CHINHOYI UNIVERSITY OF TECHNOLOGY

School of Health Sciences and Technology

Department of Medical Sciences and Technology

REGULATIONS FOR MASTER OF SCIENCE IN GENOMICS AND PRECISION MEDICINE

These regulations must be read in conjunction with the **General Academic Regulations for Graduate Studies** of Chinhoyi University of Technology hereinafter referred to as the **General Regulations**.

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1.0 PREAMBLE

The MSc in Genomics and Precision Medicine programme will prepare the students to champion genomic based solutions for healthcare in Zimbabwe and beyond. The programme focuses on three thematic areas namely; technology platforms, analytics and applications. The field of genomics is evolving at a fast pace with tremendous influences on health care and the pharmaceutical industry. There is currently limited training in genomic technologies and their application in medicine in Zimbabwe, yet there is an increasing demand in industry for genomic solutions. Genomic medicine provides insights into mechanism of diseases and disease pathways, that could be used to optimize diagnostics and care of patients. Application of genomic technologies has significant potential to address some of the health challenges in sub-Saharan Africa by better understanding host pathogen interactions, development of new biomarkers, personalized medicine, diagnostics, vaccines and therapeutics.

2.0 RATIONALE

Zimbabwe is currently importing diagnostic and therapeutic tools, some of which are not appropriate to our populations. There is therefore need for a training programme in genomic technologies that will assist in the development of diagnostics relevant to our local settings. Precision medicine is a medical discipline that involves the application of genomic information about an individual as part of their clinical care from diagnostic and therapeutic decision-making, and health outcome and policy implications. There is increasing need for champions of genomic technologies who will give birth to an industry which will drive the integration of precision medicine into the health care system. This will lead to a reduction in the need to import diagnostics and therapeutics in Zimbabwe. This will contribute to the national import substitution program.

3.0 PROGRAMME OBJECTIVES

The objectives of this degree programme are to:

3.1. Equip students with the latest and advanced knowledge and skills in practical techniques that are applicable across a number of disciplines in genomics and precision medicine.

3.2. Develop graduates with the ability to critically evaluate, design, communicate and provide appropriate and innovative solutions to health and wellness through use of genomic technology.

3.3. Promote social responsibility amongst graduates through the consideration of ethics and safety in the use of genomic data and genomic solutions in human health and wellness.
3.4. Produce functional graduates who will transform knowledge and skills into viable innovative diagnostics and therapeutic solutions in health and wellness.
3.5. Develop highly qualified, competent and versatile graduates who will influence policies and strategies in the field of genomics and precision medicine.
3.6. Collaborate and engage with national and international researchers in the conduct of relevant research and influence policy.

4.0 EXPECTED LEARNING OUTCOMES

A student who graduate with a Master of Science in Genomics and Precision Medicine from Chinhoyi University of Technology should be able to:

4.1. Demonstrate the latest knowledge, skills and techniques in genomics and precision medicine.

4.2. Design innovative genomic technology-based health and wellness solutions.

4.3. Critically evaluate health and wellness solutions for local relevance and impact

4.4. Effectively communicate research findings to a wider scientific and lay audience.

4.5. Promote social responsibility amongst graduates through the consideration of ethics and safety in the use of genomic data and genomic solutions in human health and wellness.

4.6. Design, lobby, and promote policies and strategies to integrate genomic medicine and technologies in health care.

5.0 ENTRY REQUIREMENTS

To be admitted into the Master of Science in Genomics and Precision Medicine degree programme, a candidate should normally:

a) Have obtained a Grade Point Average (GPA) of 2.4 on 0 - 4 grading scale or better in their first Honours degree programme in Medical laboratory sciences, pharmacy, pharmacology, biotechnology,

biomedical science, medicine, biology, biochemistry, veterinary science or any other relevant degree.

b) Applicants who have obtained an appropriate Honours degree with a GPA less than 2.4 may be considered provided performance in the proposed area of study has a GPA of 2.4 or better and any one of the following conditions shall be fulfilled: Demonstrated relevant experience in the proposed area of research or Relevant publications in the proposed area of research or the candidate passes a qualifying written, oral or both examinations with a minimum pass mark of 65 %.

c) Applicants who have obtained a relevant General Degree or approved equivalent qualification and have minimum 3 years relevant experience may be considered on the recommendation of the Department.

