

## NATIONAL DIPLOMA: ENGINEERING: CIVIL (Extended curriculum programme with foundation provision) Qualification code: NDCIF0 - NQF Level 6

Campus where offered: Pretoria Campus (day classes)  
Last year of new intake: 2017  
Teach-out (phase-out) date: 31 December 2023

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

Information on phased-out programmes can be obtained from the TUT website, [www.tut.ac.za](http://www.tut.ac.za).

Key to asterisks:

- \* Students who register for Reinforced Concrete and Masonry Design III should register for Structural Analysis III concurrently.
- \*\* Information does not correspond to information on AA72.  
(Deviations approved by the Senate in September 2015.)

### CURRICULUM

Consult the 2017 Faculty Prospectus for the full contents of the qualification.

**SUBJECTS ARE OFFERED IN BOTH SEMESTERS. SUBJECTS PRINTED IN BOLD ARE NOT FOR REGISTRATION PURPOSES.**

#### FIRST YEAR

**Students who repeat a subject must register for a different subject code. Even though the credits are published as 0,000, the correct credit will reflect on the academic record once the subject is passed.**

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
FPAME01	Applied Mechanics (Extended) I	(0,085)	
FPAMER1	Applied Mechanics (Extended) I (for repeaters)	(0,000)	
FPCOS03	Communication Skills (Extended) I	(0,043)	
FPCOSR3	Communication Skills (Extended) I (for repeaters)	(0,000)	
FPCSK02	Computer Skills (Extended) I	(0,083)	
FPCSKR2	Computer Skills (Extended) I (for repeaters)	(0,000)	
FPCSM01	Construction Materials (Extended) I	(0,083)	
FPCSMR1	Construction Materials (Extended) I (for repeaters)	(0,000)	
FPDRW01	Drawing (Extended) I	(0,083)	
FPDRWR1	Drawing (Extended) I (for repeaters)	(0,000)	
FPMAT04	Mathematics (Extended) I	(0,083)	
FPMATR4	Mathematics (Extended) I (for repeaters)	(0,000)	
<b>FPSUR01</b>	<b>Surveying (Extended) I</b>		
FPSURYT	Surveying: Theory (Extended) I	(0,056)	
FPSURYR	Surveying: Theory (Extended) I (for repeaters)	(0,000)	
FPSURZT	Surveying: Practical (Extended) I	(0,027)	
FPSURZR	Surveying: Practical (Extended) I (for repeaters)	(0,000)	

TOTAL CREDITS FOR THE FIRST YEAR: **0,543**



**SECOND YEAR**

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
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**FIRST SEMESTER**

After completion of all the extended subjects (see paragraph f of the remarks in the 2017 Prospectus).

DRW201T	Drawing II	(0,083)	
KME101T	Construction Methods I	(0,083)	
MAT271B	Mathematics II	(0,083)	
MNC101T	Management: Civil I	(0,083)	
<b>SUC201T</b>	<b>Surveying: Civil II</b>		
SUC20XT	Surveying: Civil: Theory II	(0,021)	
SUC20YT	Surveying: Civil: Practical II	(0,021)	
TSC211T	Theory of Structures II	(0,083)	

TOTAL CREDITS FOR THE SEMESTER: 0,457

**SECOND SEMESTER**

GTE201T	Geotechnical Engineering II	(0,083)	Construction Materials (Extended) I
MNC201T	Management: Civil II	(0,083)	Management: Civil I
SAS201T	Structural Analysis II	(0,043)	Theory of Structures II
SST301T	Structural Steel and Timber Design III	(0,083)	Theory of Structures II
TEN201T	Transportation Engineering II	(0,083)	Drawing (Extended) I
WEN201T	Water Engineering II	(0,125)	Applied Mechanics (Extended) I Mathematics (Extended) I

TOTAL CREDITS FOR THE SEMESTER: 0,500

TOTAL CREDITS FOR THE SECOND YEAR: **0,957**

**THIRD YEAR**

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
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**FIRST SEMESTER**

