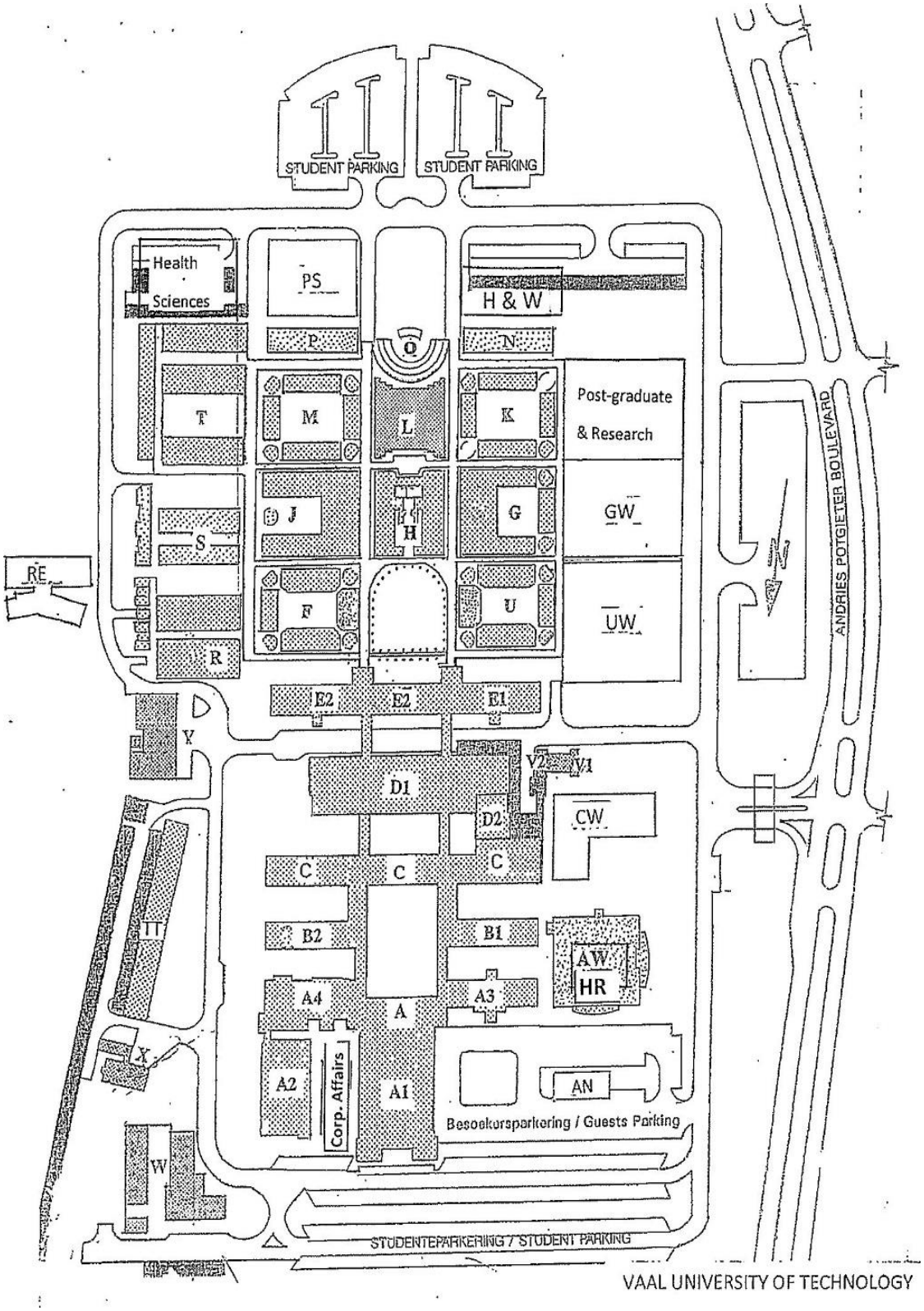
VAAL UNIVERSITY OF TECHNOLOGY

CAMPUS SITE PLAN



VAAL UNIVERSITY
OF TECHNOLOGY

APPLIED & COMPUTER
SCIENCES

Prospectus

First published	2009	Second Edition	2010
Third Edition	2012	Fourth Edition	2013
Fifth Edition	2014	Sixth Edition	2015
Seventh Edition	2016	Eight Edition	2018
Ninth Edition	2019	Tenth Edition	2020
Eleventh Edition	2021	Twelfth Edition	2022
Thirteenth Edition	2023	Fourteen Edition	2024
Fifteenth Edition	2025		

Copies of the Faculty Prospectus are obtainable from:

The Registrar

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Fax: +27 (16) 950 9775

NB:

Although the information contained in this Faculty Prospectus has been compiled as accurately as possible, the Council and the Senate of the Vaal University of Technology accept no responsibility for any errors or omissions.

Index

1. Welcoming by the Executive Dean

As an Executive Dean of the Faculty of Applied & Computer Sciences, I extend a very special welcome to you. Congratulations on being accepted into the Science programs.

All our dedicated staff members are committed to excellence in teaching, research, and community engagement. The faculty comprises four excellent departments. Our large and diverse departments welcome applications for undergraduate and postgraduate study from individuals from SADC, AU community and all overseas countries.

Our courses are constantly recognized as among the best in South Africa, and we are proud of our reputation we have gained for innovation. Our unique curricula also emphasize experience in the workplace which we achieve through class consulting projects, simulations, Work Integrated Learning (WIL) and mentor programs.

Our programs are underpinned by research informed evidence drawn from the work of our own staff and industry. Our qualifications are also informed by the experience of dedicated academic staff so that what you learn relates to real situations.

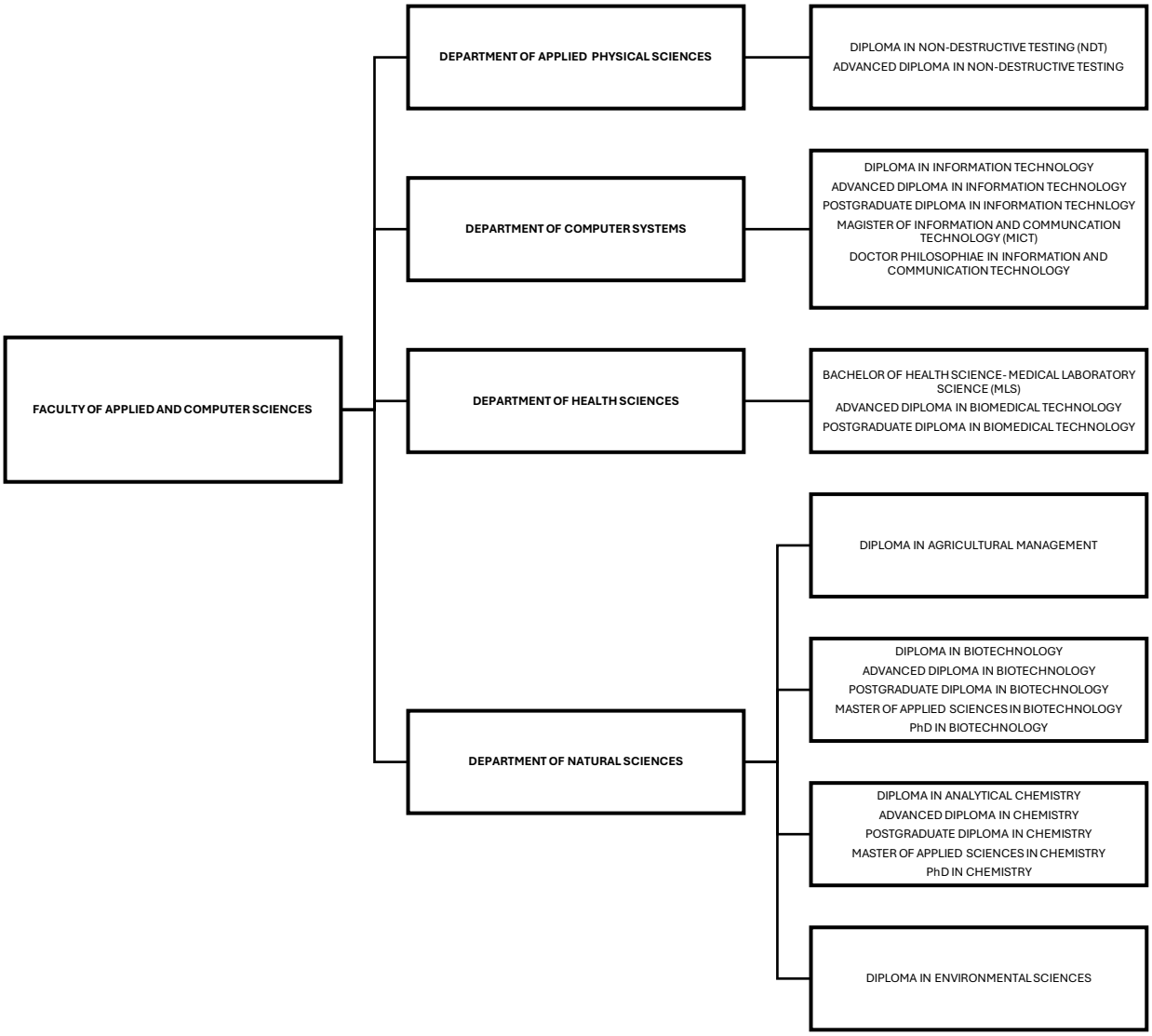
Our graduates can be found in almost all walks of industrial, community, professional and business life.

We are committed to ensuring that you have a satisfying experience studying in this Science faculty. We also want to encourage a lifelong love of ideas, discovery and learning, your ability to work independently and in collaboration with others. We are committed to intellectual integrity and curiosity.

I look forward to you working with us and wish you well on what will be a worthwhile journey.

Prof CJ Grobler
Executive Dean

2. Departmental Structure of Qualifications



3. Department of Applied Physical Sciences

3.1. Staff Details (Mathematics)

Surname, Initials & Title	Designation	Highest Qualification
Vacant	HoD	PhD
Ntseane, GE (Ms)	Administrator	BTech & PGDHE
Bokodisa, A (Mr)	Contract Lecturer	MSc
Lebelo, RS (Prof)	Associate Professor	PhD
Kanyane, M (Mr)	Contract Lecturer	MSc
Mofokeng, J (Mr)	Lecturer	MSc
Mokaba, L (Ms)	Contract Jnr Lecturer	BSc Hons
Mthombeni, TT (Mr)	Lecturer	MSc
Mukamuri, M (Mr)	Lecturer	MSc
Ndlovu, VP (Mr)	Contract-Lecturer	MSc
Ntsele, NT (Ms)	Contract Jnr Lecturer	BSc Hons
Ntshangase, MAD (Mr)	Lecturer	MSc
Sibanda, B (Dr)	Senior Lecturer	PhD

The mathematical subjects offered to students registered in career-oriented programmes in Applied Sciences, Engineering & Technology are:

- Applied Environmental Statistics
- Biostatistics
- Calculations & Statistics
- Mathematics I
- Mathematics II
- Mathematics III
- Mathematics IV
- Mathematics V
- Applied Engineering Mathematics IV
- Advanced Engineering Mathematics V

3.2. Staff Details (NDT & Physics)

Surname, Initials & Title	Designation	Highest Qualification
Vacant	HoD	PhD
Ntseane, GE (Ms)	Administrator	BTech & PGDHE
NDT		
Nolting, V (Dr)	Senior Lecturer	PhD
Nkwanyana, ZSS (Ms)	Junior Lecturer	AD: NDT NDT Levels: RT II, Welding Inspection
Shavhani, K (Ms)	Junior Lecturer	BTech NDT Levels: UT II, ECT I
Mochwanyane, M (Ms)	Contract Jnr Lecturer	BTech NDT Levels: MPT II, RT I
Physics		
Melato, LT (Mr)	Lecturer	MSc
Nemalili, FP (Mr)	Lecturer	MSc
Mokoena, P (Ms)	Lecturer	MSc
Thebe, MJ (Mr)	Technologist	MSc
Mmethi, FM (Mr)	Lecturer (secondee)	MSc
Rantho, MN (Dr)	Contract-Lecturer	PhD
Sithole, TM (Mr)	Contract-Lecturer	MSc
Dlamini, C (Mr)	Contract-Lecturer	MSc
Maphiri, VM (Dr)	Contract Lecturer	PhD
Malatsi, T (Ms)	Contract-Technician	BSc (Hons)
Mamorobela, B (Ms)	Contract-Technician	BSc (Hons)
Lehutso, JK (Ms)	Contract-Technician	BSc (Hons)
Pooe, W (Mr)	Contract-Technician	BSc (Hons)
Nkuna, E (Mr)	Contract-Technician	BSc (Hons)
Selema, T (Mr)	Contract-Technician	BSc (Hons)

The physics subjects offered to students registered in programmes in Applied Sciences, Engineering & Technology are:

- Health Physics
- Physics of Environmental Science
- Physics I
- Physics II

3.3. Diploma in Non-Destructive Testing

Purpose of the Diploma in Non-Destructive Testing

The art of material inspection complemented by the knowledge of the 'inspection system'.

The Diploma integrates the basic sciences – mathematics, chemistry, and physics - with the applied sciences of metallurgy, fracture mechanics and the notion of quality assurance so that this knowledge can be used to make an informed decision on the state of a component and its continued use (or its intended purpose).

The different methods used in the inspection require in-depth theoretical understanding for them to be optimally applied, taking into consideration the various conditions under which the component operates.

Analysis of the results obtained from these methods requires knowledge and continuous operational experience. In the process of analysis, challenges are encountered in interpretation, and hence the capability to engage in research and development.

The Diploma is designed to be also applicable in inspection according to the different codes and standards of Non-Destructive Testing. It is a progressive qualification and empowers the Diploma graduate to seek innovation in the application of the NDT methods that is grounded in sound scientific knowledge creation. For example, understanding material characteristics of different metal components in machine design and the identification of locations of concentrated stress, hence likelihood of the initiation of fracture. These graduates are thus well suited to be part of a team in the design stage of plant machinery.

The Diploma in Non-Destructive Testing empowers the student with a broad spectrum of knowledge, that is, theoretical concepts and information, which will be encountered during inspection in varied industries. This knowledge is acquired through blended learning, practical laboratory experience and industrial work-based experiential training / work integrated learning (WIL).

The knowledge (expertise) is expected to increase exponentially with experience, taking note that the world is already transforming into a 'knowledge economy'. This diploma is therefore already addressing key requirements of an 'inspection system' for the present applications and moving into the future.

The above is supported by a sample of past graduates in their employment trends in various industrial sectors.

Aspiring students should take heed of the following:

- Requirement for NDT Level Certification according to **ISO 9712:2021 Non-destructive testing -- Qualification and certification of NDT personnel** document.
- Requirement for NDT Level Certification according to **Recommended Practice No. SNT-TC-1A - Personnel Qualification and Certification in NDT**
    - The Diploma in Non-Destructive Testing qualification does not replace the NDT industry requirement for NDT Level Certification, that is, Level 1, 2 or 3 for each of the NDT methods as applicable in the industry. Students are thus required to obtain the NDT level Certification to operate within the industry. The VUT is incorporating the NDT Level Certification training on campus for the basic methods for students who complete S5.
    - Service providers are in the interim providing the NDT Level Certification during university vacation periods – through Memoranda of Understanding [MOU] - to both past [completed S4 – National Diploma] and the present [completed S5] students.

    These International Standards incorporate:

    - The initiation, promotion, maintenance and administration of the certification scheme according to ISO/IEC 17024;
    - Publishing specifications for training courses that include the syllabi, which embodies the content of recognized documents, for example, ISO/TR 25107 and ANSI/ASNT CP-105 – *Topical Outlines for Qualification of Non-destructive Testing Personnel.*

    - The general examinations are to address the basic principles of the applicable method.

- The specific examinations are to address the equipment, operating procedures, and NDT techniques that the candidate may encounter during specific assignments to the degree required. This will include specifications or codes and acceptance criteria.

- The candidate must demonstrate familiarity with and ability to operate the necessary NDT equipment, record, and analyse the resultant information to the degree required.

- The description of the specimen, the NDT procedure, including checkpoints, and the results of the examination must be documented.

- Sectors for examination
  - Product sectors
    - Castings
    - Forgings
    - Welds
    - Tubes and pipes
    - Wrought products
    - Composite materials
  - Industrial sectors
    Test specimens are varied with the below industrial sectors taken into consideration. This results in combinations of two or more product sectors.
    - Manufacturing
    - Pre- and in-service testing (includes manufacturing)
    - Aerospace
    - Railway maintenance
  - Multi sectors
    Comprises all above mentioned industrial sectors

- List of NDT Documents
  - **ISO 9712:2021 Non-destructive testing -- Qualification and certification of NDT personnel** document.
  - **Recommended Practice No. SNT-TC-1A 2006 - Personnel Qualification and Certification in NDT**
  - ASNT standard ANSI/ASNT-CP-189
  - ANSI/ASNT CP-105 – Topical Outlines for Qualification of Non-destructive Testing Personnel
  - ISO/TR 25107:2006 Non-destructive testing - Guidelines for NDT training syllabuses.
  - ISO/TR 25108:2006 Non-destructive testing – Guidelines for NDT personnel training organizations.
  - ISO/IEC 17024:2012 Conformity assessment. General requirements for bodies operating certification of persons.
  - ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories.

- Students enrolling in the Diploma in Non-Destructive Testing will therefore have to pass these NDT Level Certification examinations for them to be considered for industrial experience / WIL.