The applicants should be familiar with the basics of laboratory practice and pharmacology. Applicants must also have sufficient knowledge of the English language.

6.0 CAREER OPPORTUNITIES

Graduates of this programme can pursue careers as academics, researchers in medical institutions, pharmaceutical and diagnostic industries, public health experts in government and non-governmental institutions, technologies providing diagnostic support to clinicians, regulatory offices, bioinformaticians and data scientists among many related careers.

7.0 STRUCTURE OF THE PROGRAMME

7.1 The Master of Science Degree in Genomics and Precision Medicine is a two- year programme, which comprises of the following components:

7.2 The first year, which comprise two semesters in which a student enrols for five (5) taught modules per semester.

7.3 The second year in which a student develops a proposal, undertake research, write and submit a dissertation as required under the Postgraduate Guidelines for Thesis Writing.

7.4 All modules in the first semester and four modules in the second semester are compulsory.

7.5 A student chooses one elective module in their area of interest in the second semester to attain the five modules required per semester.

7.6 The maximum duration a student can be allowed to complete the programme is four years, which is a total of eight semesters. A student who

fails to complete the programme within the stipulated maximum time shall be asked to discontinue from the programme.

7.7 The list of modules offered for this programme is shown in Table 1. Please note that not all optional module may always be on offer in the second semester.

Table 1: List of modules, notional hours and credits offered in the first and second years for the MSc in Genomic and Precision Medicine Programme

FIRST YEAR SEMESTER 1 (Part 1:1)							
Module Code	**Module Title**	**Contact hours (hrs)**		**Non- contact hours (hrs)**	**Assessment (hrs)**	**Notional Hours**	**Credits**
		Lectures	Practicals/Case studies	Directed and self-directed learning			
MSGPM 611	Genomics	48	60	48	24	180	18
MSGPM 612	Genomic Technologies	48	60	48	24	180	18
MSGPM 613	Bioinformatics and Statistical Genetics	48	60	48	24	180	18
MSGPM 614	Medical Genetics	48	60	48	24	180	18
MSGPM615	Molecular Pathology in Oncology	48	60	48	24	180	18
Total Cumulative for first Semester						**900**	**90**
FIRST YEAR SEMESTER 2 (PART 1:2)							
Course code	**Course title**	**Contact Hours (hrs)**		**Non-Contact Hours (hrs)**	**Assessment (hrs)**	**Notional Hours**	**Credits**
MSGPM 621	Genomics in Infectious Diseases	48	60	48	24	180	18
MSGPM 622	Pharmacogenomics	48	60	48	24	180	18
MSGPM 623	Medical Laboratory Practice	48	60	48	24	180	18
MSGPM 624	Research Methods and Biostatistics	48	60	48	24	180	18
Plus one elective from the list below:							
MSGPM 625	Genetic Counselling	48	60	48	24	180	18
MSGPM 626	Genomics in Sports, Nutrition and Health	48	60	48	24	180	18
MSGPM 627	Microbiomes in Precision Medicine	48	60	48	24	180	18
MSGPM 628	Prenatal and New-born Screening	48	60	48	24	180	18
MSGPM 629	Biomedical Innovation and Entrepreneurship	48	60	48	24	180	18
Total Cumulative for Second Semester						**900**	**90**

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SECOND YEAR SEMESTERS 1							
MSGPM 630	**Research Project**					**900**	**90**
SECOND YEAR SEMESTERS 2							
MSGPM 630	**Research Project & Dissertation**					**900**	**90**
Total Cumulative for Second Year						**1800**	**18**
Grand Total						**3600**	**360**

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8. DISSERTATION

8.1 To be allowed to proceed to the second year, a student should have passed all the ten (10) modules including electives in the first and second semester of the first year.

