NATIONAL DIPLOMA: BIOTECHNOLOGY
(Extended curriculum programme with foundation provision)
Qualification code: NDBTF1 - NQF Level 6

Campus where offered: Arcadia Campus (day classes)
Last year of new intake: 2018
Teach-out (phase-out) date: 31 December 2023

Students registered for this qualification should complete their studies according to the teach-out date prescribed for the qualification, subject to the stipulations of Regulation 3.1.11 and 3.1.13 in the Students' Rules and Regulations.

Information on phased-out programmes can be obtained from the TUT website, www.tut.ac.za.

Key to asterisks:
* Information does not correspond to information in AA72.
(Deviations approved Senate in May 2012, June 2015 and September 2015.)

CURRICULUM
Consult the 2018 Faculty Prospectus for the full contents of the qualification.

SUBJECTS PRINTED IN BOLD ARE NOT FOR REGISTRATION PURPOSES.

FIRST YEAR

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
FPCLS01	Chemistry IB: Extended*	(0,170)	
FPMLB01	Microbiology I: Extended*	(0,218)	
FPMLS01	Mathematics IB: Extended*	(0,140)	
FPPLS01	Physics IB: Extended*	(0,150)	
FIRST SEMESTER			
FPENG05	Foundation English	(0,070)	
SECOND SEMESTER			
FPLSK02	Foundation Life Skills	(0,070)	
TOTAL CREDITS FOR THE FIRST YEAR:		**0,818**	

SECOND YEAR
After completion of all first-year subjects.

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
FIRST SEMESTER			
MBI241T	Microbiology II	(0,125)	
SSH101T	Sanitation, Safety and Hygiene I	(0,090)	
TOTAL CREDITS FOR THE SEMESTER:		0,215	
SECOND SEMESTER			
ACI201T	Analytical Chemistry: Biological II	(0,125)	
BCH221B	Biochemistry II	(0,125)	
PTM101T	**Process Technology and Management I**		
PTM10XT	Process Technology and Management: Theory I	(0,070)	

PTM10YT	Process Technology and Management: Computer Skills I	(0,040)	
TOTAL CREDITS FOR THE SEMESTER:		0,360	
TOTAL CREDITS FOR THE SECOND YEAR:		**0,575**	

THIRD YEAR

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
FIRST SEMESTER			
DIR201T	Disease and Immune Response II	(0,125)	Microbiology II
FMT201T	Fermentation Technology II	(0,125)	Microbiology II
MBB301T	Microbial Biochemistry III	(0,125)	Biochemistry II
TOTAL CREDITS FOR THE SEMESTER:		0,375	
SECOND SEMESTER			
ALB301T	Analytical Biochemistry III	(0,125)	Analytical Chemistry: Biological II
BPS301T	Bioprocessing III	(0,125)	Fermentation Technology II
FMB311T	Food Microbiology III	(0,125)	Microbiology II
MBG301T	Microbiology: Biological III	(0,125)	Microbiology II
TOTAL CREDITS FOR THE SEMESTER:		0,500	
TOTAL CREDITS FOR THE THIRD YEAR:		**0,875**	

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

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
FIRST OR SECOND SEMESTER			
EXP1BIO	Work-Integrated Learning I*	(0,366)	
EXP2BIO	Work-Integrated Learning II*	(0,366)	Work-Integrated Learning I
TOTAL CREDITS FOR THE FOURTH YEAR:		**0,732**	
TOTAL CREDITS FOR THE QUALIFICATION:		**3,000**	

SUBJECT 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 subject. On 01 August 2018, the syllabus content was defined as follows:

A

ANALYTICAL CHEMISTRY: BIOLOGICAL II (ACI201T) **1 X 3-HOUR PAPER**
(Subject custodian: Department of Chemistry)
Chromatographic and spectrophotometric techniques and instrumentation. (Total tuition time: ± 65 hours)

ANALYTICAL BIOCHEMISTRY III (ALB301T) **1 X 3-HOUR PAPER**
(Subject custodian: Department of Chemistry)
Chromatography, spectrophotometry, spectroscopy, polarimetry, refractometry. (Total tuition time: ± 45 hours)