- ***NB: All registered students will be subjected to Level Certification, which is the prerequisite to operate in the NDT industry and required by applicable codes & standards.***

  This requirement is comparable to the board examination required for Biomedical Technology graduates to work in the National Health Laboratory Services (NHLS).

- According to the South African National Accreditation System (SANAS), the VUT as an education and training institution is not required to have its laboratories subjected to accreditation [ISO/IEC 17024 & ISO/IEC 17025] – Generic Brochure - ACCREDITATION OF CONFORMITY ASSESSMENT BODIES ENABLES CONFIDENCE AND TRUST

The objectives of SANAS are to:

- accredit or monitor for Good Laboratory Practice compliance purposes, organisations falling within its scope of activity;
- promote accreditation as a means of facilitating international trade and enhancing the Republic's economic performance and transformation.
- promote the competence and equivalence of accredited bodies; and
- promote the competence and equivalence of Good Laboratory Practice compliant policies.

Career Opportunities

NDT Technician: Perform inspections, monitoring, evaluations using non-destructive methods and quality assessment techniques. This is achieved through both fabrication and maintenance inspections conducted in accordance with regulatory requirements (codes and specifications). The technician can be part of an NDT department or unit within a company or as an independent service provider.

NDT Specialist / Technologist: Being part of a team involved in project development including design, fabrication and specifying inspection techniques and methods to be used to ensure product safety, reliability, and longevity.

NDT Research and Development Professional: Working on improving the reliability of inspection methods and techniques. Further developing new techniques to inspect the improved materials and products utilised in the industry.

Admissions Requirements:

National Senior Certificate (NSC) Entry Requirements:

Diploma: Non-Destructive Testing		**Notes**
NSC Endorsement:	**Eligibility for Diploma**	3 = 40 – 49% 4 = 50 – 59% 5 = 60 – 69%
Compulsory Subjects:	**Achievement Level**	
English	3	
Mathematics or	3	
Technical Mathematics	3	
Physical Science or	4	
Technical Science	4	
TOTAL APS SCORE	**19 (Excluding LO)**	

Prospective students to be admitted to the NDT Diploma are those who have a

a. TVET National Certificate (Vocational) level 4.
    - a minimum 50% pass mark in Mathematics, Science and English first additional language and passes in three additional subjects
    - TVET National N3 Certificate.
    - a minimum 50% symbol D in Mathematics, Engineering Science and English language
    - a minimum 50% in Technical Mathematics and Physical Science and English language

b. Higher Certificate in Physical Sciences at NQF level 5.
    - must have passed Mathematics, Physical Science or Physics & Chemistry and English

c. Pass mark in Matric Mathematics, Physical Science and English first additional language at a minimum achievement level 3 and industrial experience of 3-5 years.
   Recognition of Prior Learning policy will be applied.

d. Senior Certificate (Matric) (before 2008).
    - Higher Grade E or Standard Grade D in Mathematics, Physical Science and English language.

e. National Senior Certificate (Matric) (from 2008).
Minimum Admission Point Score (APS)

Curriculum

YEAR ONE					
Semester 1			**Semester 2**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Chemistry 1	AACHE1A	15	Mathematics 2	AMMAT2A	12
Mathematics 1	AMMAT1A	12	Physics 2 (Theory)	APHYT2A	8
Physics 1	APHYS1A	12	Physics 2 (Practical)	APHYP2A	4
Applied Communication Skills 1.1	HKCOX1A	8	Engineering Drawing	EMEDR1A	12
ICT Skills 1	ASICT1A	10	Penetrant Testing (Theory)	APLPT2A	8
Intro To NDT (Theory)	APNDT1A	6	Penetrant Testing (Practical)	APLPP2A	8
Intro To NDT (Practical)	APNDP1A	6	Radiographic Testing (Theory)	APRTT2A	8
			Radiographic Testing (Practical)	APRTP2A	8
			Applied Communication Skills 1.2	HKCOY1A	8
CREDITS		**69**	**CREDITS**		**76**
CREDITS					**145**
YEAR TWO					
Semester 3			**Semester 4**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Magnetic Particle Testing (Theory)	APMPT4A	8	Advanced Ultrasonic Testing (Theory)	APAUT4A	8
Magnetic Particle Testing (Practical)	APMPP4A	8	Advanced Ultrasonic Testing (Practical)	APAUP4A	8
Ultrasonic Testing (Theory)	APUTT3A	8	Eddy Current Testing (Theory)	APEDT4A	8
Ultrasonic Testing (Practical)	APUTP3A	8	Eddy Current Testing (Practical)	APEDP4A	8
Introduction to Fracture Mechanics	APIFM1A	12	Quality Assurance	EBQAS2A	12
Metallurgy for NDT 1	EYMFN1A	12	Entrepreneurship 1	BBENA1A	10
			Metallurgy for NDT 2	EYMFN2A	12
CREDITS		**56**	**CREDITS**		**64**
CREDITS					**120**

YEAR THREE					
Semester 5			Semester 6		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Advanced Radiographic Testing (Theory)	APART5A	8	Work Integrated Learning (NDT)	APWIL3A	60
Advanced Radiographic Testing (Practical)	APARP5A	8			
Advanced Eddy Current Testing (Theory)	APAET5A	8			
Advanced Eddy Current Testing (Practical)	APAEP5A	8			
Signal Processing	APSIP5A	8			
Project (Numerical Analysis)	APPNA5A	12			
CREDITS		**52**	**CREDITS**		**60**
CREDITS					**112**
TOTAL CREDITS					**377**

Assessment

Assessment is continuous or summative according to the module-learning guide and is aligned with the university's assessment policy.

Work Integrated Learning

Six Months for work-based experiential training.

Articulation Options

3.4. Advanced Diploma: Non-Destructive Testing

Admission Requirements:

- The VUT National Diploma / Diploma in NDT (360 credits at NQF Level 6).
- National Diploma or Diploma in Metallurgical Engineering, Mechanical Engineering, Chemical Engineering, Civil Engineering, Electrical Engineering and Industrial Engineering with an average of 55% from all S4 subjects for National Diploma or an average of 55% from all S5 subjects for Diploma.
- Bachelor's Degree in Physics, Mathematics and Chemistry with an average of 55% from all final year subjects including Mathematics II and Physics II in case where they are not major subjects.

All applicants received by the published closing date will be evaluated and selected according to the average achieved for all final semester / year subjects. Only the top ranked applicants will be offered admission as per the applicable Enrolment Plan.

Duration:

This is a one-year full-time course.

- **Curriculum:**

Semester 1			Semester 2		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Ultrasonic Testing Techniques	APNUT4A	15	Radiographic Testing Techniques	APNRT4A	12
Fracture Mechanics	APNFM4A	12	Electromagnetic Testing Techniques	APNET4A	12
Numerical Analysis with Matlab Applications	APNNA4A	12	Corrosion Inspection and Monitoring Techniques	APNCI4A	12
Research Methodology	APNRM4A	15	Thermographic Testing Techniques	APNTT4A	12
Only one elective can be chosen			NDT Project IV	APNPR4A	16
Optical Testing Methods (Elective)	APNOT4A	10			
Penetrant Testing Methods (Elective)	APNPT4A	10			
Acoustic Emission Testing Methods (Elective)	APNAE4A	10			
CREDITS		**64**	**CREDITS**		**64**
CREDITS					**128**
GRAND TOTAL					**128**

These qualifications develop the necessary knowledge, understanding and skills required for the student's further learning towards becoming a competent NDT technologist. It empowers graduates with a much more in-depth theoretical knowledge to competently perform NDT inspection with insight and the capabilities matching those of their peer engineering professions. The acquired knowledge, understanding, research skills, and ethics in the workplace, is an advantage in career progression.

Professional Bodies

South African Institute of Non-Destructive Testing (SAINT).

British Institute for Non-Destructive Testing (BINDT).

American Society for Non-Destructive Testing (ASNT).

Phased out Qualifications

- National Diploma in Non-Destructive Testing [course code: 215048, which had the last date of intake being 31 December 2016].

- National Diploma in Non-Destructive Testing (Extended) [course code: 215099, which had the last date of intake being 31 December 2014].
- No student will be allowed to continue with phased out programmes beyond 2021 as they will no longer be active on the system [6-year maximum duration for the completion of the qualification elapsed].

Enquiries

Enquiries may be addressed to:

HoD: NDT & Physics	Tel	:	+27 16 950 9321
Faculty of Applied & Computer Sciences	Fax	:	+27 16 950 9794
Vaal University of Technology	E-Mail	:	gaban@vut.ac.za
Private Bag X021	Website	:	www.vut.ac.za

4. Department of Computer Sciences

4.1. Staff Details

Surname, Initials & Title	Designation	Highest Qualification
Harmse, A (Prof.)	HoD/Associate Professor	PhD
Rikhotso, T (Ms.)	Administrator	BTech
Zuva, T (Prof.)	Professor	DTech
Van Eck, R (Dr.)	Senior Lecturer	DTech
Sonhera, N (Dr.)	Senior Lecturer	PhD
Moletsane, R (Dr.)	Lecturer	PhD
Brown, AC (Mr.)	Lecturer	MTech
da Rocha, RD (Mr.)	Lecturer	MTech
du Toit, T (Mr.)	Lecturer	BTech
Hlatshwayo, MC (Ms.)	Lecturer	MTech
Leduma, N (Mr.)	Junior Lecturer	MTech
Makelana P (Dr)	Lecturer	PhD
Mapande, FV (Ms.)	Lecturer	MTech
Matsela, M (Mr.)	Junior Lecturer	BTech
Matshego, I (Mr.)	Lecturer	MTech
Mkwanazi, SL (Ms.)	Lecturer	BTech
Mngoma, R (Ms.)	Lecturer	BSc Hons
Nhlapo, LC (Ms.)	Lecturer	BTech
Modupe, IA (Ms.)	Lecturer	MTech
Mohoto, LK (Ms.)	Lecturer	MTech
Mokoena, N (Mr.)	Senior Lecturer	MSc
Moloi, NI (Ms.)	Junior Lecturer	MTech
Moreki, FB (Ms.)	Junior Lecturer	BTech
Moyo, S (Ms.)	Lecturer	MSc
Mposula, F (Ms.)	Lecturer	MTech
Phahlamohlaka, DI (Mrs)	Lecturer	MTech

Ribeiro, SV (Ms.)	Lecturer	BSc Hons
Senna, WM (Ms.)	Lecturer	BTech
Sibanda, E (Mr.)	Lecturer	MTech
Sibaya, IZT (Ms.)	Lecturer	MCom
Thabane, LJ (Ms.)	Lecturer	MTech
Thapeli, M (Ms.)	Lecturer	MTech

4.2. Diploma: Information Technology

Three-year full-time course. The IT Diploma is offered in two specialised fields: Business Applications & Software Development.

Career Opportunities

Computerisation of most facets of modern society creates a multitude of possibilities. This includes the development of prototypes or systems and/or the supervised support of existing systems. The typical entry-level is that of a Programmer or Business Analyst.

Admissions Requirements:

National Senior Certificate (NSC) Entry Requirements:

Diploma: Information Technology		**Notes**
NSC Endorsement:	**Eligibility for Diploma**	3 = 40 – 49% 4 = 50 – 59% 5 = 60 – 69%
Compulsory Subjects:	**Achievement Level**	
English	4	
Mathematics or	4	
Technical Mathematics or	4	
Information Technology or	4	
Mathematical Literacy	6	
TOTAL APS SCORE	**24** (Mathematics or Technical Mathematics or Information Technology, excl. LO) **26** (Mathematical Literacy, excl.LO)	

Al l subjects are taken into consideration when calculating the total APS score, excluding Life Orientation.

When entering the diploma in information technology, you are also required to have access to your own personal computer (PC), whether it be a laptop or desktop computer. You can approach our department to be provided with a list of minimum specifications required for the PC for submission to NSFAS, your bursary, etc.

Curriculum

Two Information Technology specialisation fields are offered: Business Applications & Development Software.

YEAR ONE					
Semester 1			**Semester 2**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Information Systems 1.1	AIITX1B	10	Information Systems 1.2	AIITY1A	15
Development Software 1.1	ASDSX1A	12	Development Software 1.2	ASDSY1A	12
Programming Logic 1.1	ASPRX1A	12	Programming Logic 1.2	ASPRY1A	12
System Software 1.1	EISSX1A	10	System Software 1.2	EISSY1A	10
Applied Communications 1.1	HKCOX1A	8	Applied Communications 1.2	HKCOY1A	8
Accounting Skills	BACOS2A	12			
CREDITS		**64**	**CREDITS**		**57**
CREDITS					**121**
YEAR TWO					
SEMESTER THREE			**SEMESTER FOUR**		
Information Systems 2.1	AIITX2A	15	Information Systems 2.2	AIITY2A	15
Business Analysis 2.1 (Practical)	AIBPX2A	7	Business Analysis 2.2 (Practical)	AIBPY2A	7
Business Analysis 2.1 (Theory)	AIBTX2A	7	Business Analysis 2.2 (Theory)	AIBTY2A	7
Development Software 2.1	ASDSX2A	15	Development Software 2.2	ASDSY2A	15
System Software 2.1	EISSX2A	12	System Software 2.2	EISSY2A	12
Applied Communications 2.1	HKCOX2A	8	Applied Communications 2.2	HKCOY2A	8
IT Law	HLISL1A	8	Entrepreneurship	BBENA1A	12
CREDITS		**72**	**CREDITS**		**76**
CREDITS					**148**
YEAR THREE					

SEMESTER 5			SEMESTER 6		
Business Analysis 3.1	AIBUX3B	14	Business Analysis 3.2	AIBUY3A	40
Web Development 3.1	AIWEX3A	10	Web Development 3.2	AIWEY3A	10
Information Systems 3.1	AIITX3B	10			
Information Systems 3.2	AIITY3A	15			
TOTAL CREDITS		**49**			
OR					
Business Analysis 3.1	AIBUX3B	14			
Web Development 3.1	AIWEX3A	10			
Development Software 3.1	ASDSX3A	10			
Development Software 3.2	ASDSY3A	15			
CREDITS		**49**	**CREDITS**		**50**
CREDITS					**99**
TOTAL CREDITS					**368**

Articulation Options

4.3. Advanced Diploma: Information Technology (AD0600)

The Advanced Diploma: IT is offered only at the Vanderbijlpark campus. It is offered on a full-time basis; therefore, students are required to take a full load of subjects. The minimum duration is one year. Eight modules must be completed.

NB: It is imperative that students wishing to apply for Advanced Diploma: Information Technology, have an average of 60% for their final year subjects in their previous qualification.

Admission Requirements:

Diploma: Information Technology or equivalent relevant NQF level 6, 360 credit qualification. 60% Average on all third-year subjects (Ad hoc cases will be treated on merit).

Curriculum:

Semester 1			Semester 2		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Emerging Technologies	AIETX4A	15	Advanced Databases	AIADY4A	15

IT Management	AITMX4A	15	Research Methodology for IS	AIRMY4A	15
Statistics for IT	BAITX4A	15	User Experience Design (UXD)	AIUEY4A	15
Computer Security (Elective)	AICSX4A	15	IT Auditing (Elective)	AIAUY4A	15
Advanced Software Design (Elective)	ASSDX4A	15	Artificial Intelligence (Elective)	ASAIY4A	15
CREDITS		**60**	**TOTAL CREDITS**		**60**
TOTAL CREDITS					**120**

Credits

- 120 credits on NQF level 7

4.4. Postgraduate Diploma: Information Technology (PG0600)

The Postgraduate: IT is offered only at the Vanderbijlpark campus. It is offered on a full-time basis, therefore only during the day. The minimum duration is one year. Six modules must be completed.

Admission Requirements:

- Advanced Diploma: Information Technology or equivalent relevant NQF level 7, 120 credit qualification (Ad hoc cases will be treated on merit).

Curriculum:

Semester 1			**Semester 2**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Advanced supportive techniques and technologies	AISTX5A	10	Strategic Business Analysis	AISBY5A	20
Business Intelligence	AIBIX5A	20	Database Administration	AIDDY5A	20
Software Engineering	ASSEX5A	20	Research Project in Information Systems and Technology	AIRRY5A	30
TOTAL CREDITS		**50**	**TOTAL CREDITS**		**70**
GRAND TOTAL					**120**

Credits

- 120 credits on NQF level 8

4.5. Magister of Information and Communication Technology (MICT)

Admission requirements:

- NQF level 8 related qualification with a minimum of 120 credits or equivalent, with Research Methodology as a prerequisite with a 60% average for all subjects
  (Ad hoc cases will be treated on merit)

Duration:

- Minimum 2 years Full Time, minimum 3 years part time study.

Curriculum

- Research project by dissertation

Credits

- 180 credits on NQF level 9

4.6. Doctor Philosophiae in Information and Communication Technology (DD0600)

Admission requirements:

- NQF level 9 related qualification with a minimum of 180 credits or equivalent with, a 60% average (Ad hoc cases will be treated on merit)

Duration of course:

- Minimum 2 years, minimum 4 years part time study.

Curriculum:

- Research project by thesis

Credits

- 360 credits on NQF level 10

Work Integrated Learning

The IT Diploma does not have a formal Work Integrated Learning component.

