Veterinary Medicine, Animal Resources and Biosecurity conducts research and training in animal health and biosecurity. Currently, neglected and emerging Zoonoses including Corona Virus disease, Ebola and other haemorrhagic fevers, swine, bird flu, and Corona Virus present a serious global health threat to humans and animals.

The proposed PhD program is expected to provide in-depth understanding of risks associated with intentional and unintentional release of biological agents. It will also look at systems and practices that can be used to investigate, manage and control these diseases in animals, the environment and to humans. Graduates will gain knowledge and skills in management of animal, human and plant disease related events that include laboratory and farm/firm level safety and regulation that one may call biosafety. They will also learn about biodefense, quarantine and border control especially for animals and plants. Effective management of biothreats is global, regional and national concern as shown by GHSA program. This program and others call for multidisciplinary training and especially training a cadre of professionals that can manage biothreats in animals and humans.

This programme will strengthen the research culture among the students and form a critical mass of Scientists who are well trained in pathogen molecular biology, can work productively in their communities and conduct collaborative research

The PhD in Global Biosecurity and Ecosystems Health programme will focus on preparing doctoral students for independent Global Biosecurity and Ecosystems health driven research. That preparation will be a mentored-research approach to produce new knowledge through the application of Global Biosecurity and Ecosystems Health technologies and interventions. The programme will promote innovative and cutting-edge research in either one of two areas of focus: Global Biosecurity and Ecosystems Health in Africa. This will build on existing research efforts in both areas that have relied on different approaches to study trends of emerging and re-emerging diseases, zoonotic and infectious diseases.

A taught PhD program with course works will be the first of its kind in COVAB. The purpose of this type of PhD program is to allow the student grasp a topic of interest better and to improve on their writing skills. The course work will help set a stage for dissertation phase. In addition, the

course work will help the student develop breadth as well as depth in understanding the field of global biosecurity and biosafety. Most of the PhD courses currently provided in the university are adhoc and not compulsory for students. We propose that topics such as Advanced Research Methodology and Advanced Statistics, using programs such as R, should be made core for students to take on. In our program, PhD students will also be required to take Risk Analysis course module with emphasis on risk assessment, risk management, risk communication. In addition, they will take simulation modelling of diseases as a core. Some PhD candidates are sometimes found deficient when it comes to scientific report writing. Seminar series on reporting writing will be used to improve on analytical and report writing skills of students. The student may audit other courses within COVAB that are offered within the graduate program to improve on their skill sets. However, for these audited courses, there is no need to take examinations. Meanwhile, for the rest of the compulsory courses (shown below), the student will be required to take course work for a minimum of one semester or equivalent time of six months. It is compulsory for the students to pass the course work within this time. The students will then conduct research work to generate findings that will lead to publication of at least two-three papers from her/his work in peer reviewed journals in the area of advanced epidemiology and infectious diseases management. The PhD student will be required to presentations in at least two international conferences.

#### **Uniqueness of the PhD programme.**

Compared to its sister programme (Master of Science in Global Biosecurity and Infectious Diseases Management) that will be concurrently implemented, the uniqueness of the Doctoral Programme is its intensive mentored research training spanning 2 to 4 years so as to ground trainees in critical thinking and problem solving. It will also be having course works. As such, the overall purpose of the Doctoral Degree Programme is to establish intensive mentored-research training for new scientific knowledge and improved health care, through the application of Global Biosecurity and Ecosystems health interventions. A Doctoral Degree Programme is the most suitable at cultivating skills in critical thinking; it will promote cutting-edge biosecurity and ecosystems health research and contribute to the ranking and growth of the university in many ways.

The fact that Biosecurity and Ecosystems health is a relatively new discipline not covered during undergraduate (Bachelor's) and Master's training in most universities in Africa including Makerere, successful applicants on the Doctoral Programme who do not have a biosecurity and ecosystems health background will need the knowledge and competences of coursework on the Master's programme. Therefore, during the first-year, students on the doctoral programme will take coursework similar to Master's trainees to gain those competences. Note, although the doctoral programme will leverage coursework on the Master's programme, the goals and programme objectives are quite different, and the doctoral programme has unique courses not offered on the Master's programme namely; These additional courses were carefully selected and added to the doctoral curriculum for their ability to impart critical thinking and other competences only possible at PhD-level training e.g. capacity to solve complex problems; ease

of application regarding translation into health care and management of emerging diseases in sub-Saharan Africa; bridging of the gap between laboratory-based research / health care workers and clinicians/epidemiologists and other health care workers, accelerating knowledge translation. With the regional expansion of the East African community to include South Sudan and the Democratic Republic of Congo, this programme delivery as Makerere University expands the horizon and this will attract students across the region to focus on key hotspot areas for research and development of evidence based interventions targeting emerging and re-emerging diseases such as Ebola.