8.2 Each student shall complete a dissertation on an approved research topic under supervision by a supervisor(s) approved by the departmental board.

8.3 The dissertation research and writing shall be completed within semester 1 and 2 of the second year of the programme.

8.4 The notional hours and credits for the dissertation are shown in Table 2.

Table 2: Notional study hours and credits for the dissertation in the MSc Genomics and Precision Medicine programme.

Activity	**Notional Study Hours**
Proposal writing workshop.	40
Literature Review.	80
Proposal development, review and submission.	200
Laboratory and field research.	440
Data Analysis and interpretation.	100
Interim results presentation workshop.	40
Writing of dissertation, review and submission.	860
Final dissertation defence workshop.	40
Total notional hours.	1800 hours
Credits	**180**

9. RESEARCH SUPERVISION

9.1 A student shall develop research topics guided by research areas approved by the department of Biotechnology from time to time.

9.2 A student shall be allocated supervisors according to the research area he/she will have chosen.

9.3 Student supervision shall be as prescribed in the **General Academic Regulations for Graduate Studies.**

10. ASSESSMENT

10.1 Assessment of Taught Modules

10.1.1 The final assessment mark for each module shall include both the course work and an examination mark.

10.1.2 The course work mark shall contribute 40 % and the final written examination 60 % to the final mark.

10.1.3 A course work assessment mark shall entail in-class test assessments, oral presentations, written assignments, practical reports, projects, mini-projects and any other assessed work executed during the semester for each module.

10.1.4 A student must do all required course work and attain a minimum mark of 40 % to be allowed to sit for examinations.

10.1.5 A student who fails to submit course work in time for assessment for any module will not be allowed to sit examinations for that module.

10.1.6 Final written examinations for each module shall be held at the end of each semester in year 1 semester 1 & 2 and shall normally consist of a three (3) hour written examination paper. Additional practical examinations maybe required for some modules.

10.1.7 A student who fails to meet the minimum class attendance requirements in each module as stipulated in the **General Academic Regulations for Graduate Studies** shall not be allowed to write examinations for the module.

10.1.8 The grading system in the Master of Science in Genomic and Precision Medicine shall follow the guidelines provided for in the University's General Academic Regulations for Graduate Studies Degree Programme.

10.2 **Assessment of dissertation**

10.2.1 The final dissertation mark shall consist of interim assessment marks and the written dissertation mark.

10.2.2 The interim assessment comprises of the proposal seminar presentation mark, research progress presentation marks and the dissertation oral defence mark; each of which contributes 10 %.

10.2.3 The dissertations shall be assessed by two independent examiners who are not the supervisors of the research projects. One of the two examiners will be external. The average of the two marks will be considered as the final written dissertation mark.

10.2.4 In cases where there is a difference of more than 10 % in their marks, a third examiner or external examiner, when available, will moderate, and the moderated mark will be taken as the final dissertation mark.

10.2.5 The dissertation course work mark shall contribute 30 % and the final written dissertation mark shall contribute 70 % to the final dissertation mark.

10.2.6 A student who fails the final dissertation within the 40-49 % range shall be allowed to resubmit the dissertation within three (3) months after the publication of results.

10.2.7 The maximum mark for a resubmitted dissertation is 50 %.

10.2.8 A student who fails the dissertation with a mark less than 40 % will be allowed to repeat the dissertation.

10.2.9 Dissertations will be subjected to anti-plagiarism software in accordance with the University's **General Regulations for Graduate Studies degrees**.

11. PROGRESSION

11.1 There are no supplementary examinations for all modules. A student who fails a module in this programme shall repeat when next offered.

11.2 For making decisions on progression of a student through the programme, refer to **General Academic Regulations for Graduate Studies**.

12. GRADING

12.1 The modules and degree programme shall be graded according to the **General Academic Regulations for Graduate Studies**.