Service Subjects

The following subjects are offered as service subjects:

Qualification		Subjects
i)	Diploma: FIS	• Financial Information Systems 1 • Financial Information Systems 2.1 and 2.2 • Financial Information Systems 3.1 and 3.2
ii)	Diploma: Electrical Engineering	• Engineering Programming IV
iii)	Diploma: Industrial and Operations Management	• Programming I • Programming II
iv)	Various qualifications	• ICT Skills 1
v)	Diploma: Safety Management	• Computing for Safety Management
vi)	Diploma: Tourism Management	• Advanced ICT Skills for Tourism
vii)	Diploma: Legal Assistance	• Computing for Legal Assistance
viii)	Diploma: Food Service Management	• ICT Skills for Hospitality 2.1

ix) Diploma: Public Relations	• Advanced ICT Skills for Public Relations

Enquiries

Enquiries may be addressed to:

HoD: ICT	Tel	:	+27 16 950 9605
Faculty of Applied & Computer Sciences	Fax	:	+27 16 950 9497
Vaal University of Technology	E-Mail	:	tiyiselamir@vut.ac.za
Private Bag X021	Website	:	www.vut.ac.za
VANDERBIJLPARK, 1900			

or

Postgraduate Office	Tel	:	+27 16 950 9537
Ms B Phume	E-Mail	:	beatricet@vut.ac.za

5. Department of Health Sciences

5.1. Staff Details

Surname, Initials & Title	Designation	Highest Qualification
Dr N Mkhumbeni	HOD	PhD
Mokoena, NJ (Mr)	Administrator	BTech
Mazibuko, MMM (Ms)	Junior Lecturer	B Cur
Motloba, DL (Ms)	Clinical Accompanist	BCur
Ramalisa-Budeli, R (Dr)	Lecturer	PhD
Selepe, DH (Ms)	Lecturer	MPH
Tshabalala, N (Ms)	Lecturer	MCur
Tsolo, MS (Ms)	Clinical Accompanist	BCur
Dlanjwa, V (Mr)	Lab Technician	BTech
Madonsela, ITE (Ms)	Junior Lecturer	Pg Dip
Motale, C (Ms)	Lecturer	BTech
Ngcakaza, IN (Ms)	Lecturer	MTech
Shivambu, BZ (Mr)	Lecturer	BSc Hons
Valentine, J (Ms)	Lecturer	MTech
Tagne Wambo, JR (Mr)	Lecturer	MTech
Willemse, RJ (Mr)	Lecturer	MTech
Thobejane, L (Ms)	Technician	PgDip
Xaba, M (Ms)	Junior Lecturer	PgDip
Muthabeni, T (Mr)	Junior Lecturer	BTech
Radebe, D (Ms)	Junior Lecturer	PgDip

5.2. Degree: Bachelor of Health Sciences in Medical Laboratory Sciences (BHSc: MLS)

What are the functions of a Medical Laboratory Scientist?

Qualified medical laboratory scientists are specialized health professionals who play an integral role in the healthcare of society by providing vital information about a patient's state of health. Their input is necessary in the diagnosis, monitoring and treatment of diseases. They diagnose chemical, blood, immunologic, tissue, cellular disorders and also the presence of microorganisms that cause diseases. They analyse human specimens such as blood, urine, sputum, stool, cerebrospinal fluid (CSF), peritoneal fluid, pericardial fluid, and synovial fluid, and more other specimens.

Career Opportunities

The analytical and diagnostic services provided by medical laboratory scientists require a strong scientific knowledge, as well as trained reasoning ability and empathy for humanity. Career opportunities exists in a variety of laboratory settings including national laboratories within hospital settings, private clinical laboratories, blood banking institutions, research, biotechnology, forensic, and reference laboratories.

Admissions Requirements

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Bachelor of Health Sciences: Medical Laboratory Sciences			
NSC Endorsement:	**Eligibility for Bachelor's Degree only**		
Compulsory Subjects:	**Achievement Level NSC**	**Achievement Level HG**	**Achievement Level SG**
English	4	D	C
Mathematics	4	D	C
Physical Sciences	4	D	C
Life Sciences	5	D	C
Life Orientation	Max 3		
Any other 2 subjects	10		
	No Math Literacy		
TOTAL APS SCORE	**30**		

Additional Entry Requirements: Selected applicants might be required to obtain industry knowledge (i.e. job shadowing) and may undergo placement testing.

Curriculum

Year 1					
Semester 1			**Semester 2**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Human Anatomy, Physiology & Disease 1.1	AHADX1A	15	Human Anatomy, Physiology & Disease 1.1	AHADY1A	15
Integrative Medical Sciences I: Health Chemistry	AAHCH1A	12	Introduction to Medical Laboratory Sciences 1.2	AHANY1A	9
Integrative Medical Sciences I: Health Physics	APHP1A	12	Cell Biology I	AAHCB1A	10
Integrative Medical Sciences I: Health Biostatistics	AMBIO1A	7.5	Immunology I	AHIMN1A	12
Introduction to Medical Laboratory Sciences 1.1	AHANX1A	10.5	Integrative Medical Sciences I: Laboratory Instrumentation & Techniques	AHLIT1A	15
CREDITS		**57**	**CREDITS**		**61**
CREDITS					**118**
YEAR TWO					
Semester 3			**Semester 4**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Clinical Chemistry 2.1	AHCLX2A	6	Clinical Chemistry 2.2	AHCLY2A	6
Haematology 2.1	AHHMX2A	6	Haematology 2.2	AHHMY2A	6

Histology 2	AHHST2A	12	Microbiology 2.2	AHMCY2A	6
Microbiology 2.1	AHMCX2A	6	Cytology 2	AAHCYT2A	12
Immunohaematology 2	AHIMH2A	12			
CREDITS		**42**	**CREDITS**		**30**
CREDITS					**72**
YEAR THREE					
Semester 5			**Semester 6**		
Clinical Chemistry 3	AHCLY2A	20	Integrative Medical Laboratory Sciences 3.2 Clinical Practice 3	AHCLN3A	60
Haematology 3	AHHMY2A	20	Research Methods 3	AHRSM3A	9
Cytology 3	AACHYT2A	20			
Microbiology 3	AHMCY2A	20			
Integrative Medical Laboratory Sciences 3.1 (Clinical Practice 3 Theory)	AHCLT3A	9			
CREDITS		**89**	**CREDITS**		**69**
CREDITS					**158**
YEAR FOUR					
Semester 7					
Subject Name			**Subject Code**		**Credit Value**
Research Project 4			AHCLN3A		24
Laboratory Management 4			AHCLN3A		10
ELECTIVE					
Clinical Practice 4 (elective)					120
CREDITS					**154**
TOTAL CREDITS					**502**

NB: the availability of elective subjects will be dependent on laboratory placement (spaces available in the clinical laboratories)

Work Integrated Learning/Clinical Practice

The student will have the first five semesters of class attendance at the University followed by three semesters of clinical practice in a laboratory approved for training purposes by Health Professions Council of South Africa (HPCSA). In the last two semesters of clinical practice, the student will select an area of specialisation. Students must pass a final examination in their area of specialisation before they will graduate.

It is mandatory that students receive Hepatitis B vaccination starting from their first year of enrolment. A Hepatitis B titre blood test is conducted before students are placed for Clinical Practice 3.

Registration with the Professional Body

On enrolment, it is mandatory that each student registers with the Health Professionals Council of South Africa (HPCSA) as a student Medical Laboratory Scientist as per regulations set out in the Government Gazette (Circular E2/a9/2, 79, 09,

28) within 3 months of starting the course. Successful completion of this qualification will entitle the student to register with the Health Professions Council of South Africa (HPCSA) as a qualified Medical Laboratory Scientist. HPCSA registration fees are for the student's cost.

5.3. Advanced Diploma in Biomedical Technology: AdvDip (Biomedical Technology)

NQF level: 7

Total Credits: 120 credits

NB: The Advanced Diploma in Biomedical Technology does not lead to registration with the HPCSA for those who are not already registered with the HPCSA as Medical Technologists/Medical Laboratory Scientists.

Admission Requirements

Diploma in Biomedical Technology or relevant equivalent with a minimum of 60% in final year modules or > 5 years as an HPCSA registered Medical Technologist.

CURRICULUM

Semester 1			Semester 2		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Genetics Module 1	AHGNX4A	10	Genetics Module 2	AHGNY4A	15
Research methodology in Biomedical Technology Module 1	AHRMB4A	15	Medical Laboratory management Module 2	AHMEY4A	20
Medical laboratory Management 1 Module 1	AHMEX4A	20			
CHOOSE ONE ELECTIVE SUBJECT FROM THE LIST BELOW			**CHOOSE ONE ELECTIVE SUBJCET FROM THE LIST BELOW**		
Adult Education and Training in Health Science Module 1 (Elective)	AHTBX4A	20	Adult Education and Training in Health Science Module 2 (Elective)	AHTBY4A	20
Advanced Chemical Pathology Module 1 (Elective)	AHACX4A	20	Advanced Chemical Pathology Module 2 (Elective)	AHACY4A	20
CREDITS		**65**			**55**
TOTAL CREDITS					**120**

Duration

This is a one year full-time course.

5.4. POSTGRADUATE DIPLOMA: BIOMEDICAL TECHNOLOGY

NQF level: 8

Total Credits: 120 credits

NB: The Postgraduate Diploma in Biomedical Technology does not lead to registration with the HPCSA for those who are not already registered with the HPCSA as Medical Technologists/Medical Laboratory Scientists.

Admission Requirements

Advanced Diploma in Biomedical Technology (60%average) or equivalent.

Duration

This is a one year full-time course.

Curriculum

Semester 1			Semester 2		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Epidemiology and Biostatistics	AHEBI5B	20	Management in Biomedical environment	AHMBE5A	20
Integrated Pathophysiology	AHIPP5A	20			
Research Project in Medical Laboratory Science (Year Module)				AHRPM5A	30
Advanced Molecular Biology (Year Module)				AHABB5A	30
CREDITS		**40**			**80**
TOTAL CREDITS					**120**

Phased Out Qualifications

There are no future intakes for the following courses:

Programme Name	Programme Code	Last Date of Achievement
National Diploma: Biomedical Technology	209049	31 December 2023
Bachelor of Technology: Biomedical Technology	309022	31 December 2024
Diploma: Biomedical Technology	DI0900	31 December 2024
Bachelor of Nursing (R.425)	809001	31 December 2023

The last date of achievement indicates when a learner has to complete all the requirements for the specific qualification. The transcript of the learner/student should indicate that the qualification was achieved before or on the last date of achievement. The certificate may be issued the following year as part of the graduation ceremony.

Enquiries

Enquiries may be addressed to:
Administrator: Health Sciences
Faculty of Applied & Computer Sciences
Vaal University of Technology
Private Bag X021
VANDERBIJLPARK, 1900
website : www.vut.ac.za

Administrator:	Mr N Mokoena
Tel:	(016) 950-7592
E-mail:	ntsanem@vut.ac.za
website:	www.vut.ac.za

6. Department of Natural Sciences

6.1. Staff Details (Agricultural Management)

Surname, Initials & Title	Designation	Highest Qualification
Modise, SJ (Prof)	HOD	PhD
Mdumbini, N (Ms)	Administrator	BTech
Chibamda, L (Dr)	Lecturer	PhD
Kesi, MJ (Mr)	Lecturer	MSc
Morake, C (Mr)	Lecturer	MSc
Mhlomi, T (Mr)	Lecturer	MSc

6.2. Diploma in Agricultural Management

Four semesters of class attendance at the University, plus two semesters Workplace Integrated Learning.

The Functions of an Agricultural Manager

Persons achieving this qualification will be competent in applying relevant knowledge, skills and values about agricultural production, problem solving, situation analysis and human relations to effectively manage an agricultural business.

Career Opportunities

Graduates are equipped as Managers in the Agricultural sector. There are opportunities for articulation towards further studies in an Advanced Diploma and subsequently to Postgraduate Diploma.

Admission Requirements*:*

National Senior Certificate (NSC) Entry Requirements:

Diploma: Agricultural Management		Note
NSC Endorsement:	**Eligibility for Diploma, or Bachelors' degree**	53 = 40 – 49% 4 = 50 – 59% 5 = 60 – 69%
Compulsory Subjects:	**Achievement Level**	
English	4	
Mathematics/ Maths Lit	3/4	
Official Language	3	
Life Orientation	Max 3	
Any other 3 Subjects	11	
TOTAL	**24 (Mathematics)** **25 (Mathematics Literacy)**	

Recommended: Business studies, Economics, Computer Studies, Geography (all at minimum of 3).

Recognition of Prior Learning (RPL):

Application with a Senior Certificate and a minimum of 5 years related laboratory experience will be considered for Diploma: Agricultural Management.

Duration:

This is a three-year full-time course.

Curriculum:

Diploma: Agricultural Management					
YEAR ONE					
Semester 1			Semester 2		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Applied Communication Skills 1.1	HKCOX1A	8	Applied Communication Skills 1.2	HKCOY1A	8
Business Management 1.1	ABBMX1A	12	Business Management 1.2	ABBMY1A	12
ICT Skills 1	ASICT1A	10	Agricultural Computer Applications 2	AICAA2A	10
Animal Production 1	ABANP1A	10	Animal Production 2	ABANP2A	10
Plant Production 1	ABPLP A	10	Plant Production 2	ABPLP2A	10
Agricultural Soil Science 1.1	ABASX1A	10	Agricultural Soil Science 1.2	ABASY1A	10
			Pasture Science 1	ABPAS1A	9
CREDITS		**60**	**CREDITS**		**69**
					129
YEAR TWO					
Semester 3			Semester 4		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Animal Production 3.1	ABANX3A	10	Animal Production 3.2	ABANY3A	10
Plant Production 3.1	ABPLX3A	10	Plant Production 3.2	ABPLY3A	10
Agricultural Law 1.1	HLALX1A	12	Agricultural Law 1.2	HLALY1A	12
Business Management 2.1	ABBMX2A	12	Business Management 2.2	ABBMY2A	12
Applied Communication Skills 2.1	HKCOX2A	8	Applied Communication Skills 2.2	HKCOY2A	8
Personnel Management 1.1	BHPEX1A	12	Personnel Management 1.2	BHPEY1A	12

Agricultural Engineering 1	ABAGE1A	12			
CREDITS		**76**	**CREDITS**		**64**
CREDITS					**140**
YEAR THREE					
Semester 5 & Semester 6					
Subject Name		**Subject Code**		**Credit Value**	
Work Integrated Learning 1 (Agricultural)		ABEXA1A		60	
Work Integrated Learning 2 (Agricultural)		ABEXA2A		60	
CREDITS					**120**
TOTAL CREDITS					**389**

Assessment

Assessment takes the form of Examination, CASS and Assignments. There are no practical sessions for this programme, but students are expected to participate in community Agricultural programmes.

Articulation Options

Students who have completed the Diploma can move on to an Advanced Diploma in Agricultural Management. The purpose of the qualification is to develop the necessary knowledge, understanding and skills required for the student's further learning towards becoming a competent manager in Agriculture. It is intended to empower candidate Agricultural managers to demonstrate that they can apply their acquired knowledge, understanding, skills, attitudes, and values in the work environments in South Africa. It is also designed to add value to the qualifying student in terms of enrichment of the person, status, and recognition.

6.3. Staff Details (Biotechnology)

Surname, Initials & Title	Designation	Highest Qualification
Modise, SJ (Prof)	HOD	PhD
Mdubini, N (Ms)	Administrator	ND OMT
Baburam, C (Dr)	Lecturer	PhD
Nkuna, R (Dr)	Lecturer	PhD
Padayachee, T (Prof)	Professor	DTech
Takaidza, S (Dr)	Senior Technologist	PhD
Walmsley, TA (Dr)	Senior Lecturer	PhD
Terblanche, U (Dr)	Senior Lecturer	PhD
Laloo, N (Mr)	Lecturer	MSc
Marrengane, Z (Ms)	Lecturer	MTech
Mphuthi, BR (Ms)	Technician	MTech
Rabapane, K (Ms)	Lecturer (NGAP)	MSc
Thathana, MG (Mr)	Technician	MTech
Viljoen, S (Ms)	Technician	BSc

6.3.1. Diploma in Biotechnology

Four semesters of class attendance at the University, plus two semesters Workplace Integrated Learning.

The Functions of a Microbiologist / Biotechnologist

The Biotechnology Department strives to shape technicians, academics and researchers that will develop and support sustainable and integrated biotechnology that improves life for all the living world.

Career Opportunities

A career as a Microbiologist / Biotechnologist offers challenging and exciting opportunities including quality control in enterprises such as: water purification plants, food processing factories, dairies, pharmaceutical factories, sewerage plants etc. There is a demand for trained Microbiologists/ Biotechnologists in industrial, research and academic settings.

Entry level : Laboratory Assistant

Middle level : Laboratory Technician

Top level : Laboratory Manager

Research opportunities are available at academic, industrial and research institutions.

Admission Requirements:

National Senior Certificate (NSC) Entry Requirements:

Diploma: Biotechnology		Note
NSC Endorsement:	**Eligibility for Diploma, or Bachelors' degree**	3 = 40 – 49% 4 = 50 – 59% 5 = 60 – 69%
Compulsory Subjects:	**Achievement Level**	
English	4	
Mathematics or	4	
Engineering Mathematics (TVET N4)	60%	
Physical Science or	4	
Engineering Science (TVET N4)	60%	
Life Sciences	4	
TOTAL	**23 (Excluding LO)**	

***Count any subjects except Life Orientation.**

Bonus Points

Mathematics and Physical Sciences.1 Bonus points only allocated for Pure Mathematics and Physical Science level higher than level 4...

Recognition of Prior Learning (RPL):

Application with a Senior Certificate and a minimum of 5 years related laboratory experience will be considered for Diploma: Biotechnology.

