NATIONAL DIPLOMA: SURVEYING
Qualification code: NDSU03 - NQF Level 6

Campus where offered: Pretoria Campus

Important notification to new applicants:
Students who intend to enrol for this qualification for the first time in 2017 or thereafter, should note that it will not be possible to continue with any Baccalaureus Technologiae as from 2020, since it is being replaced by qualifications aligned with the newly-implemented Higher Education Qualification Sub-Framework. Potential students are advised to consult the University's website for any new qualifications which might not be published in this Prospectus.

REMARKS

a. Admission requirement(s) and selection criteria:

- **FOR APPLICANTS WHO OBTAINED A SENIOR CERTIFICATE BEFORE 2008:**

Admission requirement(s):
A Senior Certificate or an equivalent qualification, with D symbols (50 – 59%) at Higher Grade or C symbols (60 – 69%) at Standard Grade for English and Mathematics, and an E symbol (40 – 49%) at Higher Grade or a D symbol (50 – 59%) at Standard Grade for Physical Science.

Selection criteria:
To be considered for this qualification, applicants must have an Admission Point Score (APS) of at least **20**.

Applicants who do not meet the requirements for Mathematics and/or Physical Science may enrol for Mathematics N4 and/or Engineering Sciences N4 at any Technical and Vocational Education and Training (TVET) college, and if these are successfully passed at a performance level of at least 60%, they may re-apply for admission to the University.

Assessment procedures:
All applications received by the published due dates will be ranked according to the APS achieved. After consideration of the Departmental Student Enrolment Plan (SEP), only the highest ranked applicants will be accepted to fill the available places. A waiting list consisting of the remainder of the applicants will provide an opportunity for applicants to fill places created by accepted students failing to meet the enrolment dates.

- **FOR APPLICANTS WHO OBTAINED A NATIONAL SENIOR CERTIFICATE IN OR AFTER 2008:**

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

Applicants who do not meet the requirements for Mathematics and/or Physical Science may enrol for Mathematics N4 and/or Engineering Sciences N4 at any Technical and Vocational Education and Training (TVET) college, and if these are successfully passed at a performance level of at least 60%, they may re-apply for admission to the University.

Selection criteria:
To be considered for this qualification, applicants must have an Admission Point Score (APS) of at least **20**.

Assessment procedures:
All applications received by the published due dates will be ranked according to the APS achieved. After consideration of the Departmental Student Enrolment Plan (SEP), only the highest ranked applicants will be accepted to fill the available places. A waiting list consisting of the remainder of the applicants will provide an opportunity for applicants to fill places created by accepted students failing to meet the enrolment dates.

- **FOR APPLICANTS WHO OBTAINED A QUALIFICATION FROM TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING (TVET) COLLEGES (PREVIOUSLY KNOWN AS FET COLLEGES):**

  Candidates with a National Certificate (Vocational) at NQF Level 4:

  Admission requirement(s):
  A National Certificate (Vocational) at NQF Level 4 with a bachelor's degree or a diploma endorsement, issued by the Council for Quality Assurance in General and Further Education and Training (Umalusi), with at least 50% (APS of 4) for English and Mathematics, and at least 60% (APS of 5) for Physical Sciences/Applied Engineering Technology and any other two vocational subjects.

  Selection criteria:
  To be considered for this qualification, candidates must have an Admission Point Score (APS) of at least **23**.

b. *Minimum duration:*
Three years.

c. *Presentation:*
Day classes. Classes and assessments may take place on Friday afternoons and/or Saturdays.

d. *Intake for the qualification:*
January only.

e. *Exclusion and readmission:*
See Chapter 2 of Students' Rules and Regulations.

f. *Recognition of Prior Learning (RPL), equivalence and status:*
See Chapter 30 of Students' Rules and Regulations.

g. *Registration with professional body:*
This qualification has been accredited by the South African Geomatics Council (SAGC) for registration as technicians. Practising technicians are required by law to register with the Council, while student technicians are advised to register with the statutory body. Students are advised to also register with the voluntary associations in Geomatics, such as the South African Geomatics Institute (SAGI) - http://www.sagi.co.za and the Geo-Information Society of South Africa (GISSA) - http://www.gissa.org.za. Please contact the Head of Department for clarification of the roles for the Council and voluntary associations.

h. *Work-Integrated Learning I and II:*
See Chapter 5 of the Students' Rules and Regulations for more information.

i. *Practicals:*
It is compulsory for students to attend the practical classes, survey camps and projects.

j. *Waiving of prerequisite subjects:*
Prerequisites will only be waived in highly exceptional cases, based on a motivation by the Head of the Department and approved by the Executive Dean (prerequisite subjects published in Report 151 are excluded).

k. Subject credits:
Subject credits are shown in brackets after each subject.