12.2 The grading of the degree programme is shown in Table 3.

Table 3: Grading of the degree programme.

PERCENTAGE MARK	GRADE		
85 and above	A+	4.0	Distinction
80 – 84	A	3.6	
75 – 79	A-	3.2	
70 – 74	B+	2.8	Merit
65 – 69	B	2.4	
61 – 64	B-	2.0	
56 – 60	C+	1.7	Pass
53 – 55	C	1.4	
50 – 52	C-	1.0	
Below 50	F	0.0	Fail

13. NOTIFICATION OF RESULTS

13.1 Results shall be published and a degree awarded in accordance with the provisions of the **General Academic Regulations for Graduate Studies as approved by senate**.

14. AWARD OF DEGREE

14.1 To be awarded the Master of Science in Genomic and Precision Medicine, a student must have passed all taught modules and the dissertation component in accordance with **General Academic Regulations for Graduate Studies programmes** and approved by the senate.

14.2 A degree under the seal of the Chinhoyi University of Technology is issued to each student who satisfactorily completes the approved module of study for the award of the Master of Science in Genomic and Precision Medicine.

15. NOTIFICATION OF RESULTS

15.1 Results shall be published and a degree awarded in accordance with the provisions of the **General Regulations**.

MODULE SYNOPSES

MSGPM 611: Genomics

The objective of this module is to equip the student with advanced knowledge in human genomics and genetic variation. The module will be taught through use of lectures, seminars, case studies and hands on exercises. Topics to be covered in this module include; Genetics, Epigenetics and Genomics; The Central DOGMA of genomics, transcriptomics, proteomics, metabolomics; gene regulation and protein function. Genetic variation, gene-environment interactions and international efforts in genomics research (HUGO, 1000 Genomes project & related efforts, HAPMAP, etc). The focus will be on the human genome and those of important pathogens and disease vectors. On completion of this module the student shall have a good understanding of genomics from the fundamentals of genetics to current developments at whole genome sequence levels that are both technology-driven and are giving rise to new understanding and applications in molecular mechanisms of disease, diagnostics and treatment.

MSGPM 612: Genomic Technologies

The aim of this module is to equip students with scientific and technical skills of genomic technologies. The module will be taught through theory and laboratory experimentation on nucleic acid amplification, sequence determinations and detection. This will be done through the acquisition of

hands-on skills training in standard PCR technology, quantitative PCR technology, Sanger sequencing, Next generation sequencing, and microarray SNP detection technologies including gene expression, highly multiplexed genotyping, highly parallel sequencing, partial gene sequencing, and whole exome sequencing. The module will cover the development, validation and deployment of genomic diagnostic tests. On completion of the module, the student shall be able to skilfully operate sophisticated genomic technology equipment and be able to design, test, validate and deploy genomic diagnostic tests.

MSGPM 613: Bioinformatics and Statistical Genetics

The purpose of this module is to empower the students with skills to apply computational tools, including super computers in the analysis and interpretation of genomic data in medicine. This will include programming skills, genomics study design and end use appreciation. This module will be taught through *In silico* practical analysis of sequence and experimental data sets that address various application of bioinformatics, statistical genetics, artificial intelligence and pattern recognition in genomic medicine such as; target identification and validation; chemogenomics; biomarker discovery; design of diagnostics microarrays and molecular epidemiology of disease outbreaks. The bioinformatics topics to be covered will include DNA and protein databases, sequence annotation, data mining techniques, sequence alignment and structure prediction, genome wide association study design and analytical pipelines in biomarker discovery for genomic medicine. Statistical genetics' topics to be covered include the estimation of allele frequencies, the testing for Hardy-Weinberg equilibrium, classical and complex segregation analysis, linkage analysis for Mendelian and complex diseases and quantitative traits, the detection of allelic associations, the estimation of heritability for multifactorial traits and path analysis. On completion of this module the students shall be able to design data analysis pipelines for studies or applications with varied research and clinical end-points. They will also be able to support researchers with genomic medicine research study designs and results interpretations.