Curriculum

YEAR ONE					
Semester 1			**Semester 2**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Chemistry 1 (Biotechnology)	AACMB1A	16	Analytical Chemistry 2: (Biotechnology)	AAACB2A	10
Microbiology 1 (Theory)	ABMIT1A	8	Biochemistry 2 (Theory)	ABBIT2A	9
Microbiology 1 (Practical)	ABMIP1A	7	Biochemistry 2 (Practical)	ABBIP2A	8
Calculations and Statistics 1.1	AMCAS1A	10	Microbiology 2 (Theory)	ABMIT2A	8
Biodiversity and Ecology	ABBAE1A	10	Microbiology 2 (Practical)	ABMIP2A	7
Applied Communication 1.1	HKCOX1A	8	Disease and Immune Response 2	ABDIM2A	10
			ICT Skills	ASICT1A	10
			Applied Communication 1.2	HKCOY1A	8
CREDITS		**59**	**CREDITS**		**70**
CREDITS					**129**
YEAR TWO					
Semester 3			**Semester 4**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Introductory Genetics	ABIGE2A	10	Analytical Biochemistry 3	ABABI3A	14

Microbial Biochemistry 3 (T)	ABMCT3A	9	Bioprocessing 3 (Theory)	ABPRT3A	7
Microbial Biochemistry 3 (P)	ABMCP3A	9	Bioprocessing 3 (Practical)	ABPRP3A	8
Fermentation Technology 2 (Theory)	ABFET2A	8	Food Microbiology 3 (Theory)	ABFMT3A	7
Fermentation Technology 2 (Practical)	ABFEP2A	7	Food Microbiology 3 (Practical)	ABFMP3A	8
Microbiology 3 (Theory)	ABMIT3A	8	Quality Assurance (Biological)	ABQAB1A	6
Microbiology 3 (Practical)	ABMIP3A	7	Entrepreneurial Skills	BBENP1A	10
Applied Communication 2.1	HKCOX2A	8	Applied Communication 2.2	HKCOY2A	8
CREDITS		**66**	**CREDITS**		**68**
CREDITS					**134**
YEAR THREE					
Semester 5 & Semester 6					
Subject Name	**Subject Code**				**Credit**
Biotechnology Laboratory Practice I	ABBLP1A				60
Biotechnology Laboratory Practice II	ABBLP2A				60
CREDITS	**60**		**CREDITS**		**60**
CREDITS					**120**
TOTAL CREDITS					**383**

Assessment

Assessment takes the form of written examinations for Theory subjects and CASS for practical subjects.

Articulation Options

Students who have completed the Diploma can move on to an Advanced Diploma in Biotechnology. The purpose of the qualification is to develop the necessary knowledge, understanding and skills required for the student's further learning towards becoming a competent practicing Biotechnologist. It is intended to empower candidate Biotechnologists to demonstrate that they are capable of applying their acquired knowledge, understanding, skills, attitudes and values in the work environments in South Africa. It is also designed to add value to the qualifying student in terms of enrichment of the person, status and recognition. The Advanced Diploma in Biotechnology is required for articulation into the Postgraduate Diploma in Biotechnology which provides students with the research skills required to then articulate into Master of Applied Sciences in Biotechnology and finally a PhD in Biotechnology.

6.3.2. Advanced Diploma: Biotechnology

Admission Requirements:

- Diploma: Biotechnology or equivalent relevant NQF level 6, 360 credit qualification.
- 60% average on all third-year subjects not a requirement.

Must have passed all subjects first time.

Duration:

This is a one-year full-time course.

Curriculum:

YEAR ONE					
Semester 1			**Semester 2**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Biotechniques	ABBTQ4A	30	Biotechniques (continues)	ABBTQ4A	
Research Methodology	ABRMD4A	15	Laboratory Management and Compliance	ABLMC4A	15
Molecular Biology	ABMOB4A	15	Advanced Microbial Biochemistry	ABAMBA4A	15
Green Biotechnology	ABGRB4A	15	White Biotechnology	ABWHB4A	15
CREDITS		**75**	**CREDITS**		**45**
TOTAL CREDITS					**120**

6.3.3. Postgraduate Diploma: Biotechnology

Admission Requirements:

Advanced Diploma in Biotechnology (or relevant field), BSc Hons (in relevant field)

(NB: It is imperative that those students wishing to apply for Postgraduate Diploma, have successfully completed the Advanced Diploma programme an overall average mark of 60%

Duration:

This is a one-year full-time course.

Curriculum:

YEAR ONE					
Semester 1			**Semester 2**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Research Project in Biotechnology*	ABPRB5A	40	Research Project in Biotechnology*	ABPRB5A	*

Advanced Biotechnology Module 1	ABATX5A	10	Advanced Biotechnology Module 2	ABATY5A	10
Bioinformatics Module 1	ABBFX5A	13	Bioinformatics Module 2	ABBFY5A	12
Advanced Molecular Biology	ABAMO5A	15	Biostatistics	ABBIS5A	25
CREDITS		**78**	**CREDITS**		**47**
TOTAL CREDITS					**125**

6.3.4. Master of Applied Science in Biotechnology

Admission Requirements:

A Postgraduate Diploma, BSC Hons or equivalent (in a relevant field of study with an overall average of **60%**. As this degree is based on research, all candidates shall submit the following-

a) Proof of successful completion of a course in Research Methodology; and

b) A research proposal for approval by the Executive Committee of Senate (the research proposal is submitted once the Masters candidate has secured a position within a research group and has written a proposal in consultation with their supervisor).

Duration:

The equivalent of at least two years full-time study.

Curriculum:

This instructional programme comprises of a dissertation only, provided that the student has already passed a course in Research Methodology.

In their dissertations students must prove that they understand a particular problem in the discipline in which they have done research. Students must prove that they are able to analyse and set out the problem logically, are able to arrive at logical conclusions or a diagnosis and are then able to make proposals on the improvement / elimination of the problem. The dissertation must comply with the general technical requirements and rules with regards to scope, quality and format.

6.3.5. PhD: Biotechnology

Admission requirements:

- NQF level 9 related qualification with a minimum of 180 credits.

  60% average not a requirement

Biotechnology Laboratory Practice I and II

The structured theoretical education and the Work Integrated Learning partnership, as offered by the University and the employer respectively, form the basis of this co-operative education model. Work Integrated Learning refers to that component of co-operative education that can only be conducted by the employer. This learning provides the student with an opportunity to apply and develop the academic knowledge he / she received at the University to relevant problem situations in industry and exposure to typical organisational culture, human relations and working conditions.

The policy, procedures and guidelines set out in this document benefit the co-operative partnership (student, University, and employer) in developing and introducing effective education / learning programmes and by being adaptable to

technological developments within a relatively short period of time. With suitable guidance and supervision, the student is taught the responsibility to work independently and to develop an awareness of the ethics and requirements of industry.

NB: A student will only be permitted to commence with and register for Laboratory Practice I and II provided the student has passed all the subjects in S1, S2, S3 and S4.

Professional Bodies

Membership to a professional body is not compulsory but is advisable.

Phased of Qualifications

NDip Biotechnology (phased out in 2016)
BTech Biotechnology (phased out in 2019)
MTech Biotechnology (phased out in 2019)

Enquiries

Enquiries may be addressed to:

HOD: Biotechnology	Tel	:	+27 16 950 9603/9648
Faculty of Applied & Computer Sciences	Fax	:	+27 16 950 9794
Vaal University of Technology	E-Mail	:	
Private Bag X021	Website	:	www.vut.ac.za
VANDERBIJLPARK, 1900			
or			
Postgraduate Office	Tel	:	+27 16 950 9537
Ms B Phume	E-Mail	:	beatricet@vut.ac.za

6.4. Staff Details (Chemistry)

Surname, Initials & Title	Designation	Highest Qualification
Prof SJ Modise	HoD	PhD
Mdubini, N (Ms)	Administrator	BTech
Xaba, T (Prof)	Associate Prof	DTech
Phiri, M (Dr)	Senior Lecturer	PhD
Klink, M (Prof)	Associate Professor	PhD
Dr M Bambo	Senior Lecturer	PhD
Pholosi, A (Dr)	Senior Lecturer	DTech
Shooto, ND (Prof)	Associate Professor	DTech
Bucibo, M (Ms)	Lecturer	MTech
Dyantyi, SD (Mr)	Lecturer	MSc
Mabaso, N (Dr)	Lecturer	PhD
Mlambo, M Dr	Senior Lecturer	PhD
Moekwa, TB (Mr)	Lecturer	MSc
Molosioa, PS (Mr)	Lecturer	MSc
Mtshatsheni, KNG (Dr)	Lecturer	PhD
Sehloho, RS (Dr)	Lecturer	PhD
Matamela, T (Ms)	Technologist	MSc
Molete, P (Ms)	Technologist	MTech

6.4.1. Diploma: Analytical Chemistry

Four or five semesters of class attendance at the University, plus one or two semester Workplace Integrated Learning.

What are the Functions of a Chemistry Graduate?

Analysis of samples by the wet methods or using analytical instrument, writing reports on analysis and implementation of approved methods of analysis. Quality control in enterprises such as the following: petrochemical industries, fertilizer industries, mining industries, water purification plants, food processing factories, dairies, pharmaceutical factories, sewerage plants, etc. A chemistry researcher develops new analytical methods, theories and concepts as well as investigative and synthetic research.

Career Opportunities

A career in Chemistry offers challenging and exciting opportunities in both the private and public sectors. There is a continuous demand for trained Analytical Technicians with a diploma or a BTech qualification.

Entry level : Laboratory Assistant

Middle level : Laboratory Technician / Supervisor

Top level : Laboratory Manager

Research opportunities at both industry and research institutions as well as lecturing positions for those who holds a Master or Doctoral qualification.

Admissions Requirements:

National Senior Certificate (NSC) Entry Requirements:

Diploma: Analytical Chemistry		Note
NSC Endorsement:	**Eligibility for Diploma, or Bachelors' degree**	3 = 40 – 49% 4 = 50 – 59% 5 = 60 – 69%
Compulsory Subjects:	**Achievement Level**	
English	4	
Mathematics or	4	
Engineering Mathematics (TVET N4)	60%	
Physical Science or	4	
Engineering Science (TVET N4)	60%	
Life Orientation	3	
TOTAL	**23**	

Bonus Points:

Pure Mathematics Level 5 (1 point), and Physical Sciences Level 5 (1 point). 70% and more for Vocational Maths (1 point), 70% and more for Engineering Science (1 point)

Recognition of Prior Learning (RPL):

Application with a Senior Certificate and a minimum of 5 years related laboratory experience will be considered for Diploma: Analytical Chemistry.

Curriculum

YEAR ONE					
Semester 1			**Semester 2**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Chemistry I	AACHE1C	15	Analytical Chemistry I	AAACH1B	15
Physics I	APHYS1A	12	Inorganic Chemistry II	AAICH2B	15
Mathematics I	AMMAA1A	12	Analytical Chemistry Practical I	AAANP1A	15
Applied Communication Skills (Module 1.1)	HKCOX1A	8	Organic Chemistry II	AAOCH2B	15
ICT Skills 1	ASICT1A	10	Mathematics II	AMMA2A	12
CREDITS		**57**	**CREDITS**		**72**
CREDITS					**129**
YEAR TWO					
Semester 3			**Semester 4**		
Analytical Chemistry II	AAACH2A	15	Analytical Chemistry III	AAACH3A	18
Analytical Chemistry Practical II	AAANP2A	15	Analytical Chemistry Practical III	AAANP3B	15

Physical Chemistry II	AAPCH2B	15	Physical Chemistry III	AAFCH3A	15
Inorganic Chemistry III	AAICH3A	15	Chemical Quality Assurance	AACQU3A	15
Organic Chemistry III	AAOCH3A	15			
CREDITS		**75**	**CREDITS**		**63**
TOTAL					**138**
YEAR THREE					
Semester 5			**Semester 6**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit**
Chemical Industry: Practical I	AACIP1A	**60**	Chemical Industry: Practical II	AACIP2A	**60**
OR					
Entrepreneurial Skills	BBENA1A	10			
Industrial Chemical Analysis	AAICA1A	16			
Chemical Process Industries I	AACP1A	16			
*Applied Communication Skills 1.2	HKOY1A	8			
Physics II (Theory)	APHYT2A	8			
Physics II (Practical)	APHYP2A	4			
CREDITS	**62**		**CREDITS**		**60**
CREDITS					**122**
TOTAL CREDITS					**385**

***it is recommended that, the students who choose to register for S5 modules (not P1) must register Applied Communication Skills 1.2 in the Second Semester of Year 1, official changes will be made in the 2025 Prospectus**

Assessment

Assessment takes the form of tests, assignments, practical sessions, tutorials and final examinations.

Articulation Options

6.4.2. Advanced Diploma in Chemistry

Admission Requirements:

Diploma: Analytical Chemistry or equivalent relevant NQF level 6 360 credit qualification.

60% average on all third-year subjects not a requirement

Duration:

This a one year full-time or two years part-time course.

Curriculum:

YEAR ONE					
Semester 1			**Semester 2**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**

Analytical Chemistry 4	AAACH4A	25	Organic Chemistry 4	AAOCA4B	25
Physical Chemistry 4	AAPCH4A	25	Inorganic Chemistry 4	AAICH4A	25
Research Methodology in Chemistry	AARMH4A	15	Introduction to Chemistry Project	AACPR4A	10
CREDITS		**65**	**CREDITS**		**60**
TOTAL CREDITS					**125**

6.4.3. Postgraduate Diploma

Admission Requirements

- Advanced Diploma: Chemistry or equivalent relevant

YEAR ONE					
Semester 1			**Semester 2**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Advanced Analytical Chemistry	AAACH5A	20	Advanced Organic Chemistry	AAOCH5A	20
Applied Inorganic Chemistry	AAICH5A	20	Applied Physical Chemistry	AAPCH5A	20
Research Project in Chemistry (Year Module)				AACPR5A	40
CREDITS		**65**	**CREDITS**		**60**
TOTAL CREDITS					**120**

6.4.4. Master of Applied Science: Chemistry

Admission Requirements:

Minimum 60% entrance: Postgraduate Diploma/ BSc Hons: Chemistry.

(Research Methodology subject / workshop must be completed within a year of registration).

Duration:

One Year Full-Time or Two Years Part-Time.

Curriculum:

Research project by dissertation.

6.4.5. PhD: Chemistry

Admission Requirements:

- NQF level 9 related qualification with a minimum of 180 credits.

60% average not a requirement

Duration:

Minimum two years full-time or four years part-time.

Curriculum:

Research project by thesis.

Work Integrated Learning

Work Integrated Learning refers to that component of co-operative education that can only be conducted by the employer. This learning provides the student with an opportunity to apply and develop the academic knowledge he / she received at the University to relevant problem situations in industry and exposure to typical organisational culture, human relations and working conditions.

The curriculum is designed in such a way that the student may opt for a one year industrial exposure or six months industrial exposure. There are staff members appointed to co-ordinate the WIL by visiting students at the work place on a continuous basis.

Professional Bodies

Membership to a professional body is not compulsory but is advisable. However, students at BTech/Adv Diploma, MTech/Masters and DTech /PhD level are advised to affiliate with the South African Chemical Institute which is a body regulating all chemistry related matters in both Universities and Industries.

Phased out Qualifications

NDip Anlytical Chemistry (phased out in 2016)
BTech Analytical Chemistry (phased out in 2018)
MTech Analytical Chemistry (phased out in 2017)
DTech Analytical Chemistry (phased out in 2017)

Enquiries

Enquiries may be addressed to:

HoD: Chemistry	Tel	:	+27 16 950 9603/9648
Faculty of Applied & Computer Sciences	Fax	:	+27 16 950 9794
Vaal University of Technology	E-Mail	:	
Private Bag X021	Website	:	www.vut.ac.za
VANDERBIJLPARK, 1900			

or

Postgraduate Office	Tel	:	+27 16 950 9537
Ms B Phume	E-Mail	:	beatricet@vut.ac.za

6.5. Diploma Environmental Science

6.5.1. Staff Details

Surname, Initials & Title	Designation	Highest Qualification
Modise, SJ (Prof.)	HoD	PhD
Vacant	Lecturer	MSc
Vacant	Lecturer	MSc
Mdubini, N (Ms)	Administrator	BTech & PGDHE

6.5.2. Diploma in Environmental Science

Three years full-time.

Admission Requirements:

Dip: Environmental Science		
NSC endorsement	**Eligibility for Diploma or a Bachelor's degree**	
Compulsory subjects	**Achievement Level**	**Notes**
English Mathematics Physical Science Life Orientation Any other 3 Subjects	4 4 4 3 9	3=40-49% 4=50-59% 5=60-69%
Total	**24**	

Recognition of Prior Learning policy will be applied.

Curriculum:

YEAR ONE					
Semester 1			**Semester 2**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Chemistry 1	AACHE1A	15	Chemistry 2 (Biotechnology)	AAACB2A	12
Mathematics 1	AMMAA1A	12	Physics of Environmental Science	APPES1A	15
Fundamentals of the Natural Environment	APFNE1A	15	Earth Processes	APEPR1A	15
ICT Skills	ASICT1A	10	Water Resources	APWRE1A	15
Physics 1	APHYS1A	12	Applied Communication Skills 1.2	HKCOY1A	8
Applied Communication Skills 1.1	HKCOX1A	8			
CREDITS		**72**	**CREDITS**		**65**
CREDITS					**137**
YEAR TWO					
Semester 3			**Semester 4**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
Environmental Microbiology 2.1	AEMIC2A	10	Environmental Microbiology 2.2	AEMIC2B	10
Environmental Impact Assessment 2.1	AEIAS2A	12	Environmental Impact Assessment 2.2	AEIAS2B	12
Microeconomics		12	Environmental Chemistry	AECHE2A	10
Applied Environmental Statistics	AEAES2A	10	Macroeconomics		12
Environmental Pollution	AEPOL2A	10	Biodiversity and Ecosystem Management	AEBEM2A	15
CREDITS		**54**	**CREDITS**		**59**
CREDITS					**113**
YEAR THREE					
Semester 5			**Semester 6**		
Subject Name	**Subject Code**	**Credit Value**	**Subject Name**	**Subject Code**	**Credit Value**
GIS & Remote Sensing Tools for	AEGIS3A	15	Industry, Waste and Environment	AEIWE3A	12

Environmental Applications					
Environmental Economics	AEECO3A	10	Climate Change and Natural Disasters	AECND3A	10
Environmental Law and Planning	AELAW3A	15	Entrepreneurship*	BBENA1A	10
Introduction to Research Methodology in Environmental Science	AERES3A	8			
Project in Environmental Science				AEPRO3A	30
CREDITS		**48**	**CREDITS**		**62**
CREDITS					**110**
TOTAL CREDITS					**360**

What does an Environmental Scientist do?