DOC301T	Documentation III	(0,083)	Management: Civil II
GTE301T	Geotechnical Engineering III	(0,083)	Geotechnical Engineering II
RCM301T	Reinforced Concrete and Masonry Design III*	(0,083)	Drawing II Structural Analysis II Theory of Structures II
SAS301T	Structural Analysis III*	(0,043)	Structural Analysis II
TEN301T	Transportation Engineering III	(0,083)	Transportation Engineering II
WEN301T	Water Engineering III	(0,125)	Water Engineering II

TOTAL CREDITS FOR THE SEMESTER: 0,500

**SECOND SEMESTER**

EXP1ECI	Work-Integrated Learning I**	(0,500)	
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TOTAL CREDITS FOR THE SEMESTER: 0,500

TOTAL CREDITS FOR THE THIRD YEAR: **1,000**



**FOURTH YEAR**

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
<b>FIRST SEMESTER</b>			
EXP2ECI	Work-Integrated Learning II**	(0,500)	Work-Integrated Learning I
TOTAL CREDITS FOR THE SEMESTER:		0,500	
TOTAL CREDITS FOR THE FOURTH YEAR:		<b>0,500</b>	
TOTAL CREDITS FOR THE QUALIFICATION:		<b>3,000</b>	

**SUBJECT INFORMATION (OVERVIEW OF SYLLABUS)**

The syllabus content is subject to change to accommodate industry changes. Please note that a more detailed syllabus is available at the Department or in the study guide that is applicable to a particular module. On 01 October 2019, the syllabus content was defined as follows:

**A**

**APPLIED MECHANICS (EXTENDED) I (FPAME01, FPAMER1) 1 X 3-HOUR PAPER**  
*(Subject custodian: Department of Civil Engineering)*

Module 1: Measurements, mechanics, motion in one-dimension kinematics, laws of motion dynamics, kinetic theory of matter and properties of matter. Module 2: Atom theory, electricity, magnetism and electromagnetism, inductors, capacitors, RLC networks. Basics of structural engineering and hydraulics, mass, vectors, forces, properties of sections, friction. Various forms of motions of bodies, Newton's laws, work and energy. Laboratory work. (Total tuition time: ± 180 hours)

**C**

**COMMUNICATION SKILLS (EXTENDED) I (FPCOS03, FPCOSR3) CONTINUOUS ASSESSMENT**  
*(Subject custodian: Department of Applied Languages)*

Speaking and communication skills, listening skills, reading for academic understanding, academic vocabulary, learning strategies and information gathering, writing, business and life skills. Communication theory. Oral presentation. Technical writing skills. Group communication skills. (Total tuition time: ± 120 hours)

**COMPUTER SKILLS (EXTENDED) I (FPCSK02, FPCSKR2) CONTINUOUS ASSESSMENT**  
*(Subject custodian: End User Computing Unit)*

Students have to acquire theoretical knowledge (computing fundamentals) and practical skills as end-users in operating systems and MS Office Suite applications (MS Word, MS Excel, MS Excel Intermediate, MS PowerPoint, MS Access Essentials and MS Visio Professional), graphic design and dealing with the Internet, networks and how to search for information. Students will do online and computer-based tests. The modules are mapped with SAQA and IC3 Essential Skills for Digital Literacy (international certification). (Total tuition time: ± 80 hours)

**CONSTRUCTION MATERIALS (EXTENDED) I (FPCSM01, FPCSMR1) 1 X 3-HOUR PAPER**  
*(Subject custodian: Department of Civil Engineering)*

Atoms, molecules and ions, chemical formulas and equations, the periodic table, chemical bonding, nomenclature of inorganic compounds, phases of matter, solutions, the rate of chemical reactions, equilibrium in chemical reactions, acids and bases, oxidation, reduction and electrochemical cells. The behaviour and characteristics of building materials, sampling, application of laboratory equipment and tests and the interpretation of results. Borrow-pit development, environmental awareness. Standards and codes of practice of materials, manufacturing and construction methods. (Total tuition time: ± 120 hours)