MSGPM 614: Medical Genetics

The purpose of this module is to build the student's understanding of genetic disorders and inheritance in human disease and their role in clinical genetics. The module will be taught through theory and case study analyses. This will be done through imparting knowledge of genetic information processing and inheritance patterns of human genetic disease; Mendelian/monogenic and Complex/polygenic familial disorders, epidemiology of heritable disease, single nucleotide and chromosomal defects and analysis in prenatal and neonatal diagnostics, pedigree analysis, risk calculations and ethics of clinical consultations of results of genetic tests. The module will also cover topics on Ethical legal and Social issues, (ELSI), including national, regional and

international polices, regulations and laws pertaining to the conduct of biomedical and genomic research and practice of precision medicine; policies on accountability, consent, data sharing, confidentiality, privacy and security; genetic testing; counselling for heritable diseases. To enhance the clinical experience of the students, the students will be involved in clinical rounds with specialist paediatricians attending to children with inherited diseases. They will also take part in educational clinical rounds with Medical Genetics specialists in both children adults' wards at selected referral hospitals. On completion of the module, the students should be able to trace familial disorders through generations, set up a clinical framework for the provision of prenatal, neonatal and adult genetic testing services that take into account timing of sample collection, choice of genetic tests to be done, interpretation of the genetic tests results, and genetic counselling in the sharing of the results with patients and their families.

MSGPM 615: Molecular Pathology in Oncology

The aim of this module is to equip the students with knowledge on the molecular mechanisms that underlie cancer development, growth and metastasis, the differences between different cancers, and emerging opportunities for genomics driven diagnosis and treatment options. The module shall be taught through theory and laboratory genomic analysis of biopsies and blood of different cancers such as breast, prostate and cervical cancer, genotyping of patients receiving treatment that only work in patients of specific genotypes. The module will cover topics that include genes linked to cancer risk, treatment and prevention; genomic technologies in cancer treatment plans; immunotherapy; molecular and cellular actions of anti-cancer treatments; the genomic factors affecting response and resistance to treatment; and the research approaches to anti-cancer drug design and development. The module will also cover topics on Ethical legal and Social issues, (ELSI) related to molecular pathology in oncology including national, regional and international polices, regulations and laws pertaining to the conduct of biomedical and genomic research and practice of precision medicine; policies on accountability, consent, data sharing, confidentiality, privacy and security; genetic testing; counselling for heritable diseases. To enhance the clinical experience of the students, the students will be involved in clinical rounds with specialist oncologists attending to cancer patients. On completion of this module, the student shall be able to support pathologists and oncologists with genomics data towards early cancer detection, better cancer type determination and design of effective treatment plans.

MSGPM 621: Genomics in Infectious Diseases

The objective of this module is to equip the student with knowledge and technical skills on the application of genomics in the accurate diagnosis, prediction of treatment outcome. The module will be taught through lectures and laboratory activities to identify pathogens and determine their drug

resistance status. The module will cover topics that include genomic structure of infectious agents; molecular epidemiology, host genetic risk factors for infection and disease progression, implication of genetic variation; genes and plasmids on pathogenicity, sensitivity of a pathogen to drug treatment and response to the host and host pathogen interaction. Topics on 'one-health', zoonosis, and antibiotic drug resistance will also be covered. The module will also cover topics on Ethical legal and Social issues, (ELSI) including national, regional and international polices, regulations and laws pertaining to the conduct of biomedical and genomic research and practice of precision medicine; policies on accountability, consent, data sharing, confidentiality, privacy and security; genetic testing; counselling for heritable diseases. To enhance the clinical experience of the students, the students will be involved in clinical rounds with specialists in infectious diseases such as OI clinics. In particular in the clinical management of infectious diseases, such as HIV, TB and some fungal infections that can benefit from known genetic biomarkers for drug safety and efficacy. On completion of this module the students shall be able to provide molecular diagnostic tests and interpret results with respect to pathogen and host factors that affect health.