Environmental scientists' study the effects of human activity on the environment, and identifying ways to manage, minimise or eliminate any negative impacts. Environmental scientists gather samples and observational data in the field and conduct tests in the lab. For example, they will test water, soil, or air samples to verify pollution and its source.

The environmental scientist will then undertake a rigorous assessment to identify if that contaminant source has the potential to affect or harm individuals and communities. Further, they will present their findings to other scientist and key stakeholders, including government officials, then advance possible ways to solve the problem. They also advise on guidelines of mitigating the problem, and also are involved in crafting future policies

Career opportunities

Typically, environmental scientists can be employed in

- Manufacturing companies
- Energy generation plants
- Environmental consultancies
- National and Local governments
- Wildlife/species conservation groups
- Universities

Career status

Environmental Scientists can register with the South African Council for Natural Scientific Professions (SACNASP), the legislated regulatory body for natural science practitioners in South Africa.

Enquiries

Enquiries may be addressed to:

HoD: Natural Sciences	Tel	:	+27 16 950 9603/9628
Faculty of Applied & Computer Sciences	Fax	:	+27 16 950 9794
Vaal University of Technology	E-Mail	:	joe@vut.ac.za
Private Bag X021	Website	:	www.vut.ac.za

7. Syllabi

Accounting Skills I

Basic accounting skills - Interpretation and application of accounting principles and cost-based accounting.

Acoustic Emission Testing Methods

Types of acoustic emissions, basic concepts, instrumentation and read out, signal description, background noise, inspection of pressure vessels, flaw location, inspection of wire ropes, inspection of welds, inspection of ceramic materials, brazed metal to ceramic bonds, inspection of composite materials, laboratory experiments.

Advanced Databases

This module provides the theory and practice of advanced database development and administration, building upon the student's existing knowledge of database systems. The modules covers advanced and complete database concepts relating to storage, management, and architecture of data, specifically related to big data and data warehousing. It also covers topics in advanced database design, focussing on both logical and physical design aspects.

Advanced Eddy Current Testing - Theory

Significant discoveries about electromagnetism; Modern Eddy Current Testing; Material variables detectable by Eddy Currents; Major application areas; Power dissipation of eddy currents; Diffusion equation; Maxwell's equations; Material properties; Electromagnetic acoustic transducer; The undamped uniform plane wave; Wavelength and phase velocity; Wave impedance; Uniform damped plane waves; The skin effect; Reflection of plane waves at normal incidence; Some comments on uniform plane waves; Pointing's theorem; Interference sources; Passive circuit elements; Digital signals; Pre-amplifiers in the TOFD technique; The electromagnetic interference of ultrasonic pulse-preamplifier; The shielding effectiveness theory; Filters; Metal impedance, skin depth, barrier impedance; The skin depth; New shielding materials; Seams and joints, and ventilation; General properties; The Hertzian dipole; The small loop antenna; Antenna properties; Radar; Basic operation of a radar system; Unambiguous range; Range and Angular resolutions; Target detection; Microwave NDT; Development of time domain reflectometry eddy current tests; Intelligent materials with microwave trouble signals; Basic Principle; Magnetism; Electromagnetism; Permeability; Features; The impedance; Eddy current concept; Impedance diagrams; Test coil impedance; Field distributions; Eddy current testing probes; Eddy current applications; Multiple frequency techniques; Pulsed eddy current inspection; Remote field testing; Remote field principle and skin depth theory; Display of signal and quantification of depth; Theoretical model of mathematical compensation; Reference standards; Eddy current display media; Effect of phase lag on the conductance curve; Lift-off curves and fill factor; Edge effect; Surface coil impedance curves for material and performance variables; Conductivity variation; Ferromagnetic materials; Discontinuity signal display; Subsurface discontinuities; Surface-breaking discontinuities; Shape of the Eddy current field; Display of discontinuity orientation; Enhancing signal display; Thickness variation; Plating and cladding; Spacing between conducting materials; Differential surface coil display; Encircling and internal coil display; Law of similarity; Test procedure; Testing non-ferromagnetic tubes; Testing ferromagnetic tubes; Characterisation of microstructures; Applications of Eddy Current Testing; Advantages of Eddy Current Testing; Disadvantages of Eddy Current Testing; Designing and building an Eddy Current position sensor; Physics and behavior; Target selection; Sensor design; Circuit design; A model sensor system design; What to remember about ECT; Reference standards; and Glossary of key terms.

Advanced Eddy Current Testing - Practical

Historical and developmental process; Basic physics and controlling principles; Generation of eddy currents in conductors; Eddy current propagation and decay, standard depth of penetration; Near field, transition, and remote field eddy currents; Properties of remote field eddy currents; Probes; Factors affecting choice of probe type; Frequency; Coil drive: current/voltage; Pre-amp gain ; Display gain; Standardization; Display types; RFT reference curve; Chart recordings; Odometers; Storing and recalling data on computers; RFT theory Types of RFT sensing probes; Test part; Test system; Definition; Relationship to RFT testing ; Methods of improving signal-to-noise ratio: Relationship of frequency to depth of penetration ;Relationship of frequency to resolution; Dual frequency operation; Beat frequencies; Optimum frequency; Fill factor; Importance of centralizing the probe; Probe drive and penetration; Effect of increasing thickness, conductivity or permeability; Position of receive coils versus field strength; Amplification; Phase and amplitude detection (lock-in

amplifier); Differentiation and filtering; Instruments; Reference standards; Factors affecting signals; Selection of test frequencies; Tubulars of test frequencies; Tubulars using internal probes; Tubulars using external probes; Other applications; Accept/reject criteria; Signal classification processes; Detection of signals of interest; Signal recognition, data analysis, flaw-sizing techniques; Three zones in RFT; Through – transmission nature of RFT; Standard depth of penetration factors; Signal analysis; Display options; Advanced applications; Writing procedures; ASTM E 2096; SNT-TC-1A; Supervision and training; Administering exams; Ethics ; Reports: essential elements and; Legal responsibility.

Advanced Materials Evaluation - Theory

Separated transducers; Basic principles; Mathematical model for TOFD; Diffraction of waves; TOFD in anisotropic materials; TOFD in isotropic materials; Mathematical model; Application of TOFD; Advantages of TOFD technique; Disadvantages of TOFD technique; Process factors influencing the susceptibility to defects of different types; Operation of phased arrays; Implementation of phased arrays; Scan types; Combined scans; Basic theory of ultrasonic phased array; Applications of phased arrays; Linear phased arrays; Focusing formula; Distribution of pressure for beam focusing; Time delay; Methodologies of thermal Non-destructive testing; Physical principles; Thermal property requirements; Thermographic signal reconstruction; Thermal wave theory; Defect detection; Advanced signal processing techniques; Advantages of thermographic testing; Disadvantages of thermographic testing; Heat source finite pulse time effects; Lasers; Basic parts of a laser; Characteristics of laser light; Principle of laser; Advantages of laser ultrasound; Laser ultrasound; Principle of laser based detection of ultrasound; Interferometry; Type of lasers used for generation; Applications of laser laser ultrasound; Application for laser ultrasound; Laser ultrasonics for materials characterization; Corrosion; Mechanism of corrosion; Types of corrosion; Corrosion of steel in concrete; Corrosion detectability; Detection of corrosion; and Probability of detection.

Advanced Materials Evaluation - Practical

Practical sections; Laboratory periods; Casting; Forging and rolling; Extrusion; Welding; Material; **PHASED ARRAY –** Purpose; Scope of application; Organization and personnel requirements; Class notation; Terminology of PA; History of PA; Review of ultrasonic wave theory: longitudinal and shear wave; Basic principle of phased array; Introduction to PA concepts and theory; Scan plans and exam coverages; Data presentations; Computer-based systems; Focal law generation; Probes; Wedges; Scanners; Blocks; Parameter settings; Calibration; Design of testing procedures; Collection of data; Encoded scans; Zone discrimination; On-site data acquisition; Specific applications; Data interpretation and evaluation; Reporting; Storage of documents; **TOFD -** Introduction to TOFD; Review of ultrasonic wave theory; Basic principle of Time of flight diffraction; TOFD concepts and theory; Technique limitations; Types of scan; Data presentations; Effects of curvature; Computer-based systems/ Software; Beam profile tools; Probes; Wedges; Blocks; Parameter settings; Calibration; Data collection; Encoded scans; On-site data acquisition; Specific applications; Data interpretation and evaluation; Codes/ standards/ specifications; Reporting; Storage of documents; The nature of heat and flow; Temperature measurement principles; Heat transfer modes and basic calculations; Proper selection of thermal/ infrared testing (TIR) as technique of choice; Introduction to Thermography; Operation of support equipment for infrared surveys; Radiosity concepts familiarization and problems/ Basic theory and building applications; Resolution tests and calculations; Error potential in radiant measurements (an overview); The infrared spectrum; Operating for infrared measurements (quantification); Operating for high-speed data collection; Operating special equipment for active techniques; Infrared image and documentation quality; Recording; Detecting thermal anomalies resulting from differences in thermal resistance (Quasi-steady state heat flow); Detecting thermal anomalies resulting from differences in thermal capacitance, using system or environmental heat cycles; Detecting thermal anomalies resulting from differences in physical state; Detecting thermal anomalies resulting from fluid flow problems; Detecting thermal anomalies resulting from friction; Detecting thermal anomalies resulting from non-homogeneous exothermic or endothermic conditions; Field quantification of point temperatures; Temperature measurement applications; Energy loss analysis applications; Active applications; Filtered applications; Transient applications; Building applications; Composite material applications; Equipment/ Materials; Heat flux indicators; Performance parameters of non-contact devices; Exothermic or endothermic investigations; Friction investigations; Fluid flow investigations; Thermal resistance (steady state heat flow) investigations; Thermal capacitance investigations; Contact temperature indicators; Non-contact pyrometers; Thermal/ infrared imaging; Heat flux indicators; Checking equipment calibration with blackbody references; Codes, standards and Procedures; Support data collection; Surface reference temperatures; Identification and other; Interpretation/ Evaluation; Reports and documentation; Safety responsibility and authority; Safety for personnel; Safety for client and facilities; Safety for testing equipment; and corrosion experiments.

Advanced Radiographic Testing - Theory

Objective of radiation protection and safety; Regulatory authority; Appointment of radiation protection officers; Workplace monitoring; Testing and maintenance of equipment; Operational instructions; Industrial radiographer/worker; Instructions for use and maintenance; Instructions for use and maintenance; Additional precautions for gamma radiography; What is Radiation?; Units for Measuring Radiation; Biological Effects of Radiation; Biological Damage Factors; Radiation safety on Real time radiography; Sources in industrial radiography; History of Digital Radiography; Conventional radiography; Digital radiography; Spatial resolution in Digital radiography; Pixel depth; Flat panel detectors; Exposure time and energy; Results without chemical processing; High quality of images; Enhanced Archiving and Retrieval; The working principle of computed radiography; What to consider when deciding to use Computed Radiography; Digital images; The application of CR; Advantages of CR; The limitations of CR; Special radiographic techniques; High resolution X-ray microscopy; Microfocus and nanofocus X-ray tubes; Image intensifier tube systems; Image quality; Image sharpness; Image contrast; Image noise; Image quality requirement in RTR system; Image processing; Image data analysis; Real time X-ray imaging system for boiler tubes; Tube handling system; Image processing software; Hardware; Advantages of Real Time Radiography; Applications; Codes and Standards; Inspection speed; Image resolution; Image Magnification; Image enhancement; Real time Radiography system costs; Computing capacity and scanning time; Reverse engineering; CT metrology; High resolution and defect sizing; CT for defect detection and sizing; Beer Law of attenuation; The system of tomographic testing; Principle of industrial computed tomography; Fundamental properties of matter; Radioactive materials; Types of radiation; Interaction of radiation with matter; Exposure devices and radiation sources; Imagine viewing; Application techniques; Image interpretation and processing; Hardware configuration; Image fidelity indicators; Advanced image processing and algorithm analysis; Detectors election; Principle of tomographic testing in NDT; Resolution; Advantages of tomographic testing; Disadvantages (drawbacks) of tomographic testing; Recommendations on drawbacks; Image reconstruction; Transmitted intensity; A numerical study on the effect of object functions on tomography reconstruction; Radon transform; Safety radiation project review; Principles of neutron radiography; Image and non-image devices; Miscellaneous applications; Techniques – calibrations; Interpretation – evaluation; Procedures; Neutron Beam; Neutron Sources (reactors, accelerators, isotopic sources) ; Neutron collimators; Neutron radiographic techniques; Applications of neutron radiography; Collimation; Quality control of Neutron radiography; Advantages of proton radiography; Principle of proton radiography; Application of protons to radiography; Simulation using CAD model; Monte Carlo methods and their application in X-ray image simulation; Generative image for flaw simulation in product radiographs; Image generation technology; Defect image collecting; Visual feature analysis and nonparametric sampling; Counter based hierarchical template model; Visual feature analysis and fuzzy representation.

Advanced Radiographic Testing - Practical

Casting; Weldments; History of industrial neutron radiography; General principle of examination of materials by penetrating radiation; Relationship of penetrating neutron radiation, radiography and radiometry; Comparison with other NDT methods, particular with X-rays and Gamma rays; General area of applications; Specific areas of application in industry; Review on nature of penetrating radiation; Radiation source for Neutrons (Specific description); Beam design Radiometry; Radiation- detection imaging; Film-principles, properties and uses with neutron converter screens; Blocking and filtering; Multi film technique; Enlargement and projection; Stereo-radiography; Triangulation methods; Autoradiography; Flash radiography; In motion radiography; Fluoroscopy; Electron emission radiography; Micro radiograph; Tomography; Control of diffraction effect; Panoramic exposures; Gaging; Real time imaging; Image analysis techniques; Direct TV viewing; Non-imaging devices; Gaseous and ionization detectors; Neutron detectors; Gaging and control processes; Basic neutron imaging considerations; Film processing and viewing of radiographs; Viewing of radiographs; Causes and correction of unsatisfactory radiographs; Arithmetic of exposure and other factors affecting neutron radiographs; The radiographic process; Imaging considerations; Test results and interpretation; Codes, standards, specification, and procedures; Introduction to computed radiograph; Computed radiography (CR) system capabilities; System component; Basic CR Techniques; Digital image Processing; Application techniques; Image display characteristics and viewing; CT technical requirements; CR technical developments; Evaluation of CR images; Image viewing; Standards, codes, and procedures for radiography; Computed Tomography Techniques - CT technical background; Physical basis- X ray interactions with material properties; Mathematical basis- line integral; Data sampling principle; Physical limitations of the sampling process; CT System performance- characterizing system performance; CT system performance measurements and monitoring; Image interpretation and processing; Advanced image processing algorithms; Radiographic evaluation and interpretation in tomography; Digital radiography overview; Image file format and compression (JPEG, TIFF, DICONDE); Advantages and disadvantages; Lossy versus lossless; Sampling theory; DR system over view; DR system capabilities; DR system components; Image fidelity; Detector issues for the detectors used/

Additional detector selection criteria/ parameters; Detector calibration for the detectors used; Detector selection; Detector monitoring; Detector maintenance; Image processing (post processing); Arithmetic; Acquisition system considerations; DR image quality topics/ technique development considerations; Image viewing; Application techniques; Triangulation methods for discontinuity location; Qualification of DR procedures; Use of Digital Reference Images; Valuation; Personnel safety radiation protection review; Methods of controlling radiation exposure; Specific equipment requirements; and Operation and emergency procedure.

Advanced Software Design

This course introduces advanced software design technologies, both theoretically and practically. Key topics include: Object-oriented analysis and design, component-based software design, model-driven software design, design evaluation and improvement, software quality, design patterns and refactoring.

Advanced Supportive Techniques and Technologies

This module will extend students' knowledge and understanding of supportive technologies and techniques that will support them in the undertaking of IT-related projects. Different software packages, IT methodologies and support techniques will be covered in detail. Topics covered may include (but are not limited to) research supporting applications such as SPSS, Mendeley, Atlas-TI, etc.; article writing for IT-based projects; project management and modelling software; IT audit tracking, etc. The module will also extend students' theoretical knowledge by presenting contemporary issues in the support of IT projects, and supportive technologies that can be used to help minimize potential risks and threats.

Analytical Chemistry I

The nature of analytical chemistry; Laboratory practice and safety; Calculations used in analytical chemistry; Elementrary statistics including significant figures, precision and accuracy; Statistical data treatment and evaluation; Sampling and sample handling and Introduction to classical analysis.

Analytical Chemistry II

Calculations used in analytical chemistry; Aqueous solutions and chemical equilibria; Gravimetric methods of analysis; Precipitation titration; Principles of neutralisation titration; Titration curves for complex acid / base system; Application of neutralisation titratious; Electrochemistry; Analytical separation and Refractometry and polarimentry.

