

DIPLOMA IN BIOTECHNOLOGY

Dip (Biotechnology) - NQF Level 6 (360 credits)

Qualification code: DPBI19

SAQA ID: 100977, CHE NUMBER: H16/14268/HEQSF

Campus where offered:

Arcadia Campus

REMARKS

a. *Admission requirement(s) and selection criteria:*

Please take note that all completed applications received within the published due dates will be ranked. After consideration of the Departmental Student Enrolment Plan, only the top ranking applicants will be selected. Once a programme is full, a waiting list will be in place to provide an opportunity for applicants to fill places of those who did not register on time. Applicants will be informed of their status per official letter from the Office of the Registrar, alternatively, they can check their application status on the TUT website, www.tut.ac.za.

• **APPLICANTS WITH A SENIOR CERTIFICATE OBTAINED BEFORE 2008:**

Admission requirement(s):

A Senior Certificate or an equivalent qualification, with an E symbol at Higher Grade or a D symbol at Standard Grade for English, Mathematics and Physical Science.

Recommended subject(s):

Biology.

Assessment procedure(s):

For 2022: Applicants who meet the minimum requirements will be considered for admission.

As from 2023: Applicants who meet the minimum requirements will be invited to submit a portfolio and to write an academic proficiency test. The APS will contribute 80% to the final admission score and the academic proficiency test will contribute 20%.

• **APPLICANTS WITH A NATIONAL SENIOR CERTIFICATE OBTAINED IN OR AFTER 2008:**

Admission requirement(s):

A National Senior Certificate with a bachelor's degree or a diploma endorsement, or an equivalent qualification, with an achievement level of at least 4 for English (home language or first additional language) and 4 for Mathematics or Technical Mathematics, 4 for Physical Sciences or Technical Sciences and 3 for Life Sciences.

Recommended subject(s):

None.

Selection criteria:

To be considered for this qualification, applicants must have an Admission Point Score (APS) of at least 21 (excluding Life Orientation).

Assessment procedure(s):

For 2022: Applicants with a score of 24 or more will be considered for admission.

As from 2023: Applicants with a score of 24 or more will be automatically accepted. Applicants with a score of 21 to 23 will be considered for admission, and will be invited to write an academic proficiency test. The APS will contribute 80% to the final admission score and the academic proficiency test will contribute 20%.

b. *Recognition of Prior Learning (RPL), equivalence and status:*

See Chapter 30 of Students' Rules and Regulations.



- c. *Intake for the qualification:*
January only.
- d. *Presentation:*
Day classes.
- e. *Minimum duration:*
Three years.
- f. *Exclusion and readmission:*
See Chapter 2 of Students' Rules and Regulations.
- g. *WIL in Biotechnology I:*
See Chapter 5 of Students' Rules and Regulations.

CURRICULUM

FIRST YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
11P105X	Communication for Academic Purposes	(5)	(10)	
CHM105X	Chemistry I	(5)	(24)	
CPL105X	Computer Literacy	(5)	(10)	
GMA105D	General Mathematics I	(5)	(24)	
GPH105D	General Physics I	(5)	(24)	
INI125D	Information Literacy I (block module)	(5)	(2)	
LF1125X	Life Skills I (block module)	(5)	(2)	
MIB105D	Microbiology I	(5)	(24)	
TOTAL CREDITS FOR THE FIRST YEAR:			120	

SECOND YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
BPD206D	Biotechnology Professional Development II	(6)	(24)	Microbiology I
MLB206D	Molecular Biology II	(6)	(15)	Microbiology I

FIRST SEMESTER

BAC216D	Bioanalytical Chemistry II	(6)	(12)	Chemistry I
BCH216D	Biochemistry II	(6)	(12)	Chemistry I
PEM216D	Process Technology and Management I	(6)	(12)	General Mathematics I General Physics I

SECOND SEMESTER

BCT216D	Biotechnology Cultivation Technology II	(6)	(18)	Microbiology I
MBC216D	Microbial Biochemistry II	(6)	(12)	Biochemistry II
MBT216D	Microbial Taxonomy II	(6)	(15)	Microbiology I