B

BIOCHEMISTRY II (BCH221B) **1 X 3-HOUR PAPER**
(Subject custodian: Department of Biomedical Sciences)
Structures and properties of carbohydrates, lipids, proteins and nucleic acids. Buffers and pH. Vitamins and coenzymes. Principles of volumetric analyses and spectrophotometry, DNA replication, transcription and protein synthesis. (Total tuition time: ± 65 hours)

BIOPROCESSING III (BPS301T) **1 X 3-HOUR PAPER**
(Subject custodian: Department of Biotechnology and Food Technology)
Products of fermentation technology such as food and beverage fermentations, amino acid production, single cell protein production etc. Biotransformation, enzyme technology, domestic and industrial wastewater treatment. (Total tuition time: ± 65 hours, preparation time)

C

CHEMISTRY IB: EXTENDED (FPCLS01) **1 X 3-HOUR PAPER**
(Subject custodian: Department of Chemistry)
Scientific methodology and its use in discovering chemistry. Numbers in chemistry. The use of SI units. Matter. Atomic structure. Compounds in chemistry. The mole concept and chemical calculations. The electronic structure of the atom and electronic configurations within the periodic table. Chemical bonding. The states of matter and the binding forces within matter. Basic concepts of the gas laws. Solutions in chemistry. Acids, bases and salts. Oxidation and reduction and the balancing of equations. Organic chemistry: introduction, alkanes, alkenes, aromates, alkanols, phenols, halogen compounds, alkanoates, alkynes, aldehydes, ketones and alkanoic acids. (Total tuition time: ± 160 hours)

D

DISEASE AND IMMUNE RESPONSE II (DIR201T) **1 X 3-HOUR PAPER**
(Subject custodian: Department of Biomedical Sciences)
Important diseases of man, animals and plants. Control strategies. Immune system, vaccination, monoclonal and polyclonal antibody, plant and animal tissue culture, diagnostic techniques. (Total tuition time: ± 65 hours)

F

FERMENTATION TECHNOLOGY II (FMT201T) **1 X 3-HOUR PAPER**
(Subject custodian: Department of Biotechnology and Food Technology)
Isolation of micro-organisms, preparation of media, microbial growth, primary and secondary screening, setting up a fermentation laboratory: instrumentation, stirred tank reactor design, other types of bioreactors, sterilisation of media, sterility and aseptic conditions, inoculum development, batch and continuous cultures, product recovery, economics of fermentation. (Total tuition time: ± 84 hours)

FOOD MICROBIOLOGY III (FMB311T) **1 X 3-HOUR PAPER**
(Subject custodian: Department of Biotechnology and Food Technology)
Importance of food microbiology, microbial and mycological spoilage of food, factors influencing microbial spoilage of foods, microbiological aspects of food preservation, microbial food poisoning and food-transmitted infection, the isolation and identification of pathogens from food products, the use of micro-organisms in the production of food, microbiology of the air. (Total tuition time: ± 84 hours)

FOUNDATION ENGLISH (FPENG05) **1 X 3-HOUR PAPER**
(Subject custodian: Department of Applied Languages)
Interpret, relate and reflect on all available and relevant resource material in proper English. Communicate orally in a comprehensible and clear manner in both general and subject-specific communication. Demonstrate intermediate-level of proficiency in written English. (Total tuition time: ± 160 hours)

FOUNDATION LIFE SKILLS (FPLSK02) **CONTINUOUS ASSESSMENT**

(Subject custodian: Department of Management and Entrepreneurship)

Campus ethics, learning styles and whole-brain thinking, self-image and assertive behaviour, time management, self-motivation, conflict management, sexuality and relationships, problem-solving skills, managing stress, the multicultural society, techniques for summarising and memorising, how to cope with assessments and assignments, creativity, and many more. The life-skills sessions are participative, with group discussions and personal application to optimise student's learning experience. (Total tuition time: ± 128 hours)

M

MATHEMATICS IB: EXTENDED (FPMLS01) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Mathematics and Statistics)