Analytical Chemistry III – Module 1

Data handling; Absorption and emission spectrometry; Ultraviolet and visible spectrometry; Infrared spectroscopy and X-ray spectroscopy.

Analytical Chemistry III – Module 2

General principles of chromatographic methods; Potentiometry; Electrogravimetry and coulometry; Polaragraphy; Themogravimetry and Thermal methods of analysis.

Anatomy and Physiology Semester 1 (AHNAX1A)

The anatomy and physiology in semester 1 for the bachelor of nursing students focuses on anatomical terms used regarding the body, the anatomical structures of all systems of the body, the location of major organs and cavities of the human body.

Anatomy and Physiology Semester 2 (AHNAY1A)

The anatomy and physiology in semester 2 focuses on the structure and function of the human body and focuses on regional anatomy which is the interrelationships of all the structures in a specific body region e.g. abdomen.

Anatomy and Physiology MODULE 1

This module attempts to provide a good introduction into Anatomy and Physiology. How structure and function of the body complement with one another in a normal, healthy human body. The concepts outlined in this module will help in understanding other modules in the field of Biomedical Technology.

Anatomy and Physiology MODULE 2

This module attempts to provide a better understating of structural body systems and functional metabolisms. How structure and function in the human body can be explained in terms of keeping conditions in the environment relatively constant. The concepts outlined in this module will help in understanding other modules in the field of Biomedical Technology.

Artificial Intelligence IV

Students choosing this module might be studying the following topics (but not limited to these):

The history of AI, Deduction, reasoning, problem solving, knowledge representation, natural language processing (communication), Perception, Cybernetics and brain simulation, Search and optimization, Logic Probabilistic methods for uncertain reasoning, Classifiers and statistical learning methods, Neural networks, Control theory, Philosophy and ethics, The limits of artificial general intelligence, intelligent behaviour and machine ethics

Blood Transfusion Technology:
Blood Transfusion Technology is a module based immune-haematology, also sometimes referred to as blood banking. It is a branch of haematology which studies antigen-antibody reactions to understand the aspects of basic blood transfusion technology. The module includes concepts, procedures and techniques used by the South African Blood Transfusion service for determination blood groups, donor compatibility, transfusion hazards and the preparation of blood components.

Business Analysis II Practical
The implementation of databases and business processes through the use of relational databases using SQL and appropriate programming extensions to SQL

Business Analysis II Theory
Enterprise Information Systems; database design for each business process; business analysis and management; functional business systems; enterprise modelling and process modelling.

Business Analysis III
Analysis of an existing, established business and the documentation and logical design of a physical IT system and project-based management according to the SDLC. Exposure to vendor specific software platforms and certifications in demand by industry. IT-based project management.

Business Intelligence
This module aims to review and complement foundation information technology, statistical and analytics knowledge and to establish the context for a range of methods, used in the analysis of simple and complex systems. Topics may include (but are not limited to): text mining; machine learning; statistical modelling; predictive, diagnostic, descriptive and prescriptive analytics; econometrics; optimization; marketing analytics; data visualization and business communication, software systems used for big data analytics such as (but not limited to) Hadoop and Mahout.

Cellular Pathology II (THEORY & PRACTICAL)
The module is a science that enables the assembling of diagnostic criteria used to recognize, evaluate and analyse the normal and abnormal cell content of specimens obtained from the Female Genital Tract for microscopic diagnosis.

Cellular Pathology III (THEORY & PRACTICAL)
The module is a science that teaches to assemble the diagnostic criteria used to recognize, evaluate and analyse the normal and abnormal cell content of specimens obtained from the Respiratory tract, Urinary tract and Serous cavities for microscopic diagnosis.

Chemical Pathology Module 1
The module is comprised of theory and practical in clinical chemistry. This module attempts to provide a good introduction of clinical chemistry. Enabling the better understanding of Laboratory safety, equipment's, fluids sample analysis, Quality control and quality assurance. The concepts outlined in this module will help in understanding Chemical pathology module 2 and 3 in the field of Biomedical Technology.

Cellular Pathology I (Theory & Practical)
The module that equip the students with theoretical knowledge and technical skills on the preparation of tissue specimen for diagnostic purposes.

Chemical Pathology 11 Theory (AHCHT2A)
Chemical Pathology 11 theory (also known as Clinical Biochemistry or Clinical Chemistry) is a level of study which seeks to bring a scientific and theoretical understanding of diseases (e.g. Hepatitis) and tests (e.g. liver enzymes) affecting various organs of a human body. The module entails biochemical analysis of human bodily fluids or specimens such as blood and through testing of disease markers which will enable facilitation of correct diagnosis, treatment and prevention of diseases.

Chemical Pathology 11 Practical (AHCHP2A)

Chemical Pathology 11 practical is intended to bring practical clarity to Chemical Pathology 11 theory. The module is a practical approach in understanding disease markers and application of techniques used in analysing tests on human bodily fluids which results are used to interpret disease status of a patient.

Chemical Pathology 111 Theory (AHCHT3A)

Chemical Pathology 111 theory is a branch of pathology with a specific focus on biochemical analysis of disease markers which affect human body. The theoretical approach entails understanding of minerals and trace elements, lipids, immunoassays and Pharmacology. The module is applied science which seeks to clarify the study of human body in various phases of health and diseases.

Chemical Pathology 111 Practical (AHCHP3A)

Chemical Pathology 111 Practical is a module intended to practically perform tests from specimens to bring more clarity on Chemical Pathology 111 theory. The practical application of laboratory techniques would bring about the necessary experience related to the module and the expertise required in a medical laboratory.

Chemical Quality Assurance

Introduction to research development and problem-solving skills; The research process; Planning and managing a research project; Interpretation of results; Introduction to quality in the analytical laboratory and Establishing a quality assurance programme.

Chemistry – Module 1

Measurements in chemistry; Atoms, molecules and ions; Formulas, equations and moles; Reactions in acqueous solutions; Periodicity and atomic structure; Ionic bonds and molecular structure; Chemical equilibrium and Aqueous equilibrium (acids and bases).

Chemistry – Module 2

Composition and structure of the atom; Structure and properties of ionic and covalent compounds; Calculations and chemical equations; Reactions in aqueous solutions; Energy, rate and equilibrium; Acids and bases and oxidation reduction; Saturated hydrocarbons; Unsaturated hydrocarbons (alkenes, alkynes and aromatics); Alcohols, phenois, thiols and ethers; Aldehydes and ketones; Carboxylic acids and derivatives and Amines and amides.

Communication

Organisational theory; communication techniques and written communication.

Computer Security

Computer security, also known as cybersecurity or IT security, is the protection of information systems from theft or damage to the hardware, the software, and to the information on them, as well as from disruption or misdirection of the services they provide. Topics might include (but is not limited to) ethical hacking, cryptography, footprinting, reconnaissance, scanning networks, Viruses, sniffers, web servers and web applications and physical security.

Corrosion Inspection and Monitoring Techniques

Corrosion and its cost in a modern world, corrosion detectability, maintenance, management and inspection strategies, corrosion monitoring, non-destructive evaluation, laboratory experiments.

Database Administration

The aim of this module is to equip students with the skills for the administration of a database system entails installation, configuration, and management. This module is designed for large systems with multiple concurrent users operating transaction and high data requirements. Potential topics may include (but are not limited to): installation and configuration of a high-volume database; creating and managing users; administration of the database; understanding the interaction of database components; backup and disaster recovery; memory, performance and resource optimization; recovery strategies and task automation.

Development Software I
Programming concepts; Structured and object- orientated programming.

Development Software II
Object-Orientated design and development; Connect SQL Database using ADO in the .NET environment.

Development Software III
Object-Oriented design and development as well as database access and data structures in a Java environment. Basic mobile design and development.

Eddy Current Testing – Theory

Scalars and vectors; Coordinate systems; Del ∇operator; Gradient of a scalar, $V = \nabla V$; Divergence of a vector, $A = \nabla . A$; Curl of a vector $\equiv \nabla \times A$; Laplacian operator ∇2; Gradient (Vector operators); Vector integration; Divergence; Curl operator; The vector differential operator; Differential vector identities (For any vector and scalar); Direction angles, Direction cosines; Review of complex numbers; Multiplication and division of a vector by a scalar; Addition and subtraction of vectors; Cartesian coordinates of a vector; The scalar or Dot product of two vectors; The line integral; The surface integral; The volume integral is given by; Vector or cross product of two vectors; The introduction to coordinate systems; Electromotive force; Electromagnetic induction; Alternating current principle; The nature of the sinusoidal functions; Application of ac voltage to resistors, inductors and capacitors; Kirchhoff's laws; Bridges; The frequency; Series LCR circuit; Instruments; Parallel LCR circuit; Resonance; Transients; Filter circuits; Power in ac circuits; The transformer; Eddy current testing circuits; Factors affecting eddy current; Depth of penetration; Coil connections; Eddy current flow characteristics; Transient eddy current testing for aging aircraft; Profiled eddy currents probes for complex shape examination; Multi-frequency flaw detectors; Test coils; Surface coils; Impedance Plane Analysis; Detailed discussion of eddy current testing; Eddy Current Inspection Techniques; Grain Structure; and Reference standards.

Eddy Current Testing – Practical

Introduction to Eddy Current Testing; Historical and developmental process; Basic physics and controlling principles; Product technology; Generalities on NDT; Terminology (EN 1330-1 and EN 1330-2 EN 1330-5); Fundamentals; Applications of eddy current testing; Eddy current testing system; General purpose application instrument; Specific application instruments; Probe functions; Probe family; Probe designs; Array probes; Pulsed eddy currents; Non inductive techniques; Magneto-Optical Imaging, SQUID, Giant magneto-resistance; Imaging; Modelling; Measurements; Output and signal display; Reference blocks; Mechanized equipment; Probes; Factors affecting choice of sensing elements; Selection of inspection parameters; Frequency; Coil drive; Hall element drive; Channel gain; Display sensitivity selections; Standardization; Filtering; Thresholds; Readout mechanisms; Calibrated or un-calibrated meters; Impedance plane displays; Data recording systems; Alarms, lights, etc.; Numerical readouts; Marking systems; Sorting gates and tables; Cut-off saw or shears; Automation and feedback; Information on the product; Information on test conditions; Preparation of written instructions; Use of other NDT methods; Reference blocks; Operating conditions; Calibration curves; Settings; Evaluation; Reporting; User standards and operating procedures; Inspection system output; Accept/reject criteria; Signal classification processes; Detection of signals of interest; Flaw sizing techniques; Calculation of flaw frequency; Sorting for properties related to conductivity; Thickness evaluation; Measurement of ferromagnetic properties; Personnel qualification (according to EN 473 and ISO 9712); Equipment verification; Written instructions; Format of working procedures; Traceability of documents; Other NDT qualification and certification systems; and A review of applicable NDT application and product standards.

Electromagnetic Testing Techniques
Introduction, fundamental theory, magnetic methods, eddy currents: principles, eddy current methods, microwave methods of testing, miscellaneous methods, Barkhausen effects, laboratory experiments.

Emerging Technologies
The aim of the module is to allow students to identify, critically examine and debate a range of current and social issues in information technology, and in so doing develop a critical awareness of the impact of current and emerging technology. It will enable students to gain a broad general knowledge of some current research areas in computing and their application in industry and commerce. Examples of topics included (but not limited to) are server virtualization, big data,

cloud computing, fog computing, mobile computing, new generation wireless technologies, Homomorphic Encryption, 3-D Displays, Biometrics and Human-Robot Collaboration in the Workplace

Engineering Programming 4
Object-Orientated design and development.

Financial Accounting
Introduction to Accounting; books of prime entry; the ledger; fixed assets; stocks; debtors; creditors; control accounts; results of operations and financial positions; elementary analysis and interpretation of financial statements; clubs and non-profit organisations and introduction to partnerships.

Financial Accounting II

Advanced partnerships; company accounting; close corporations; incomplete records and correction of errors; funds statement and cash flow statement; insurance claims; analysis and interpretation of financial statements (intermediate); royalty accounting; contract accounts and branch accounting.

Financial Information Systems II Practical
Excel basic operations, functions and formulas, simple VBA programs with Excel, program control, Arrays.

Financial Information Systems II Theory
Enterprise Information Systems; database design for each business process; business analysis and management; functional business systems; enterprise modelling and process modelling.

Financial Information Systems III Practical
More advanced VBA programming with Excel, macros, VBA and Access, SQL, Data validation and error trapping, Programming with ADO.

Financial Information Systems III Theory
Advanced database theory, and information system-based project management.

Financial Management
Basic financial management; principles of budgeting; principles of managerial finance; introduction to financial statements; forms and sources of financing.

Fracture Mechanics
Introduction, structure and deformation in materials, survey of engineering materials, mechanical testing: tension test and other basic tests, review of complex and principal states of stress and strain, yielding and fracture under combined stresses, fracture of cracked members, fatigue of materials: introduction and stress-based approach, stress based approach to fatigue: notched members, fatigue crack growth, strain-based approach to fatigue, time-dependent behaviour: creep and damping, laboratory experiments.

Haematology II:
The module is one of two modules based on the study of blood. After completion of this module the student will be able to understand and apply basic haematology concepts and principles, assemble the diagnostic criteria used to identify and classify erythrocytes, haemoglobin disorders, anaemia, platelets and coagulation & bleeding disorders. These concepts aid in haematological evaluation leading to an accurate interpretation.

Haematology III
The study of blood continues in Haematology III. The module covers basic haematology concepts and principles, diagnostic criteria used to identify and classify leucocytes, leukocytes disorders and leukaemia. These concepts aid in haematological evaluation leading to an accurate interpretation of haematological specimens.

Immunology:

This module is based on the study of the molecular and cellular components of the immune system. It includes diagnostic techniques used in immunology, antigen-antibodies reactions and complement. This information forms a base for the body's immune response in a wide range of human diseases. Thus, it is an integral part of life science.

Information Systems I

Introduction to computer concepts, hardware, programming, SDLC, impact of computers on society and DBMS principles. Relational database design and basic implementations of database.

Information Systems II

Systems analysis; design and development; using SQL and PL / SQL; SDLC; basic project management and DBMS principles.

Information Systems III

Advanced database systems and implementation, IT-based operational research.

Information Technology Skills I

Basic IT skills – Entrepreneurial skills; Inter personal communication skills and legal aspects.

Inorganic Chemistry II

An introduction to chemical bonding; Advanced study of ionic bonds; Covalent bonding and molecular structure; Chemical reaction in aqueous solutions; Solvent for non-aqueous solutions; Redox chemistry; Group A elements and Hydrogen.

Inorganic Chemistry III

Bonding; Ligand field theory; Descriptive chemistry of transition elements and Nuclear chemistry.

Inorganic Chemistry IV

Advanced atomic structure; Molecular structure and bonding; Molecular symmetry; Advanced d-metal complex; Electronic spectra; Reaction mechanism of d-metal complexes; Main group organo-metallic compounds; d and f organo-metallic compounds; Catalysis and Descriptive industrial chemistry.

Introduction to Fracture Mechanics

Difference between stiffness and strength; Mechanical properties of materials; Shearing stress and strains; Tensile testing; Composite materials; Examples of how to use formulae in this chapter; Failure rate; Modes of failure; Modes of fracture; Stress concentration effect of flaws; Griffith's theory; Brittle fracture; Ductile fracture; Relationship between energy rate and stress field approaches; Theoretical tensile strength; Theoretical shear strength; Stress intensity factor; Toughness; Fracture toughness; Crack opening; Stress approach (Fracture Mechanics); Stress concentration effect of flaws; Stress concentration factor; Geometric stress concentration factor; Stress intensity factor; Impact toughness; Theoretical shear strength; Cohesive strength; Factors affecting crack propagation; Crack growth and fracture; Some nonlinear aspects of fatigue crack propagation; The Paris-Erdogan equation; The Paris crack growth rate law; Application to quality control of materials and fabrication; Monitoring of fatigue crack length; Fatigue methodology; Mechanisms; Paris Law; Fibers and matrix; Advanced composite materials; Laminate theory; Shear buckling; Fiber-reinforced composites; Manufacturing and in-service damage; Adhesives; Sandwich structures; Joining polymer matrix composites and resin matrix composites; Bonded against bolted joints; Mechanical fastening; Non-destructive testing methods; Types of forging processes; Statistics; Weibull statistics for failure; Strength analysis; NDT hardness testing; Impact testing; The characteristics of creep; Creep and creep testing; Creep parameters; Stress state in cylindrical pressure vessel; Manufacture technology of pressure vessel; Geometry of considered pressure vessels; Stress intensity factor for a through-cracked cylindrical pressure vessels; Fracture toughness; Hooke's Law; Practical applications; Fatigue; Maintain a chain of custody; Photos and other records; Examination in your laboratory or service laboratory; Storage; Deposition; Pre-trial preparation; Trial testimony; Cross-examination; and The technical report.

Introduction to Medical Technology

Introduction to Medical Technology is a module that deals with the basic concepts of Medical Laboratory science. It exposes the students to glassware and apparatus used in a laboratory. The basic concepts of medical law and ethics enable the student to understand the necessary attributes required from students entering the field. Career pathing and work conditions is a part of the module which is intended to put the learner in pole position to make an informed decision regarding Medical Technology as a career.