TOTAL CREDITS FOR THE SECOND YEAR: **120**

THIRD YEAR

CODE	MODULE	NQF-L	CREDIT	PREREQUISITE MODULE(S)
FIRST SEMESTER				
BAC316D	Bioanalytical Chemistry III	(6)	(12)	Bioanalytical Chemistry II
FOM316D	Food Microbiology III	(6)	(15)	Microbial Taxonomy II Molecular Biology II
MBP316D	Microbial Bioprocessing III	(6)	(18)	Biotechnology Cultivation Technology II
MMB316D	Medical Microbiology III	(6)	(15)	Microbial Biochemistry II Microbial Taxonomy II Molecular Biology II
TOTAL CREDITS FOR THE SEMESTER:			60	

SECOND SEMESTER

On completion of all the modules. If a student has one outstanding module, that particular case will be reviewed and permission might be granted in collaboration with the specific employer.

WBT316D	WIL in Biotechnology I (first- or second-semester module)	(6)	(60)	
TOTAL CREDITS FOR THE SEMESTER:			60	
TOTAL CREDITS FOR THE THIRD YEAR:			120	
TOTAL CREDITS FOR THE QUALIFICATION:			360	

MODULE INFORMATION (OVERVIEW OF SYLLABUS)

The syllabus content is subject to change to accommodate industry changes. Please note that a more detailed syllabus is available at the Department or in the study guide that is applicable to a particular module. At time of publication, the syllabus content was defined as follows:

B

BIOANALYTICAL CHEMISTRY II (BAC216D) 1 X 3-HOUR PAPER *(Module custodian: Department of Chemistry)*

Introduction to Bioanalytical Chemistry. The role and importance of analytical chemistry in everyday life. Perform analytical chemistry calculations. Calculate the amount required to prepare accurate concentrations of solutions. Apply titration method to quantify the content of acid or a base. Apply appropriate procedure to determine unknown analyte quantity in a given sample. Identify and explain the functions of the components of spectrophotometer and chromatographic instrument. Apply the fundamental laws of photometry to solve spectroscopic problems. Separate and identify analytes by applying appropriate chromatographic principles. Compile and present report. (Total notional time: 120 hours)

BIOANALYTICAL CHEMISTRY III (BAC316D) 1 X 3-HOUR PAPER *(Module custodian: Department of Chemistry)*

Calculations in Analytical Chemistry. Introduction to Spectrochemical methods. Atomic Absorption Spectrometry. Molecular Spectrometry. Sample preparation. General principles of Gas Chromatography, general principles of Liquid Chromatography. (Total notional time: 120 hours)

BIOCHEMISTRY II (BCH216D) 1 X 3-HOUR PAPER *(Module custodian: Department of Biomedical Sciences)*

The Organisation of a cell. Molecular structure of amino acids and proteins. Enzyme Kinetics. Carbohydrates. Lipids. Nucleic acids. Reagents, pH and buffers. (Total notional time: 120 hours)



BIOTECHNOLOGY CULTIVATION TECHNOLOGY II (BCT216D)**1 X 3-HOUR PAPER****(Module custodian: Department of Biotechnology and Food Technology)**

Isolation of Microorganisms. Microbial growth. Screening of microorganisms. Setting up a fermentation laboratory – Instrumentation. Bioreactors. pH and dissolved oxygen sensors. Sterilisation. Inoculum development. Fed batch and continuous cultures. Product recovery. Fermentation economics. (Total notional time: 180 hours)

BIOTECHNOLOGY PROFESSIONAL DEVELOPMENT II (BPD206D)**CONTINUOUS ASSESSMENT****(Module custodian: Department of Biotechnology and Food Technology)**

Ordering and safekeeping of chemicals. Budgeting for a single determination using standard methods. Writing of laboratory protocol from a standard method. Data analyses: Introduction data analyses: graph selection, variables (dependents and independents), drawing graphs, interpretation of data. Laboratory practice. Operation of apparatus. Establishment of repeatability and reliability of experimentation and scientific data. (Total notional time: 240 hours)

C**CHEMISTRY I (CHM105X)****1 X 3-HOUR PAPER****(Module custodian: Department of Chemistry)**