MSGPM 622: Pharmacogenomics

The objective of this module is to equip the student with knowledge and laboratory skills and clinical insights in pharmacology and the role of genetic variation in drug response with respect to safety and efficacy of medicine. The module shall be taught through use of examples of known and validated pharmacogenomic tests relevant to the treatment and management of both communicable and non-communicable diseases. Laboratory tests will be done and treatment algorithms used to demonstrate clinical applications of pharmacogenomics. The module will cover topics that include pharmacodynamics, pharmacokinetics, therapeutic drug monitoring, genetic biomarkers in relation to drug response and toxicity; Pharmacogenomics in clinical trials; Pharmacogenomic technologies in pharmacovigilance; Good pharmacogenomics practice; stratified health strategies. The module will also cover topics on Ethical legal and Social issues, (ELSI) related to pharmacogenomics. including national, regional and international polices, regulations and laws pertaining to the conduct of biomedical and genomic research and practice of precision medicine; policies on accountability, consent, data sharing, confidentiality, privacy and security; genetic testing. To enhance the clinical experience of the students, the students will be involved in clinical rounds with specialist clinician attending to patients in disease areas related to pharmacogenomics. Pharmacogenomics has been shown to be an effective tool in optimising treatment outcome in conditions such as psychiatry, cardiovascular, cancer and HIV/TB. On completion of this module, the students shall be able to identify drugs that require pharmacogenetic

tests, do the lab tests, write reports to guide the clinicians in implementing the pharmacogenetics guided treatment plan.

MSGPM 623: Medical Laboratory Practice

The module is aimed at equipping the student with knowledge and skills to apply Good Clinical Laboratory Practice (GCLP) principles that are relevant to the analyses of human samples. The application of GCLP principles ensures the reliability, quality, consistency and integrity of data generated by medical laboratories. The module includes topics such as : Organisation of a Clinical Laboratory; Management of Personnel, Facilities, Equipment, and Materials & Reagents; Quality Management systems (QMS) in Clinical Laboratories and Laboratory Accreditation; Standard Operating Procedures; Laboratory Information Management System; Method and System Validation, Sample Management, Data and Recording; Biosafety in the collection, processing and disposal of human samples; types of body samples; phlebotomy; anticoagulants; Biobanking.

MSGPM 624: Research Methods and Biostatistics

The objective of this module is to equip the student with skills of research proposal development, grant writing, experimental design, and data analysis in the conduct of biomedical research. The module will be taught through exercises on the preparation of various study designs, through which various design tools, statistical approaches will be practically applied. Mini-proposal developments will be used to enhance research proposal development skills in the students. The module will cover topics that include the scientific method, human and animal ethics as well as the ethics approval process. It will cover topics on research proposal development, grantsmanship and research collaboration. Additional topics will include biostatistics, experimental design and methodology, analysis, management and presentation of data, literature search, evaluation of research papers, scientific writing and oral presentations, laboratory and chemical safety, and use of bibliography databases. On completion of this module, the student will be able to plan, conduct, document and present their research work in a professional manner.

Elective Modules

MSGPM 625: Genetic Counselling

The objective of this module is to equip the student with knowledge and skills to provide genetic counselling to clients intending to undergo genetic tests or receiving results of genetic tests. The module will be taught through case

studies and role simulation as either counsellor or client. The module will cover topics that include client psychology, social and behavioural variables, needs of healthcare providers, policy makers and the public on genetic tests, prenatal and new-born screening, cancer genetic tests and other disease risk tests. On completion of the module, the student shall have an appreciation of genetic counselling in various setting involving pre and post genetic tests.