Introduction to Non-Destructive Testing – Theory

Measurement; SI Unit; List of symbols; Conversion factors; Non-destructive Testing at Vaal University of Technology; Programme requirements; Levels of NDT certification; Matter and mass; Atoms; Ions; Attraction of charged particles; Atomic number; Metals and non-metals; Neutrons and isotopes; Radioisotopes; Radiant energy or electromagnetic radiation; What is Non-destructive testing? Applications of NDT? When is NDT needed? NDT Methods; Visual inspection; Liquid Penetrant Testing; Eddy Current Testing; Magnetic Particle Testing; Magnetic Flux Leakage (MFL); Radiographic Testing; Ultrasonic Testing; Ground Penetrating Radar; Accidents or hazards; The concept of using an NDT instrument; The process of developing pure science into NDT solutions; Operational definitions of hardness; Testing of large structures; Destructive software testing; Resistance welding; New developments in welding; Weld joints; Weld defects; Properties of metals; Manufacturing; Effects of welding; Heat-treating; Reasons for testing welds; Quality control; Testing of welded joints; Destructive testing; Differences between destructive and non-destructive techniques; Casting steel; Forging techniques; Machining process; Diagrams displaying welding process; What is Ground Penetrating Radar?; Electromagnetic energy; Principle of GPR; GPR reflected and transmitted signals; Requirements for void testing; Limitations of GPR; Image processing to detect the signal and size of a void; Interpretation of GPR; Safety; Examples of structure inspection; Sample space and events; Probabilities on events; Conditional probabilities; Probability of detection; Stress and strain; Elements of fracture mechanics; Environmentally assisted cracking in metals; Hardness testing; Engineering materials; Cracks; What is a signal?; Transducers and sensors; Different categories of electrical signals; Time-domain and frequency-domain; Analog and digital signals; What is digital signal processing?; Sampling; The Decibel unit; DSP applications; Mathematical definition of a signal; Comparison between digital signal processing over analog signal processing; Some special basic discrete signals; and Pulse characteristics.

Introduction to Non-Destructive Testing – Practical

Mineral-based material; Metallic material, including welds; Organic-based materials; Other materials and products (employer defined); History; Terminology; Use of visual testing as a complement to other NDT methods; Applications; Personnel qualification and certification; Relevant standards; Fundamentals; Photometry; Vision; Lighting; Electromagnetic radiation; Visible wavelengths; Fundamentals of light; Light measurement; Luminance; Optical principles; Visual perception; Material attribute affecting the test; Environmental factors and physiological factors; Comprehensive knowledge and understanding of the physical principles and physics of light including; Optical performance; Types of light sources, natural, artificial including laser; Details of the eye including; Camera and photo sensor operation and principles; Principles of operation of fibre bundles and lenses; Photogrammetry; Advantages and limitations; Outline of basic flaws detectable by VT as necessary to work in a specific sector; Including cladding and buttering; Material composition; In-service aspects; Capability and limitations of VT; Detect ability; Associated techniques; References; Evaluation of surfaces; Roughness and waviness; Definition of shape and geometry of flaws; A comprehensive understanding and knowledge of manufacturing process and associated metallurgy and flaw types, etc.; A comprehensive understanding and knowledge of the cause and formation of in-service defects including associated metallurgy and flaw types, etc.; Introduction to, and applications of, equipment introduction to equipment; Pre-test documentation (EN 13018); The development and application of verification techniques including the demonstration of procedures and instruction of effectiveness.; A thorough knowledge of complementary NDT methods that may be referenced in written procedures; Equipment variables affecting test results including type and intensity of light; Material variables affecting test results including the variations of surface finish; Discontinuity variables affecting test results; Determinations of dimensions (i.e., depth, width, length, etc.); Sampling/scanning procedure variables affecting test results; Process for reporting visual discontinuities; Personnel (human factors) variables affecting test results; Detection; Selection of parameters; How to setup and calibrate a test; Diagrams and drawings; Raw materials; Primary process materials; Joining processes; Fabricated components; In-service materials; Coatings; Other applications; Evaluation and disposition criteria; Audio/video-requirements; Reporting the results of tests; Technique reports; Data reports; Image recording methods; Personnel qualification (according to EN 473 and ISO 9712); Developments; Safety and health; Activities; Defect rectification, removal and repair; Quality; Management and leadership; Core values; Strategic quality planning; Customer satisfaction; Customer feedback; Problem-solving; Continuous process improvement; Deming's points; NDT personal and academic

traits sought by employers; Factors that can lead to rejection of employment; Factors that may lead to termination from a job; Records keeping and testimony; Communication; Team work; Problem solving; Initiative and enterprise ; Planning and organizing; Self-management; Learning; and Technology.

IT Auditing

An IT audit is the examination and evaluation of an organization's information technology infrastructure, policies and operations. Topics that can be included (but not limited to) is: IT Governance, Legal and Ethical issues for IT auditors, IT Risks and controls, IT deployment risks, IT networks and telecommunication risks, E-business risks and controls.

IT Management

This module aims to equip the student with the theory and knowledge to manage all the information technology resources of a firm in accordance with its needs and priorities. These resources may include tangible investments like computer hardware, software, data, networks, and data centre facilities, as well as the staff who are hired to maintain them. Managing this responsibility within a company entails many of the basic management functions, which the student will learn about, such as budgeting, staffing, change management, and organizing and controlling, along with other aspects that are unique to technology, like software design, network planning, tech support, Business/IT alignment, IT governance, IT financial management, IT service management, Sourcing, IT configuration management etc.

Liquid Penetration Testing – Theory

Difference between liquids and gases; Force and mass; The international system of units (SI); SI unit prefixes; English gravitational unit system; Density; Relatively density; Specific weight; Specific gravity; Principles in hydrostatics; Three phases of matter; The hydrostatic equations; Incompressible fluids; Mercury barometer; Compressible fluids; Pressure across a flat fluid/fluid interface; Pascal's law; Hydrostatic paradox; Principle of Archimedes; Stationary flow; Continuity principle, Bernoulli's equation; Application of Bernoulli's equation, Viscosity; Physical phenomena underlying penetrant testing; Contraction of a liquid surface; Free energy of the surface of a liquid; Contact angles; The spreading of liquids on solids or liquid surface; Surface energy versus surface tension; Interphase tension; Pressure at a curved surface; Introduction to bubble dynamics; Bjerknes forces; Capillarity; Dissolution (dissolve); Adsorption; Capillary condensation; Adhesion (cling); Cohesive and adhesive forces; Relation of surface energy to bonding; Anisotropy of surface energy; Structural features of liquid crystals; Characterization of liquid crystals; Applications of liquid crystals; Defects; Properties of the order parameter tensor; Three types of liquid crystals; Diffusion; Fick's first law; Fick's second law of diffusion; Solution of Fick's 2nd law; Mechanisms of diffusion; Defects penetrated by liquids; Blind capillaries; Advantages of the penetrant testing; Re-deal wash burn equation; The effect of non-circular cross section; Entrapped air; Effect of fluid elasticity; Colour; Dyes; Codes; Standards; specification; Procedures; Defect rectification; Removal and repair; Quality management and leadership; Core values; Strategic quality planning; Customer satisfaction; Customer feedback; Problem-solving; Continuous process improvement; Deming's point; NDT personal and academic traits sought by employer; Factors that can lead to rejection for employment; Factors that may lead to termination from a job; and Records keeping and testimony.

Liquid Penetration Testing – Practical

Practical sessions; Laboratory periods; Welding process; Casting process; Processes of rolled bars; Indication from cracks; Discontinuities inherent in various materials; Discontinuity categories; Processing discontinuities; Service discontinuities; Influence of manufacture and material; Effects of metal smearing; Brief history of Non-destructive testing and liquid penetrant testing; Purpose of liquid penetrant testing; Method of personnel qualification; Terminology; Why penetrant inspection improves the detectability of flaws; Physics of how penetrants work; Proper selection of PT as method of choice; Liquid penetrant processing; Types of penetrants; Characteristics of penetrants; Verification that the test object is in suitable condition for testing; Factors affecting indications; Written procedure with check reports; Effects of test object factors on process; Design and operation of penetrant installation and units; Materials for liquid penetrant testing; Environmental and safety conditions (Material safety data sheets (MSDS); Light sources; Measuring units and reference blocks (EN 3452-3 and EN 3452-4); Ultraviolet Light Safety; Information about the test object, prepare written instructions according to EN 1371-1, EN 571-1 EN 10228-2, EN 1289; Calibration ;Assessment of discontinuities; Evaluation of indications on metallic materials and non-metallic materials; Testing and maintenance materials Personnel qualification (according to EN 473 and ISO 9712); Equipment verification; Test material control samples; Penetrant tests; Quality control of wash temperature and pressure; Quality control of drying process; Quality control of lighting; Advantages and disadvantages of penetrant testing; Inspection procedures (minimum requirements); Standards/codes (Current ASTM and

ASME standard methods-ASTM E165, E 1208, E 1209, E 1210, and E1417); Applicable method/processes (Characteristics of each method and general applications of each method; and Acceptance criteria.

Magnetic Particle Testing – Theory

Induced magnetic fields; Circular and longitudinal fields; Advantages and disadvantages of MPT; Gradient (Vector operators); Vector integration; Curl; The vector differential operator; Differential vector identities (For any vector $\vec{F}$ and scalar φ); Direction angles, Direction cosines; Mathematical preliminaries; Coordinate systems; Cartesian coordinate system; Del (∇) operator; Gradient of a scalar, $V(=\nabla V)$; Divergence of a vector, $A(=\nabla.A)$; Curl of a vector $(\equiv \nabla \times A)$; Laplacian operator (∇^2); Determinants; Matrices; Permutations; Basic series; Exponential series; Sine and cosine series; $Sin\ h$ and $Cos\ h$ series; Hyperbolic functions; Sine, cosine, tan and cot functions; Partial derivative; Some differentiation formulae; Some useful integration formulae; Integral theorems; Divergence theorem; Magnetic fields; Magnetic pole; Lines of force; Magnetic effects of steady currents; Magnetic flux density and magnetic field intensity; Magnetic moment; Force in magnetic field; Magnetization and amperian current distributions; Magnetic field produced by a magnetic material; Magnetic pole density; Magnetic field intensity; Ampere's circuital law; Demagnetization; Magnetic circuits used in inspection; Current requirements for MPT; and Forces on particles.

Magnetic Particle Testing – Practical

History; Applicability and limits; Terminology (EN 1330-7) associated with Magnetic particle testing; Product technology; Effect of discontinuities of material; Effects of discontinuities on materials; Theory of magnetic fields; Theory of magnetism; Electric circuits; Magnetic circuits; Magnetic field created by electric circuits; Flux fields; Nonmagnetic materials; Magnetic materials; Bar magnet; Ring magnet; Magnetic fields characterization and measurements; Inspection materials; Influence of the interface between a magnetic medium and a nonmagnetic medium; Influence of the orientation of the discontinuity on magnetic flux; Behaviour of a magnetic particle in the vicinity of a magnetic flux; Influence of geometry (depth, thickness and orientation) on detectability; Magnetic properties of principal ferromagnetic alloys; Principles of magnetic particle testing; Equipment selection considerations; Manual inspection equipment; Medium-and heavy-duty equipment; Mechanized inspection equipment; Portable type; Stationary type; Multidirectional units; Liquid requirements as a particle vehicle; Ultraviolet radiation and fluorescence; Light sensitive instruments; Magnetizing equipment; Viewing condition; Measurement and calibration; Sources of light and conditions of illumination; Accessories; Considerations on the choice of the equipment (EN ISO 9934-2 and EN ISO 9934-3); Current flow technique; Identification or designation material; Preparation of written instructions; Presentation of the standards and codes ; Testing according to written instructions; Use of standards e.g., ASTM E 1444, E 709; Defect appraisal; Manufacturing process; Possible causes of defect; Use of part; Acceptance and rejection criteria; Use of tolerances ; Magnetic particle test indications and interpretations; Effects of discontinuities on materials and types of discontinuities indicated by magnetic particle testing; Preparation of the parts and influence of the surface quality; Means of magnetization; Values of the parameters; Continuous or simultaneous method; Remanence method; Flux indicators; Choice of the detection media products indicators; Treatment of components after test; Demagnetization; Principle, minimal value of the magnetic field of demagnetization, frequency, effect of skin and calculation of magnetizing coil; Level of residual field according to the later use of material; Influence of terrestrial magnetic field; Cleaning of the components; Test report ; Basics of evaluation, viewing conditions (EN ISO 3059) according to reference block, other used reference blocks, calibration of test units, Report of simple welding, forging, rolled products and casting; Imperfections Report of imperfections according to EN 1290, EN 1369, EN 10228-1; Evaluation and verification of the indication quality; Circular field; Longitudinal fields; Precautions-safety and overheating; Contact prods and yokes; Discontinuities commonly detected; Selecting the proper method of magnetization; Principles of demagnetization & procures; Classification of the indications; Report of simple welding, forging, rolled products and casting imperfections; Malfunctioning of equipment; Proper magnetic particles and bath liquid; Bath concentration; Tests for ultraviolet radiation intensity; Personnel qualification (according to EN 473 and ISO 9712); Equipment verification; Traceability of documents; A review of applicable NDT application and product standards; Format of working procedures; Other NDT qualification and certification systems; Precautions for ultraviolet radiation; Health and safety; Safety data sheet; Harmfulness and toxicity of the products; Treatment and rejection of the effluents, environmental conditions; Fire hazards; Risks related to the ultraviolet radiations and; and Laboratory work.

Microbiology 3A AHMMT3A &AHMMP3A

This field of microbiology encompasses the epidemiology, pathogenesis, pathology and laboratory diagnosis of bacteria that causes diseases such as tuberculosis, listeriosis, cholera etc. It also includes the determination of the sensitivity and mechanisms of antibiotic resistance.

Microbiology 2A AHMMT2A &AHMMP2A

This covers the diseases that are caused by viruses (e.g. HIV and rabies), parasites (e.g. malaria and bilharzia) and fungi (e.g. thrush and ringworms). Epidemiology, pathogenesis, pathology, laboratory diagnosis and treatment are covered

Microbiology Semester 1 (AHNMB1A)

Microbiology focuses on microbial transmission and reproduction. The principles of infection control and the role of the immune system.

Microbiology

The module is the study of microorganisms, such as bacteria, viruses and fungi. It includes the physiology, cell biology and clinical aspects of microorganisms. It also includes the various techniques used to identify and isolate and control the organisms.

Molecular Biology

The module is the study of biology or science at molecular level. It deals with the structure and function of DNA, RNA and proteins as well their interactions in cellular processes

Non-Destructive Testing Project (Numerical Methods and Matlab Applications)

Choosing a project; Steps to be followed; Finishing on time; Writing a report; Project report format; Getting started; Prose; Style considerations; First versus third person; References; Plagiarism; Get organized; Categories of NDT modelling; A brief history of some aspects of NDT modelling; The modelling process; Mathematical model; The solution of nonlinear equations $f(x) = 0$; Fixed point interaction; Bisection method; New-Raphson method; The solution of linear systems $Ax = B$; Gaussian elimination; LU factorization; Cholesky factorization; Gauss-Seidel method; Inverse matrix; Interpolation and polynomial approximation; Cubic splines; Hermite polynomial; Chebshev approximation polynomial; Numerical differentiation; Differentiation of the Newton polynomial; Richardson extrapolation; Numerical integration; Trapezoidal rule; Composite Trapezoidal rule; Newton-Cotes integration; Gauss-Legendre Two-point rule; Monte Carlo integration; Euler's method for ODE's; Runge-Kutta method Finite difference method; Four windows of Matlab; Vector variables; A minimum Matlab session; Tutorial lessons; Basic plotting; Entering a matrix; Matrix indexing; Colon operator; Linear spacing; Colon operator in a matrix; Creating a sub-matrix; Deleting row or column; Dimension; Continuation; Transposing a matrix; Concatenating matrices; Matrix generators; Special matrices; Solving linear equations; Matrix inverse; Matrix functions; M-File scripts; M-File functions; Input to a script file; Output commands; Control flow; Saving output to a file; Debugging process; Correcting the ending debugging; Ending debugging; Correcting an M-file; Defining vectors in Matlab; Vector Transpose; Computing the outer product in Matlab; Diagonal matrices; Identity matrices; Matrix inverse; Symmetric matrices; Reflection coefficients; and Design of absorbers.

NDT Project IV

This project will involve multi-disciplinary industrial projects in NDT subjects in which the findings will be communicated through a written report. Most of the work will be including Matlab calculations

Numerical Analysis with Matlab Applications

An introduction to Matlab, linear equations and eigensystems, roots of equations, differentiation and integration, differential equations, boundary value problems, fitting functions to data, optimisation methods, Matlab fundamentals.

Optical Testing Methods

Devices for surface and size testing, photometrical techniques of sizing, photoelectric measuring microscope, photoelectric autocollimator, laser scanning microscope, microscope with image camera tube, holographic technique of transparent material structure analysis, endoscopes, interference systems of testing, laser flaw detectors, fiber-optic devices of testing, error analysis, principles of photoconductivity, simple models, impurities, principles of luminescence, laser principles, laboratory experiments.

Organic Chemistry II

Polar covalent bonds; Organic compounds – Alkanes and cyclo alkanes; Overview of organic reactions – Alkenes, Alkenes and alkynes and Armatic compounds.

Alkyl halides; Alcohols, ethers and phenols; Aldehydes and ketones – nucleophillic addition reactions; Carhooxylic acid and derivatives and Amines.

Organic Chemistry III

Hybrid orbitals; Stereochemistry and comformational analysis; Acids and bases; Nucleophilic reactions at unsaturated carbon; Nucleophilic substitution at saturated carbons; Elimination reaction; Electrophilic and nucleophilic aromatic substitutes; Carbohydrates; Amino acids, peptides and proteins; Radicals; Determination of organic structure; Polynuclear aromatic compound and Fats, oils and waxes.