Key to asterisks:
* Information does not correspond to information in Report 151.
(Deviations approved by the Senate in August 2005 and Senex in 26 July 2010.)

CURRICULUM

SUBJECTS PRINTED IN BOLD ARE NOT FOR REGISTRATION PURPOSES.

FIRST YEAR
Subjects are offered in both semesters as determined by the Head of the Department.

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
FIRST SEMESTER			
COS101T	Communication Skills I	(0,050)*	
CSK101G	Computer Skills I	(0,100)	
DRW101B	Drawing I	(0,083)	
GEG111T	Geography I	(0,083)	
MAT171T	Mathematics I	(0,084)*	
PHU161E	Physics ID	(0,083)	
SUR111T	**Surveying I**		
SUR11YT	Surveying: Theory I	(0,066)	
SUR11ZT	Surveying: Practical I	(0,034)	
TOTAL CREDITS FOR THE SEMESTER:		0,583	
SECOND SEMESTER			
MAT271B	Mathematics II	(0,083)*	Mathematics I
MPJ201T	Map Projections II	(0,083)	
PHO211T	Photogrammetry II	(0,100)	
STA111T	Statistics I	(0,084)*	
SUD211T	Survey Drawing II	(0,083)	Drawing I
SUR211T	**Surveying II**		
SUR21WT	Surveying: Theory II	(0,065)	Surveying I
SUR21ZT	Surveying: Practical II	(0,035)	Surveying I
TOTAL CREDITS FOR THE SEMESTER:		0,533	
TOTAL CREDITS FOR THE FIRST YEAR:		**1,116**	

SECOND YEAR
Subjects are offered in both semesters as determined by the Head of the Department.

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
FIRST SEMESTER			
EXP1SUR	Work-Integrated Learning I	(0,500)	Surveying I
TOTAL CREDITS FOR THE SEMESTER:		0,500	

SECOND SEMESTER

EXP2SUR	Work-Integrated Learning II	(0,500)	Work-Integrated Learning I
TOTAL CREDITS FOR THE SEMESTER:		0,500	
TOTAL CREDITS FOR THE SECOND YEAR:		**1,000**	

THIRD YEAR

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
CSJ300T	Control Surveying: Project III*	(0,103)*	Surveying II
FIRST SEMESTER			
AJE301T	Adjustment of Errors III	(0,083)*	Mathematics I Surveying II
CGH301T	Cartography III	(0,073)*	
COA301T	Computer Applications III	(0,100)	Computer Skills I Surveying II
MNC101T	Management: Civil I	(0,050)*	
SMI301T	Stereo Mapping III	(0,073)*	Photogrammetry II
SUR331T	**Surveying III**		
SUR33WT	Surveying: Theory III	(0,062)*	Surveying II
SECOND SEMESTER			
CSU301T	Cadastral Surveying III	(0,100)	Survey Drawing II
GIS301T	Geographic Information Systems III*	(0,083)	
PHO331T	Photogrammetry III	(0,072)*	Photogrammetry II
SUR331T	**Surveying III**		
SUR33XT	Surveying: Precise III	(0,040)*	Surveying II
SUR33YT	Surveying: Geometric III	(0,045)*	Surveying II
TOTAL CREDITS FOR THE THIRD YEAR:		**0,884**	
TOTAL CREDITS FOR THE QUALIFICATION:		**3,000**	

SUBJECT/MODULE INFORMATION (OVERVIEW OF SYLLABUS)

The syllabus content is subject to change to accommodate industry changes. Please note that a more detailed syllabus is available at the Department or in the study guide that is applicable to a particular subject. On 13 October 2017, the syllabus content was defined as follows:

A

ADJUSTMENT OF ERRORS III (AJE301T) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Geomatics)

Law of propagation of errors. Least squares. Application to Geomatics measurements and spatial data. Network adjustments, constrained networks, free networks, pre-analysis and analysis of results. (Total tuition time: ± 80 hours)

C

CADASTRAL SURVEYING III (CSU301T) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Geomatics)