### **Eligibility Criteria**

The program will take students with background in the following Master's degree programs: Global Biosecurity and Infectious Diseases Management, Veterinary Preventive Medicine, Epidemiology and Biostatistics, Public health, Wildlife health, Rural Development, Sociology, Environmental and Occupational Health and Agricultural and Health science related Master's degree programs. The following are proposed compulsory courses for the PhD program namely: (A waiver might be given to those courses covered during the MSc in Global Biosecurity and Infectious Diseases Management)

- a. Advanced Epidemiology;
- b. Advanced Research methods and Bioethics;
- c. Biosecurity and Biosafety;
- d. Advanced Risk Analysis;
- e. Advanced Statistics
- f. Health Sociology and Anthropology
- g. Ecosystems health management
- h. Advanced Health Economics.
- i. Seminar Series: The PhD candidate will be required to attend and present in at least Four (4) seminars. In addition, the student will be tasked to review papers on biosecurity and biosafety, risk analysis, disease modeling and ecosystem health etc. Students are expected to also learn writing of scientific information in this module. A PhD student is then required to conduct a minimum of one-year field/laboratory work.
- j. The PhD candidate is required to publish at least two-three papers from her/his work in peer reviewed journals in the area of Global Biosecurity and or Ecosystems health before proceeding to thesis writing.

### **Programme Learning Objectives**

The main aim of the Collaborative PhD programme (CPP) is to develop PhD programmes in Africa that meet international standards, are relevant to global needs and can eventually be sustained from local resources.

Specifically, the programme is intended to meet the following the objectives:

- a. To train human, animal, and environmental health professionals and academics to become research leaders on Global Biosecurity and Ecosystems health using modern methods as well as research through PhD and Post-doctoral programs.
- b. To create Post-doctoral Fellowship training that will serve as a focal point where PhD students can always interact and share ideas and resources.

- c. The program proposed will provide knowledge and skills to students to be able to administer and manage bioterrorism threats from zoonotic and other infectious diseases including antimicrobial resistance (AMR).
- d. To produce a cadre of professionals with advanced skills in biosecurity that are internationally recognized.
- e. To build a human resource prepared to work with in biosecurity and ecosystems health in a diverse range of settings, from health emergencies, disease outbreaks, bioterrorism threats, zoonotic and infectious diseases.
- f. To build capacity for conducting research in epidemiology of priority animal diseases, zoonotic diseases, emerging and re-emerging diseases, biosecurity, ecosystem health, and impacts of disease on animal productivity, human health and wellbeing.
- g. To train the next generation of leading African Scientists, including newly established generations and health research institutions in Uganda and globally on Biosecurity and Ecosystems health, foster increased research collaboration among scientists globally.
- h. To build capacity of professionals who are able to develop and strengthen health systems and impact policy at national, regional, and international level geared towards improving biosecurity and ecosystems health.

### **Programme Learning Outcomes**

- a) Able to use and develop models to analyze various health issues, to communicate results, and to make policy recommendations.
- b) Graduates will be critical thinkers in the subject of biosecurity and public health capable of undertaking research for policy and also participate meaningfully in academia.
- c) Apply statistical and epidemiological models, based on evidence and knowledge acquired to identify and correctly use data sources.
- d) Communicate, in written form and verbally, theoretical and evidence-based findings to an audience of public health professionals and to a general audience.
- e) Conduct, analyze, manage and communicate research findings on global biosecurity and ecosystems health.
- f) Analyze different global perspectives affecting human, animal, and environmental health in diverse cultural settings.
- g) Work as a team across all disciplines and sectors involved in Global biosecurity and ecosystems health.
- h) Develop, implement, and advise on international health policies strategies and institutional arrangements for biosecurity and ecosystems health.

### **Employment Prospects**

Upon completion, Graduates of the PhD in Global Biosecurity and Ecosystems health programme will serve in the following areas:

- Career in Research
- Career in Academia
- Employment in Global Biosecurity and Ecosystem Health companies:

### **Institutional benefits**

Additionally, the programme will provide benefits to Makerere University:

- It has already attracted funding for the University and is poised to attract more by way of both training and research grants

- It is going to avail training opportunities to Makerere University staff at Master's, PhD and Postdoc levels
- It is going to enhance Makerere's international collaborative footprint through its inbuilt partnerships with various funding agencies/donors. It will also be attracting tuition-paying students from across the globe and private students interested in its cutting-edge capabilities.
- Building capacity for Team-Science through a joint implementation of the program by CHS, CoCIS, and CoNAS, owing to its intercollegial and multidisciplinary nature
- Position Makerere University to host the first Global Biosecurity and Ecosystems Health Masters and Doctoral degree programs in the East and Central African region, giving it a first-mover advantage in the domain.
- Through research internships, Makerere University will increase collaboration opportunities with other institutions within the country and the region.
- It will improve Makerere University global visibility in Global Biosecurity and Ecosystems Health led research outputs

**Target Group:** The doctoral programme is targeting the following cadres: Veterinary Doctors and animal health practitioners, biological scientists like Biochemists, Botanists and Zoologists laboratory workers in hospital laboratories and research institutions, field Epidemiologists, Clinical epidemiologists and public health workers and sociologists who wish to pursue a career in biosecurity and ecosystems health in relation to their field.