The role and importance of chemistry in everyday life. Classification and properties of matter. Units of measurement. Atoms, molecules and ions. The modern view of atomic structure and the use of electron configurations in chemical bonding. The periodic table of elements. The use of IUPAC rules for naming inorganic compounds. Application of the mole concept in stoichiometric calculations. Reactions in aqueous solutions. Chemical equilibrium. Fundamental concepts in electrochemistry. Organic nomenclature. (Total notional time: 240 hours)

COMMUNICATION FOR ACADEMIC PURPOSES (11P105X)**1 X 3-HOUR PAPER****(Module custodian: Office of the Executive Dean)**

A workable knowledge of English is an essential skill for any graduate who is required to conduct themselves successfully in a professional working environment. This module will equip students with the competencies required to compose a selection of written texts related to communicating both internally and externally within a professional environment. In addition, the module includes strategies that are essential for the effective communication in various situations, including small groups to avoid unproductive conflict, a multicultural context, etc. (Total notional time: 100 hours)

COMPUTER LITERACY (CPL105X)**CONTINUOUS ASSESSMENT****(Module custodian: End User Computing Unit)**

This module provides students with foundational knowledge in computing fundamentals, essential digital skills in key applications based on MS Office Suite and network basics (i.e. MS Outlook and Internet). Online exams are mapped with End-User Computing: SAQA 49077 (61591) Core Element as well as Internet and Computing Core Certification (IC3). (Total notional time: 100 hours)

F**FOOD MICROBIOLOGY III (FOM316D)****1 X 3-HOUR PAPER****(Module custodian: Department of Biotechnology and Food Technology)**

Importance of food microbiology, microbial and mycological spoilage of food, factors influencing microbial spoilage of foods will be covered including: Microbial growth, survival and death. Spores and their significance. Detection and enumeration of microbes in food. Indicator microorganisms and microbiological criteria. Gram negative foodborne pathogenic bacteria. Gram positive foodborne pathogenic bacteria and other detrimental organisms associated with food. Microorganisms used in fermented foods. Spoilage organisms. Molds. Chemical preservatives. (Total notional time: 150 hours)

G**GENERAL MATHEMATICS I (GMA105D)****1 X 3-HOUR PAPER****(Module custodian: Department of Mathematics and Statistics)**

Do numerical computations. Apply knowledge of mensuration to calculate perimeters, areas and volumes of two- and three-dimensional objects. Apply knowledge of functions and equations to solve well-defined problems. Use basic calculus rules to solve well-defined problems. Use Excel to organise given data in charts and calculate descriptive measures. Do basic regression analysis and curve fitting using Excel and a scientific calculator; and Implement basic probability theories to predict outcomes of events. (Total notional time: 240 hours)



GENERAL PHYSICS I (GPH105D)**1 X 3-HOUR PAPER****(Module custodian: Department of Physics)**

Basic mathematical concepts for physics and measurements. Motion in one dimension. Motion in a plane (projectile motion). Forces and Newton's Law of Motion. Equilibrium condition and torque. Work, energy and power. Linear momentum and impulse. Properties of static and dynamic fluids. Temperature and heat. Heat transfer. General properties of waves. Reflection. Refraction. Electrostatics. Electric circuits. Basic nuclear physics. (Total notional time: 240 hours)

I**INFORMATION LITERACY I (INI125D)****CONTINUOUS ASSESSMENT****(Module custodian: Directorate of Library and Information Services)**

Introduction of information literacy. Development of a search strategy and application of a search string to search engines and academic databases. Evaluation of information sources. Ethical and legal use of information. (Total notional time: 20 hours)

L**LIFE SKILLS I (LFI125X)****CONTINUOUS ASSESSMENT****(Module custodian: Directorate of Student Development and Support)**

Personal, socio-emotional and academic skills development for students in higher education. This module includes 1. Intra- and interpersonal skills (e.g. emotional intelligence, relationships, and conflict management); 2. General study skills (e.g. time management, goal setting, learning styles); 3. Health and wellness (e.g. HIV/AIDS, GBV issues, substance abuse); 4. Student life and adjustment (e.g. identity development, adjusting to a higher education environment); and 5. Financial management. (Total notional time: 20 hours)