Introduction to property law. Application of ACTS of Parliament directly and indirectly pertaining to Geomatics. Cadastral Surveying in practice. (Total tuition time: ± 120 hours)

CARTOGRAPHY III (CGH301T) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Geomatics)

Types of maps and their uses. Cartographic representation: colour. Map design: problems and control, purpose. Applications, analysis and interpretation of maps, international cartography. (Total tuition time: ± 100 hours)

COMMUNICATION SKILLS I (COS101T) **CONTINUOUS ASSESSMENT**

(Subject custodian: Department of Applied Languages)

Communication theory, non-verbal communication (body language). Oral presentations, interviews, developing leadership and participation skills. Technical reports and correspondence. (Total tuition time: ± 64 hours)

COMPUTER APPLICATIONS III (COA301T) **CONTINUOUS ASSESSMENT**

(Subject custodian: Department of Geomatics)

Program writing and program development in a high-level language (e.g. Visual Basic, C^{++}), subroutines, functions, files. Applications: use of software for project assignments. Database management systems: MS Access, manipulation of data. (Total tuition time: ± 120 hours)

COMPUTER SKILLS I (CSK101G) **CONTINUOUS ASSESSMENT**

(Subject custodian: Department of Geomatics)

Components of a microcomputer system. Engineering applications of software. Managing personal computers. Word-processing, spreadsheets, presentations and databases. (Total tuition time: ± 120 hours)

CONTROL SURVEYING: PROJECT III (CSJ300T) **PROJECT ASSESSMENT**

(Subject custodian: Department of Geomatics)

Instrument checks and adjustments. Observation reductions for distances. Random and systematic errors: slope, ppm, mean sea level, projection, zero error, least squares. Observation reduction for directions: RO, t-T. Observation techniques: eccentric observations, forced centering. Accuracy and fast traversing conditions, trigonometric heighting. Engineering geomatics techniques: setting out of horizontal circular, transition compound and reverse curves and vertical curves. (Total tuition time: ± 120 hours)

D

DRAWING I (DRW101B) **CONTINUOUS ASSESSMENT**

(Subject custodian: Department of Geomatics)

Engineering Drawing standards: points, lines, form, lettering. Projections: orthographic, perspective (oblique and isometric). Topographical and cadastral drawing. (Total tuition time: ± 100 hours)

G

GEOGRAPHY I (GEG111T) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Geomatics)

Introduction to Geography. Geographical coordinate systems, latitude and longitude angles. Astronomical geography. Geomorphology. Climatology. South Africa: topography, settlements, maps. (Total tuition time: ± 100 hours)

GEOGRAPHIC INFORMATION SYSTEMS III (GIS301T) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Geomatics)

Fundamentals of GIS. Spatial concepts. Spatial data. GIS hardware and software. Data input. Data analysis. GIS output. Data modeling and spatial analysis. Practical applications of GIS. (Total tuition time: ± 100 hours)

M

MANAGEMENT: CIVIL I (MNC101T) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Civil Engineering)

Composition of the civil engineering industry. Types of contracts, tenders, management principles, productivity. Office and site administration, quality control. Elementary economics and financial accounting. (Total tuition time: ± 45 hours)

MAP PROJECTIONS II (MPJ201T) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Geomatics)

Introduction: the shape of the earth, isostasy, geoid, spheroid. Mathematical deductions from selected map projections. Conical projections and cylindrical projections. (Total tuition time: ± 100 hours)

MATHEMATICS I (MAT171T) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Mathematics and Statistics)

Basic mathematics. Differentiation. Integration. Matrices and determinants. Vectors. Data handling. Complex numbers or mensuration. (Total tuition time: ± 60 hours)

MATHEMATICS II (MAT271B) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Mathematics and Statistics)

Revision of differentiation. Differentiation of functions with more than one variable. Further integration. Numerical methods. First-order ordinary differential equations. Matrices (Gauss elimination). (Total tuition time: ± 60 hours)

P

PHOTOGRAMMETRY II (PHO211T) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Geomatics)

Applications, geometry of vertical photos, stereocopy, parallax, optics, cameras. Mapping - the approximate solution and elementary flight planning. (Total tuition time: ± 120 hours)

PHOTOGRAMMETRY III (PHO331T) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Geomatics)

Rectification of aerial photos, terrestrial photogrammetry, photo control for aerial triangulation. Photogrammetric flight planning project. (Total tuition time: ± 100 hours)

PHYSICS ID (PHU161E) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Physics)