Arithmetic. Graphs. Functions. Basic algebra. Trigonometry. Differentiation. Mensuration. Basic statistics. (Total tuition time: ± 190 hours)

MICROBIOLOGY I: EXTENDED (FPMLB01) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Biotechnology and Food Technology)

General microbiology, chemical and physical control, environmental microbiology, food microbiology, occupational microbiology and microbiology ecology. Practical microbiological techniques. (Total tuition time: ± 248 hours)

MICROBIOLOGY II (MBI241T) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Biotechnology and Food Technology)

Advanced composition and structure of the eukaryotic cell. Metabolism for energy production - pathways for the production of ATP. Introduction to the genetics of micro-organisms, the genetic code, mutations and recombinant DNA technology. Taxonomy, principles and characteristics/schemes used. Bergey's manual - groups of bacteria (including bacteria that cause food-borne illnesses), their characteristics and importance. (Total tuition time: ± 90 hours)

MICROBIAL BIOCHEMISTRY III (MBB301T) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Biomedical Sciences)

Genetic code, restriction enzymes, polymerase chain reaction, glycolysis, glucogeogenesis, pentose phosphate pathway, glycogen degradation and synthesis, control of glycogen metabolism, fatty acid breakdown, fatty acid synthesis, metabolism of triacylglycerols, citric acid cycle, electron transport and oxidative phosphorylation, anaerobic and aerobic metabolism, nitrogen fixation and assimilation, amino acid metabolism, urea cycle. (Total tuition time: ± 180 hours)

MICROBIOLOGY: BIOLOGICAL III (MBG301T) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Biotechnology and Food Technology)

Pathogenicity of micro-organisms, antimicrobial chemotherapy, clinical microbiology, epidemiology of infectious diseases. Human diseases caused by viruses, Gram-positive and Gram-negative bacteria, other bacteria, fungi and protozoa. (Total tuition time: ± 84 hours)

P

PHYSICS IB: EXTENDED (FPPLS01) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Physics)

A general physics qualification with applications in the biological sciences: remedial mathematics, fundamental units, vectors and scalars, kinetics, mechanics, dynamics, momentum, work, energy and power, fluids, temperature and heat, gas laws, waves and sound, optics, electricity, magnetism, radioactivity. Practical: experiments related to the theory. (Total tuition time: ± 160 hours)

PROCESS TECHNOLOGY AND MANAGEMENT: COMPUTER SKILLS I (PTM10YT) **CONTINUOUS ASSESSMENT**

(Subject custodian: End User Computing Unit)

Students have to acquire theoretical knowledge (computing fundamentals) and practical skills as an end-user in operating systems and MS Office Suite applications (MS Word, MS Excel and MS PowerPoint) on an introductory level. Students will do online and computer based tests. The modules are mapped with SAQA and IC3 Essential Skills for Digital Literacy (international certification). (Total tuition time: ± 40 hours)

PROCESS TECHNOLOGY AND MANAGEMENT: THEORY I (PTM10XT) **1 X 3-HOUR PAPER**
(Subject custodian: Department of Biotechnology and Food Technology)
Units and dimensions, energy and mass balances, steam tables, basics of heat transfer. Introduction to general management: planning, organising, leading, controlling, communication and interpersonal skills, transcultural management. (Total tuition time: ± 45 hours)

S

SANITATION, SAFETY AND HYGIENE I (SSH101T) **1 X 3-HOUR PAPER**
(Subject custodian: Department of Biotechnology and Food Technology)
Introduction to biotechnology, importance of first-aid and laboratory safety. Aspects of safety legislation and reporting. Chemical cleansers and sanitisers and good personal hygiene practice. Classification of microbial hazards, and waste disposal. (Total tuition time: ± 40 hours)

W

WORK-INTEGRATED LEARNING I (EXP1BIO) **WORK-INTEGRATED LEARNING**
WORK-INTEGRATED LEARNING II (EXP2BIO) **WORK-INTEGRATED LEARNING**
(Subject custodian: Department of Biotechnology and Food Technology)
The purpose of work-integrated learning is to expose the student 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 tuition time: six months)