M**MEDICAL MICROBIOLOGY III (MMB316D)****1 X 3-HOUR PAPER****(Module custodian: Department of Biotechnology and Food Technology)**

Upon completion of the module, the student will be able to define, characterise, discuss and observe factors related to microorganisms, their control, as well as their influence on humans and the environment in the field of medical microbiology (such as infection and pathogenicity of microorganisms, non-specific host resistance, specific immunity, antimicrobial chemotherapy, clinical microbiology, epidemiology of infectious diseases and public health, human diseases caused by: viruses and prions, gram-positive and gram-negative bacteria, other bacteria (chlamydiae, mycoplasmas, rickettsias; dental and nosocomial infections), as well as diseases caused by fungi and protozoa. (Total notional time: 150 hours)

MICROBIAL BIOCHEMISTRY II (MBC216D)**1 X 3-HOUR PAPER****(Module custodian: Department of Biomedical Sciences)**

The module prepares the student to apply fundamental and specialised knowledge of biological chemistry in the field of biotechnology. The student will be able to apply his/her knowledge of structural biochemistry, metabolism of carbohydrates, proteins and lipids, as well as photosynthesis. This module offers a clear understanding of microbial metabolism and behaviour, central to proper functioning in a biotechnology field, ensuring productivity and skilful resolution of problems. (Total notional time: 120 hours)

MICROBIAL BIOPROCESSING III (MBP316D)**1 X 3-HOUR PAPER****(Module custodian: Department of Biotechnology and Food Technology)**

The module introduces the student to Bioprocesses using microorganisms, covering concepts such as beer brewing, using microorganisms to treat sewage, fermented foods, production of amino acids, Single Cell Protein production, microbial enzymes and yeast production. The unit facilitates the student to apply basic knowledge acquired in the fundamental modules to bioprocesses used worldwide through group work, presentations and/or scientific reports. (Total notional time: 180 hours)



MICROBIAL TAXONOMY II (MBT216D)**1 X 3-HOUR PAPER****(Module custodian: Department of Biotechnology and Food Technology)**

Introduction to microbial taxonomy. Fundamentals of taxonomy including identification, classification and nomenclature. Classification systems. Phylogenetic. Phenetic. Levels of classification. Evolutionary processes and the species concept. The three-domain alternative. The kingdom systems (5 and 7). The concept and definition of microbial species. The groups of techniques applied in taxonomy. The classical characteristics. Ecological. Biochemical, Physiological. Molecular based techniques. Microbial phylogeny. Phylogenetic trees. Molecular markers. Endosymbiotic theory. Bergey's manual. (Total notional time: 150 hours)

MICROBIOLOGY I (MIB105D)**1 X 3-HOUR PAPER****(Module custodian: Department of Biotechnology and Food Technology)**

History and scope of Microbiology. The study of microbial structure. Prokaryotic cell structure and function. Microbial nutrition. Microbial growth. The control of microorganisms by physical and chemical agents. Viruses and other acellular agents. Infection and pathogenicity. Eukaryotic cell structure and function. Fungi. Protists. Microbiology of air. (Total notional time: 240 hours)

MOLECULAR BIOLOGY II (MLB206D)**1 X 3-HOUR PAPER****(Module custodian: Department of Biotechnology and Food Technology)**

Genes: Structure, Replication and Expression. Microbial Genetics: Regulation of gene expression. Microbial Genetics: Mechanisms of genetic variation. Recombinant DNA Technology. Microbial Genomics. (Total notional time: 150 hours)

P**PROCESS TECHNOLOGY AND MANAGEMENT I (PEM216D)****1 X 3-HOUR PAPER****(Module custodian: Department of Biotechnology and Food Technology)**

Units, dimensions and definitions. Material balances. Energy and Energy balances. Steam and Steam tables. Psychrometrics. Fluid flow and properties. (Total notional time: 120 hours)

W**WIL IN BIOTECHNOLOGY I (WBT316D)****WORK-INTEGRATED LEARNING****(Module custodian: Department of Biotechnology and Food Technology)**

The student is exposed to as many techniques (microbiology, molecular technology and chemical analysis) and apparatus and as much industrial experience as possible in order to further prepare the student for the industry. (Total notional time: 600 hours)