Basic mathematics for physics, measurements, classical mechanics – force and Newton's laws of motion, basic rotational motion, gravitation, torque, heat, wave motion, sound, electromagnetic waves, geometric optics – light, reflection, thin lenses, prisms and dispersion, aberration, combined lenses, optical instruments, interference and diffraction. Laser: Simple theory, types and applications. Practical work. (Total tuition time: ± 80 hours)

S

STATISTICS I (STA111T) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Mathematics and Statistics)

Descriptive and inferential statistics, standard deviations, regression, correlation, z- and t-tests, modus, medians, variance frequency, histogram. (Total tuition time: ± 96 hours)

STEREO MAPPING III (SMI301T) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Geomatics)

Mapping – the precise solution, orientations, photo control, aerial triangulation methods, stereo mapping from space borne platforms. (Total tuition time: ± 100 hours)

SURVEY DRAWING II (SUD211T) **CONTINUOUS ASSESSMENT**

(Subject custodian: Department of Geomatics)

Compilation and plotting of grids and graticule, topographic plans, plotting, scales, symbols. The production of longitudinal cross sections and mass haul diagrams. Cadastral drawings: erf diagrams, general plans, working plans, comparison diagrams, compilation plans. (Total tuition time: ± 100 hours)

SURVEYING: GEOMETRIC III (SUR33YT) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Geomatics)

Curves: horizontal - calculation of geometric and setting out data and coordinates of points on the curve. Different set-out methods. Transition curves. Vertical curve theory. (Total tuition time: ± 80 hours)

SURVEYING: PRACTICAL I (SUR11ZT) **PROJECT ASSESSMENT**

(Subject custodian: Department of Geomatics)

Setting up and levelling of the level and theodolite. Taking levelling readings and compiling the field book, testing and adjusting the different levelling instruments, testing and adjusting the theodolite, distance measurement with a tape, individual levelling line of at least 600 m and testing it, levelling of longitudinal section of at least 300 m and the transverse sections at every 20 m interval in group context. Individual traverse with at least three legs. Calculation and correction of traverse, topographic surveying of demarcated area. Drawing a plan and interpreting the contours. (Total tuition time: ± 40 hours)

SURVEYING: PRACTICAL II (SUR21ZT) **PROJECT ASSESSMENT**

(Subject custodian: Department of Geomatics)

Staking out roads that include a simple curve. Levelling of the longitudinal and cross sections. Setting out of profile and batters of intersection and resection. (Total tuition time: ± 40 hours)

SURVEYING: PRECISE III (SUR33XT) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Geomatics)

Instrument adjustments. Spherical triangulation. Precise surveying. Precise levelling. Deformation measurements. Coordinate transformations. (Total tuition time: ± 40 hours)

SURVEYING: THEORY I (SUR11YT) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Geomatics)

Basic surveying principles, surveying, testing and adjustment of instrument errors, traverse, levelling of longitudinal and cross sections. Areas and volumes for excavations and filling. South African coordinate system. Calculation of joins and polars and corrections to tape measurements. (Total tuition time: ± 80 hours)

SURVEYING: THEORY II (SUR21WT) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Geomatics)

South African map series, cadastral information. Higher order control techniques: intersections, resections and Global Navigation Satellite Systems. Levelling, setting-out profiles and batters, horizontal curve calculations and setting-out procedures. (Total tuition time: ± 80 hours)

SURVEYING: THEORY III (SUR33WT) **1 X 3-HOUR PAPER**

(Subject custodian: Department of Geomatics)

Instrument checks and adjustment. Networks: scale enlargement, t-T correction, eccentric reduction, base extension, trilateration, auxiliary points, traverses with short leg and exterior orientation. Trigonometric levelling. Curves: horizontal circular and transition, calculation of geometric and setting-out data, coordinates of points on the curve. Different setting-out methods. Vertical curve theory. Spherical trigonometry. Precise surveying and levelling. Deformation measurements. Coordinate transformations. (Total tuition time: ± 100 hours)

W

WORK-INTEGRATED LEARNING I (EXP1SUR) **WORK-INTEGRATED LEARNING**
WORK-INTEGRATED LEARNING II (EXP2SUR) **WORK-INTEGRATED LEARNING**

(Subject custodian: Department of Geomatics)

To meet the requirements of the National Diploma, students must complete applicable Work-Integrated Learning, which will be evaluated by the department. (Total tuition time: six months)