MSGPM 626: Genomics in Sports, Nutrition and Health

The aim of this module is to equip the student with knowledge on the advances and applications of sport, nutrition and health genomics. The module will be taught through laboratory analysis of genetic variants associated with sport performance and dietary effects. Case discussions will also be used to interrogate the validity of some reported gene-sport and gene-health associations. The module will cover topics that include organization and functioning of the genome of elite athletes; tools for sport selection; individualization of the training process; sport traumatology; 'gene doping' in sports genomics. In nutrition and health, topics to be covered include effects of food and food constituents on gene expression; genetic variations and the nutritional environment and how specific nutrients or dietary regimes may affect human health and contribute to preventive medicine. On completion of the module, the student must be able to make informed genetic tests results interpretations in assistance of sports coaches and dieticians.

MSGPM 627: Microbiomes in Precision Medicine

The purpose of the module is to equip the student with knowledge of the emerging field of microbiome based precision medicine. The module will be taught through lectures, metagenomics experiments, analysis of microbiomes from stools, and sputum using microarray technologies. The module will include topics such as microbiome association with communicable and non-communicable diseases, metagenomics of hospitalized Diarrheal Patients and Healthy Individuals; Mining of the Human Microbiome for Novel Antimicrobials and Host-Modulators; Multiplexed Assay for Microbial Profiling; and Next generation sequencing applications in microbiome studies; pre- and probiotics, commercial microbiome-based products. On completion of this module, the student shall be able to interpret results of stool and sputum microbiome analysis with respect to human health.

MSGPM 628: Prenatal and New-born Screening

The aim of this module is to equip the student with the technological know how to conduct neonatal and new-born screening for inherited diseases. The module will be taught by conducting both biochemical and genetic laboratory analysis of anonymous samples from new-borns. The module will cover topics that include; inborn metabolic disorders, chromosomal disorders, ethics and

legalities of abortion, biochemical screening for inherited diseases, genetic screening for genetic disorders, next generation sequencing in genetic disorder analysis, treatments for genetic disorders and genetic counselling. On completion of this module, the student shall be able to conduct neonatal and new-born screening tests, write a professional report for use by paediatricians in presenting results to their clients.

MSGPM 629 Biomedical Innovation and Entrepreneurship.

The objective of this course is to highlight commercialization pathways for novel biomedical innovations as well as research tools and to equip students with biomedical business and entrepreneurship concepts. The module will be taught through lectures, from the lead instructor and guest experts, that cover a broad topic of life science commercialization concepts followed by mock exercises including business pitch at establishing viable biomedical businesses. The module will cover topics such as: Commercialization Case Study (Scientific Instrument); Hypothesis, Value Proposition & Customer Discovery; Commercialization Case Study, How to Communicate Innovative Ideas; Customers & Markets, Regulatory Considerations; Intellectual Property for Start-ups; Defining Your Product & Setting Milestones; Risk as a Planning Tool for Innovators; Funding Start-ups: Equity & Investment, Careers in Biomedical Innovation. On completion of this module, students shall be able to identify viable areas to develop small to medium enterprises that provide services to large pharmaceutical/biotechnology industries, develop a business case, and attract investors for their proposed start-ups. They shall also be able to assist inventors and entrepreneurs to negotiate technology transfer agreements.

MSGPM 630 Dissertation-

A candidate for an MSc Genomic and Precision Medicine degree programme shall be required to submit a proposal. In the proposal the candidate shall: Propose a research topic; Give brief background information on the proposed study; Identify gap in knowledge as determined by literature review and state the major objective(s) of the proposed study. The candidate shall embark on research that addresses the university's mandate, national aspirations and preferably lead to patents, commercialisable products or spin off companies. This course encourages research at the interface of genomic sciences and their application to precision medicine. The specific thematic areas that students are required to focus their research on in this MSc in Genomic and Precision Medicine include: genomic technologies, bioinformatics, molecular pathology in cancer, infectious diseases, pharmacogenomics, legal and ethical Issues in genomic medicine, genetic counseling, genomics in sports, applications of genomics in nutrition and health, Microbiomes, prenatal and new-born Screening, biosafety and bioethics.

=THE END=

Vice Chancellor ……………………………………………………………….. Date......................................