**Duration:** The Programme in accordance with standing University regulations lasts 3-5 years

**Designation of the Award:** Successful candidates will be awarded the PhD in Global Biosecurity and Ecosystems Health programme.

**Tuition fees:** The programme relies on tuition fees paid by students. PhD students from East Africa will pay tuition fees totalling to ten million and six hundred sixty-two thousand five hundred Uganda shillings (10,662,500/=) per year, while Non-East African students will pay tuition fees of sixteen million, four hundred sixty five thousand Uganda shillings(16,454,000/=)

**Regulations:** The general regulations of Makerere University for Doctoral Degree Programmes by Coursework and Dissertation as indicated in the students' handbook shall apply. The regulations cover aspects of:

1. Applications, registration, academic integrity, examination, research proposal writing and supervision;
2. Guidelines for submission of progress reports and final dissertation/thesis.

**Admission requirements:** To qualify for admission, a candidate must fulfil the minimum Makerere University entry requirements for a PhD. There is a need to bridge the biosecurity skills gap for students admitted with different backgrounds and competences. Accordingly, PhD students without a biosecurity MSc degree will be required to do the masters level coursework first.

## Course Categoration

### 3.2.1 Doctoral-level mentored research leading to a dissertation/thesis

As per the Makerere University Guidelines for writing PhD research proposals and dissertations/theses that are well-described here (<https://rgt.mak.ac.ug/sites/default/files/GRADUATE%20HANDBOOK%20SEPTEMBER%20%202013.pdf>), students will be required to demonstrate ability to independently formulate a

detailed research proposal, which will culminate into a well-written examinable dissertation/thesis. Details on supervision and formulation of the research proposal and thesis write-ups are described in the course description section.

### **Programme Structure**

The curriculum maps for **doctoral degree programme in Global Biosecurity and Ecosystems Health** is herewith outlined. Although coursework for doctoral programme may be similar to that of the Master's programme in Bioinformatics, please note the key difference in combinations of courses for the doctoral programme, and bear in mind that the focus of the PhD Programme is its intensive mentored research programme in genomics and bioinformatics.

**Progression:** Progression through the programme shall be assessed in three ways:

**Normal Progress:** This occurs when a student passes each course taken with a minimum Grade Point of 3.0.

**Probationary:** This is a warning stage and occurs if either the cumulative grade point average (CGPA) is less than 3.0 and/or the student has failed a core course. Probation is waived when these conditions cease to hold.

**Discontinuation:** When a student accumulates three consecutive probations based on the CGPA or the same core course(s), he/she shall be discontinued. A student who has failed to obtain at least the pass mark (60%)/ grade point of 3.0 during the third assessment in the same course(s) he/she had retaken shall be discontinued from his/her studies at the University. Likewise, a student who has overstayed in an academic programme by more than two (2) years shall be discontinued from his /her studies at the university.

**Re-taking a Course:** A student may re-take any course when it is offered again in order to pass if the student had failed this course. A student may take a substitute elective, where the student does not wish to re-take a failed elective.

**Certificate of Due performance:** A certificate of due performance will be granted to a student who attains at least 50 percent of the continuous assessment (40 percent).

**Approval of Examination Results:** The School of Biosecurity, Biotechnology and Laboratory Sciences Higher Degrees and Research committee approves examination results which are then forwarded to the College of Veterinary Medicine, Animal Resources and Biosecurity Academic Board for approval on behalf of the University Senate.

**Appeals:** Student appeals are handled by the School of Biosecurity, Biotechnology and Laboratory Sciences Higher Degrees and Research committee, chaired by the Dean, School of Biosecurity, Biotechnology and Laboratory Sciences. A student can appeal against a decision of the School of Biosecurity, Biotechnology and Laboratory Sciences Higher Degrees and Research committee by appealing to the College of Veterinary Medicine, Animal Resources and Biosecurity Malpractices and Appeals Committee.