Organic Chemistry IV

Application of spectroscopy in organic chemistry; Combined structure problems; Aspects of energy and raw material supply; Chemicals from ethylene and / or Acelylene and Polymerisation

Penetrant Testing Methods

Basic principles of Penetrant testing, penetration of liquids into defects, spreading of Penetrant along the surface, hydrodynamics of the developing process, visual recognition of indications, outlook for further developments in Penetrant testing, laboratory experiments.

Physical Chemistry II

Gases, liquids and solids; Solutions and their properties; Chemical kinetics; Acid-base equilibria and Electrochemistry.

Physical Chemistry III

Chemical thermodynamics; Change of phase; Electrochemistry; Reaction kinetics; Solid state chemistry and Surface chemistry.

Physical Chemistry IV

Thermodynamics; Entropy; Quantum mechanics; Molecular spectroscopy; Advanced kinetics and Surface chemistry.

Physics I

Introduction (S1 units and conversion); Waves and sound; Introduction to vectors; Kinematics in one and two dimensions; Forces and Newton's law of motion; Work and energy; Impulse and momentum; Electricity; Fluids; Temperature, heat and the transfer of heat; Electric forces, fields, potential energy and circuits; Reflection, fraction and interference of light; and Nuclear physics and radioactivity.

Physics II – Theory

Electric circuits (alternating current, Kirchhoff's Rules, RCL Circuits); Magnetic forces and magnetic fields; Electromagnetic induction; Fluids (Archimedes principle, Poseuille's Law); Thermodynamics; The ideal gas law and kinetic theory; The nature of the atom; X-rays; Lasers; Ionising radiation; Nuclear energy and elementary particles; Dynamics of uniform circular motion; Rotational kinematics; Rotational dynamics; Simple harmonic motion and elasticity

Physics II – Practical

Experiments are in-line with the theoretical content.

Force constant of a helical spring; Static versus dynamic method; the mass of a ruler using torque; Relative density of a liquid by application of Archimedes' Principle; The influence of pressure difference on flow rate; the effective capacitance of two capacitors in series of two capacitors in parallel; the time constant and half-life of a RC-circuit (resistor – capacitor capacitor).

Programming I and II

Programming concepts; Structured and object-orientated programming.

Programming Logic I

Structured and object-oriented programming concepts and algorithms. Testing and desk checking algorithms.

Radiographic Testing – Theory

History of radiographic testing; Measurements and units; Periodic table; Protons, Electrons; Ions; Neutrons; Atomic number; Atomic mass; Nucleon number; Isotopes; X-rays; Beta-rays; Gamma-rays; Alpha decay; Beta decay; Gamma decay; Half-life; Radio-active decay; Radiation detectors; Nature of X-rays; Nature of Gamma-rays; Making a radiograph; Intensifying screens; Scattered radiation; Types of film; Production of X-rays; The X-ray tube; Cooling; Focal-spot size; Effects of Kilovoltage; Flash X-ray machines; High-voltage equipment; Application of various types of X-ray apparatus; Principles of radiography (Geometric principles); General principles; Radiographic shadows; Application to radiography; Calculation of geometric unsharpness; Pinhole projection of focal spot; Radiation emitted by source; Inverse square law; Radiation absorption in the specimen; Exposure factor; Determination of exposure factors; contrast; Choice of film; Radiographic sensitivity; Multiple film techniques; Effects of processing; Lead foil screens; Lead oxide screens; Fluorescent screens; Cassettes and film holders; Reduction of scatter; Mottling caused by X-ray diffraction; Scattering in 1 – and 2 – million-volt radiography; Multimillion-volt radiography; Relations of Millioamperage (source strength), distance, and time; The reciprocity law; Logarithms; Photographic density; Densitometers; X-ray exposure charts; Preparing an exposure chart; Gamma-ray exposure charts; The characteristic curve; Use of the characteristic curve; Graphical solutions to sensitometric problems; Sliding scales for exposure charts; Estimating exposures for multithickness specimens; Use of multiple films; Limitations of exposure charts; Subject contrast; Film contrast; Film graininess, screen mottle; Penetrameters; Viewing and interpreting radiographs; Selection of films for industrial radiography; Film packaging; Handling of film; Identifying radiographs; Shipping of unprocessed films; Storage of unprocessed film; Storage of exposed and processed film; Commercial keeping; Additional storage suggestions; General considerations; Manual processing; Automated film processing; Film radiographs; Equipment and materials; General aspects; Technique; Processing area; General considerations; Intensification of underexposed radiographs; Removal of fixing agents; Testing for fixer removal; Removal of one emulsion from double-coated film; Tray processing; Silver recovery from fixing solutions; In motion radiography; Radiography of radioactive materials; Depth localization of defects; Thickness measurement; High speed radiography; Geometric enlargement; Neutron radiography; Autoradiography; Duplicating radiographs; Fluoroscopy; Photofluorography; Microradiography; Electron radiography; X-ray diffraction; Advantages of paper radiography; Applications for paper radiography; Factors affecting paper radiography; Exposure techniques; Processing techniques; Stabilization processing; Automated processing; Manual processing; Viewing paper radiographs; Interpreting paper radiographs; The characteristic curve; Density-exposure relation; Reciprocity law failure; Effect of development time on speed and contrast; X-ray spectral sensitivity; The Gurney-Mott theory; X-ray latent image; Development; Radioactive materials; Interaction of radiation matter (Photoelectric effect, Compton scattering, Pair production); Radiographs; Exposure techniques; Radiographic safety principles; and Film interpretation.

Radiographic Testing – Practical

Manufacturing processes and associated discontinuities, History and discovery of radioactive materials; Fundamental properties of matter; Radioactive materials; Types of radiation; Principal methods of detection of X-rays; Limiting wave length of X-rays; Scattered radiation; Properties of radiation; Radiographic safety principle review; Photon; Energy; Principle of radiography; Advantages of radiography; Disadvantages of radiography; Basic equations; Geometric exposure; Exposure devices and radiation sources; Generation of X-radiation; Advantages of gamma rays over X-rays; Disadvantages of gamma rays over X-rays; Gamma radiation; Atom; Interaction of radiation with matter; Build up factor, Radiographic safety principle review; Energy; Principle of radiography; Advantages of radiography; Disadvantages of radiography; Geometric exposure; Exposure devices and radiation sources; Generation of X-radiation; Advantages of gamma rays over X-rays; Gamma radiation; Theoretical concepts; Principle of transfer analysis; Quantitative measurements using a near mono-energetic X-ray sources; Design of operation of X-ray machines; Design and operation of gamma ray devices; Information about the test object and national requirements; Testing conditions; Applicable standards; Standard assigned to the test object; Preparation of written instructions; Selection of standards for specific test applications; Product specific standards for special industrial sectors; Working with exposure charts; Film handling, Loading and processing; Darkroom facilities, Techniques, and processing; Exposure techniques; Radiography; Fluoroscopic Techniques; Radiographic image quality; Radiographs; Properties of film systems screens and digital detection systems; Influence on detectability; Radiographic viewing; Standards, codes, and procedures for radiography; Evaluation of castings; Evaluation of weldments; Test report; Check of test report; and Feasibility of test report.

Radiographic Testing Techniques

Radiographic interpretation, digital radiographic imaging, computed tomography, image data analysis, backscatter imaging, special radiographic techniques, neutron radiography, radiographic testing of metal castings, radiographic testing of welds, radiographic testing in utility, petroleum and chemical industries, aerospace applications of radiographic testing, laboratory experiments.

Research Methodology for IS and Technology

The student must be able to apply different research methodologies to a research topic of their choice in the Information Technology field. This module will offer the theoretical underpinning for understanding which method, set of methods, or so-called "best practices" that can be applied to specific cases. Students will study in detail some of the following topics: Business research methods, Research designs, qualitative, quantitative, and mixed methods approaches, doing a successful research project: using qualitative or quantitative methods. Students should also be able to apply the main research methods used in IS research; They should understand and apply the main concepts underlying the selection of a research method for different types of research questions and stages of research, and develop an appreciation of the importance of both rigour and relevance in IS research.

Research Methodology

Application of research methodology principles in proposal writing, scientific writing skills and article analyses. (Additional content)

Research Project for IS and Technology

This module aims to support students in the identification of a research field within the discipline of Information Technology (IT), and the definition of an individual research project. Students will explore the meaning of a research culture in the form specific examples of current projects presented by the lecturers and other staff and postgraduates of the department. They will learn how to research and present an outline of their chosen field and project, and to deliver a mini dissertation on a chosen project and to prepare them for further postgraduate studies and articulation into an appropriate master's programme.

Signal Processing

A concept of a signal; Time domain and frequency domain; Notation; Digital and analog signal processing; Sampling; The Decibel unit; Quantization error and noise; Some special basic discrete signals; General cases of sinusoidal signals; Operations on sequences; Crucial results in discrete-time signal theory; The discrete Fourier Series; Orthogonal functions; Relation to discrete-time Fourier transform; Transformers; Continuous-time Fourier series; Fast Fourier Transform; Properties of time-domain impulse functions; The properties of frequency-Domain Impulse Functions; Periodic Signals; Unit-step function; Correlation as a sliding, windowed operation; A mathematical definition for correlation; Construction of a filter from a continuous function; Correlation; Convolution; Discrete convolution; A convolution model for ultrasonic pulse–echoes; The window functions; Parseval's formula for periodic signals; Deconvolution algorithms and practical considerations; Wiener filtering; Spectral extrapolation; Optimum Wiener filters; Curve-filtering methods; L_2 Deconvolution; L_1 Deconvolution; Sparse deconvolution; Minimizing the cost function; Spiking deconvolution; Predictive deconvolution; and Surface-consistent deconvolution.

Software Engineering

The aim of this module is to further develop and equip students with more advanced skills in the development of software systems of varying size and complexity using fundamental software engineering knowledge, work at various abstraction levels, and with appropriate design principles, tools, and technologies. Potential topics may include (but are not limited to): system re-engineering; model-driven software development; automatic code generation; aspect-oriented software development; service oriented architecture (SOA) and agile software development.

Statistics for IT

The student will, throughout the module, gain an understanding of the strengths and weaknesses of a data-based approach and learn how and when a specific approach is appropriate. The student will also learn practical skills in interpreting statistical information and gain the ability to critically evaluate statistically based arguments. The student will gain practical hands-on experience of applied statistics, using statistical software. Advances in social science research methodologies and data analytic methods are changing the way research in information technology is conducted. New

developments in statistical software technologies for data mining (DM) such as regression splines or decision tree induction can be used to assist researchers in systematic post-positivist theory testing and development. Established management science techniques like data envelopment analysis (DEA), and value focused thinking (VFT) can be used in combination with traditional statistical analysis and data mining techniques to explore behavioural questions more effectively in information technology research.

Strategic Business Analysis

This module will extend students' knowledge and understanding of strategic management, strategic issues and the IT tools and techniques used to support business strategy and analysis. It will introduce a range of contemporary issues associated with the formulation and implementation of corporate and business strategies with an emphasis on identifying and implementing strategic change within the organisation using information technology tools and methodologies, building dynamic capabilities, and developing coherent strategies. Issues might include IT supported strategies for a recession, global strategies, knowledge-based strategies, firms and industries, strategies where profit is of secondary (or no) importance. The module will also extend students' theoretical knowledge by presenting contemporary debates and issues in strategic thinking and knowledge economies, and how IT can be used to support or solve strategic issues in businesses.

System Software I

CISCO IT Essentials: The IT Essentials: PC Hardware and Software curriculum provides an introduction to the computer hardware and software skills needed to help meet the growing demand for entry-level information and communication technology (ICT) professionals. The curriculum covers the fundamentals of PC technology, networking and security and also provides an introduction to advanced concepts.

System Software II

(CISCO) – CCNA Discovery Course: networking for home, small businesses and ISPs. The course provides a hands-on introduction to networking and the Internet using tools and hardware commonly found in the home and small business environments. The students will also cover an introduction to routing and remote access, addressing and network services. They are also familiarised with servers providing e-mail services, web space and authenticated access.

Thermographic Testing Techniques

Getting started with thermography for nondestructive testing, introduction to thermal emission, introduction to heat transfer, infrared sensor and optic fundamentals, images, automated image analysis, IR thermography, IR detectors for thermographic imaging, getting the most from the IR camera, filters, ultra-high-speed thermography, laboratory experiments.

Ultrasonic Testing – Theory

Modes of ultrasonic waves; Flaw detection on tubes and bars; Curved surfaces; Pipe and pipe line inspection; Advantages of ultrasonic testing; Limitations of UT; Sound Velocity; Sound in solids, liquids and gases; Wave characteristics; Pulse characteristics; Doppler principle; Resonance and anti-resonance; Ultrasonic wave equation; Reflection and transmission; The law of refraction; Boundaries; Embedded layers; Guided waves; The physics of bulk wave radiation; Waves in three dimensions; Generating a narrow beam at low frequencies; Bulk wave equations; Bulk wave background; Equation of continuity; Wave equation for sound propagation in fluid; Energy; Acoustic pressure and specific acoustic impedance; Continuity equation; Force equation; Linear continuity equation; Linear force equation; Linear wave equation; Velocity potentials; Sound speed values; Surface wave velocity (Rayleigh wave velocity); Derivation of a wave equation for bulk material; Dispersion; The Rayleigh wave equation; Uses of surface waves; Lamb wave theory; Love waves; Isotropic surface; Measurement of Poisson's ratio; Newton's laws and Hooke's law; Simple undamped oscillators; Damped oscillator; Forced damped oscillator; Resonance; Dirac delta function; Fourier series; Non-periodic waves; Wave motion; Harmonic waves; Dispersion, group velocity and wave packets; Decibel notation; Decibel scale of attenuation; Utilizing the attenuation; Relaxation time formulation for viscosity; Beam attenuation; Physical characteristics of attenuation; Point source; Ultrasonic beam characteristics; Ultrasonic transducers; Piezoelectric transducers; Transducer characteristics; Ultrasonic circuitry for piezoelectric transducers; Beam characteristics; The propagation of longitudinal waves in piezoelectric materials; Composite piezoelectric material; The shape of the piezoelectric disc; Driving pulse shape; Ultrasonic beam modification techniques for piezoelectric probes; and Diffraction.

Ultrasonic Testing – Practical

Practical sessions; Laboratory periods; Various defects related to the manufacturing processes and service-induced defects related to the defined sectors; Heavy forgings; Worked parts of machines; Railway material; Plate and strip; Semi-finished products: Rods, billets and wires; Casting; Welded Joints; Joints produced by riveting, gluing and shrinking; Non-metallic specimens; Composite structures; Bounded structures; Miscellaneous product forms as applicable (rubber, glass, etc.); Task of non-destructive testing – Personnel; History of NDT; Terminology of NDT (EN 1330-1 and EN 1330-; Terminology of UT (EN 1330-4); History of ultrasonic testing; Applications of ultrasonic testing; Overview of standards: ISO, (EN 583-1 to EN 583-6 and EN 14127)and national (general, and products); Responsibilities of levels of certification; Review of mathematical basics ;Various types of wave modes; Near and far fields The piezoelectric effect; Ultrasonic transducers; Single crystal zero compression probe; Twin crystal probes; Transducer materials; Transducer type search unit; Transducer groups; Immersion probes; Main groups of flaws in materials; Four facts of testing; Golden rules for NDT; Application of ultrasonic testing; Features of ultrasonic testing; Examples of capabilities of UT; Examples of limitations; Requirements for UT; Ultrasonic vibrations; Characteristics of ultrasonic waves; Reflection of ultrasonic waves; Refraction and mode conversion of ultrasonic waves; Straight beam, angle beam and surface beam transducers; Advantages of contact testing; Limitations of contact testing; The principal advantages of immersion testing; Limitations of immersion testing; Properties of a test specimen that will affect a particular ultrasonic test; Discontinuity conditions; General requirements for successful testing; Test interpretation; Calibration; Compression wave techniques; A-scan rectified and unrectified display; Lamination testing; Inspection of brazed and bonded joints; Shear wave techniques; Inspection of pipes; Surface wave techniques; Causes of material failures; Types of material failures; Procedure of examination; Duplex stainless steel; Inspection of welds; Shear wave root examination; Procedure for the shear wave root examination; Transducer characteristics; Characteristics of the beam of a circular transducer; Attenuation of sound waves; Acoustic impedance; Beam propagation; Ultrasonic testing techniques; Basic pulse-echo instrumentation (A-scan, B-scan, C-scan and Computerized systems); Digital thickness instrumentation; Resonance testing equipment ; Connecting cables Detailed knowledge of the different functions of UT test equipment; Sealing, insulation and flexibility; Couplants; Pulse-echo instrumentation; Calibration; Selection of technical parameters; Object appraisal; Variables affecting test results; Discontinuity variations; Procedure variations; Personnel variations; Detecting, locating (trigonometrical rules) and sizing techniques; Evaluation and confirmation of test reports; and Codes, standards specifications and procedures.

Ultrasonic Testing Techniques

Introduction, the propagation of low amplitude ultrasound, ultrasonic characterization, ultrasonic transducers, the principles of ultrasonic testing, ultrasonic testing equipment, ultrasonic flaw detection, flaw sizing in metals, the testing of metals, the examination of non-metals and adhesive bonds, training, certification and standards, laboratory experiments.

User Experience Design (UXD)

Students choosing this elective might be studying the following topics (but not limited to these): the history of UXD, Elements of User Experience Design, Visual design, Information architecture, Structuring, organization, and labelling, Interaction Design, Usability, Accessibility, Human–computer interaction, General design process and UX Deliverables

Web Development III

Front and back-end based web development. E-commerce principles and management.

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