### **Weighting System**

The weighting unit is the Credit Unit (CU). The Credit Unit is 15 contact hours per semester. A contact hour (CH) is equal to: one lecture hour, two practical hours or two tutorial hours

### **Grading of Courses**

Each course unit will be graded out of a maximum of 100 marks and assigned an appropriate letter grade and a grade point as follows:

Marks %	Letter Grade	Grade Point	Interpretation
90 – 100	A+	5.0	Exceptional
80 – 89	A	5.0	Excellent
75 – 79	B+	4.5	Very Good
70 – 74	B	4.0	Good
65 – 69	C+	3.5	Fairly Good
60 – 64	C	3.0	Pass
55 – 59	D+	2.5	Marginal Pass
50 – 54	D	2.0	Clear Fail
45 – 49	E	1.5	Bad Fail
40 – 44	E-	1.0	Qualified Fail
Below 40%	F	0.0	Qualified Fail

### Calculation of Cumulative Grade Point Average (CGPA)

The CGPA shall be calculated as follows: -

$$CGPA = \frac{\sum_{i=1}^n (GP_i \times CU_i)}{\sum_{i=1}^n CU_i}$$

Where  $GP_i$  is the Grade Point score of a particular course  $i$ ;  $CU_i$  is the number of Credit Units of course  $i$ ; and  $n$  is the number of courses so far done.

**Pass Mark:** The pass mark for each course shall be 60% (i.e. 3.0 grade points).

### Student Academic Status

The following additional letters will be used, where appropriate to describe the academic status of the student;

- W: Withdrawal from course
- I: Incomplete
- AU: Audited course
- P: Pass
- F: Failure

### Graduation Load.

To qualify for the award of PhD in Global Biosecurity and Ecosystems Health degree, a full-time candidate will be required to obtain a minimum of 69 credit units and pass the Doctoral Thesis (120 CUs) within a period stipulated by the Directorate of Research and Graduate Training, usually not exceeding five (5) years from the date of registration.

### Curriculum Map

CODE	YEAR 1: SEMESTER I	LH	PH	CH	CU
MBD 7102	Evolution and Prevention of Infectious Diseases	60	60	0	3
MBD 7104	International Health Systems and Policy	30	15	15	3

MBD 7106	Bioterrorism and Health Intelligence	30	30	30	<b>3</b>
<b>TOTAL</b>					<b>9</b>

\*\*\* LH: Lecture Hours; PH: Practical Hours; CH: Contact Hour; CU: Credit Units

<b>CODE</b>	<b>RECESS SEMESTER:</b>	<b>LH</b>	<b>PH</b>	<b>CH</b>	<b>CU</b>
PBE9102	Philosophy of Methods	0	0	0	0
PBE9101	Doctorateness	30	0	30	2
PBE7301	Research Bioethics	30	0	30	2
MBD 7201	Research methods	30	30	00	3
<b>TOTAL</b>					<b>7</b>

<b>CODE</b>	<b>YEAR 2: SEMESTER I</b>	<b>LH</b>	<b>PH</b>	<b>CH</b>	<b>CU</b>
PBE7111	Journal Club Series I	30	0	30	2
MBD 8101	Advanced Epidemiology	45	45	30	3
MBD 8102	Advanced Biostatistics	30	30	30	3
MBD 8103	Disease and Economic Modeling	45	45	30	3
<b>TOTAL</b>					<b>11</b>

<b>CODE</b>	<b>YEAR 1: SEMESTER II</b>	<b>LH</b>	<b>PH</b>	<b>CH</b>	<b>CU</b>
MBD 8105	Terrestrial and Aquatic Ecosystem health	45	45	00	3
MBD 8107	Climate Change, Biodiversity and Infectious Diseases	45	45	00	3
MBD 7204	Health Economics	30	15	00	3
Total					9

<b>CODE</b>	<b>RECESS SEMESTER (Between Year 3 and 4):</b>	<b>LH</b>	<b>PH</b>	<b>CH</b>	<b>CU</b>
PBE9303	Doctoral Symposium	0	0	0	0
PBE1010	Seminar Series				
<b>TOTAL</b>					<b>0</b>

<b>CODE</b>	<b>YEAR 2: SEMESTER II</b>	<b>LH</b>	<b>PH</b>	<b>CH</b>	<b>CU</b>
PBE9202	Grantsmanship	30	30	45	3
PBE9201	Global Biosecurity and Ecosystems health Doctoral Research Proposal			225	15
PBE8501	Scientific writing and dissemination	30	0	30	2
<b>TOTAL</b>					<b>20</b>



<b>CODE</b>	<b>YEAR 3 – YEAR 4: SEMESTER I &amp; II</b>	<b>LH</b>	<b>PH</b>	<b>CH</b>	<b>CU</b>
PBE7111	Journal Club Series II	30	0	30	2
PBE9203	Global Biosecurity and Ecosystems Health Doctoral Research Project			1800	120
<b>TOTAL</b>					<b>122</b>