**CONSTRUCTION METHODS I (KME101T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Civil Engineering)**

Construction methods, techniques, maintenance of and remedial work to a wide range of engineering works and projects, typical construction problems. The application of construction plant, earth-moving calculations, plant management. Standard specifications and codes of practice, contract documents. Safety legislation. (Total tuition time: ± 60 hours)

**D****DOCUMENTATION III (DOC301T)****1 X 3-HOUR PAPER (OPEN BOOK)****(Subject custodian: Department of Civil Engineering)**

Costing, writing of specifications and the application of standardised specifications. Computer-aided applications. Contractual aspects, payment certificates. (Total tuition time: ± 45 hours)

**DRAWING (EXTENDED) I (FPDRW01, FPDRWR1)****CONTINUOUS ASSESSMENT****(Subject custodian: Department of Civil Engineering)**

Lettering, line work and freehand sketches, geometric constructions, fasteners, dimensioning, methods of projections, sectioning, interpenetration curves and pipe developments, conversions: imperial to metric, terms and abbreviations used in engineering drawing, piping diagrams. Drawing office practice. Introduction to draughtsmanship, projections (orthographic and isometric), intersections of surfaces, graphic determination of forces in frames, topographical drawings, SABS specification. (Total tuition time: ± 180 hours)

**DRAWING II (DRW201T)****CONTINUOUS ASSESSMENT****(Subject custodian: Department of Civil Engineering)**

Detailing structural steel members and connections. Detailing and preparation of bending schedules for reinforced concrete members. Drawing longitudinal and cross sections for roads, and road pavement details. Sections through structures, and application of National Building Regulations. (Total tuition time: ± 120 hours)

**G****GEOTECHNICAL ENGINEERING II (GTE201T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Civil Engineering)**

Introduction to geology, identification of minerals, classification of rocks, interpretation of geological maps. Engineering geology, identification of rock types, soil profiles, geological mapping, subsurface conditions. Engineering soils, soil composition, grading and soil classification. (Total tuition time: ± 90 hours)

**GEOTECHNICAL ENGINEERING III (GTE301T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Civil Engineering)**

Soil mechanics, permeability and strength of soils, stability of slopes, earth pressures. Bearing capacity of soils for founding purposes. Consolidation and settlement. Practical site investigations. (Total tuition time: ± 60 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)

**MANAGEMENT: CIVIL II (MNC201T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Civil Engineering)**

Contract planning, planning phases of tenders and contracts. Planning techniques, priority diagrams. Financial planning and control, budgeting, cash flow, cost control. Computer applications, construction programme analyses, scheduling of resources. Legislation, labour relations, procedures and practices. (Total tuition time: ± 60 hours)

**MATHEMATICS (EXTENDED) I (FPMAT04, FPMATR4)****1 X 3-HOUR PAPER****(Subject custodian: Department of Mathematics and Statistics)**

Basic algebra, functions, exponents and logarithm, differential calculus, trigonometry, geometry. Basic mathematics. Differentiation. Integration. Matrices and determinants. Vectors. Data handling. Complex numbers or mensuration. (Total tuition time: ± 120 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)

**R****REINFORCED CONCRETE AND MASONRY DESIGN III (RCM301T) 1 X 4-HOUR PAPER (OPEN BOOK)****(Subject custodian: Department of Civil Engineering)**

Design of reinforced concrete structures, beams, slabs, columns, retaining walls, foundations. Design of unreinforced masonry structures, walls, columns. Application of empirical rules. Design projects. (Total tuition time: ± 90 hours)

**S****STRUCTURAL ANALYSIS II (SAS201T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Civil Engineering)**

The analysis of elementary structures for structural design purposes, calculation of bending moments, shear forces and deflections, pin-jointed frames, three-pinned structures, struts, combined stresses. Laboratory work. (Total tuition time: ± 90 hours)

**STRUCTURAL ANALYSIS III (SAS301T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Civil Engineering)**

The analysis of complex structures for structural design purposes. Calculation of bending moments, shear forces and deflections for propped cantilevers, continuous beams, portal frames. Moment distribution, plastics theory. Laboratory work. (Total tuition time: ± 60 hours)

**STRUCTURAL STEEL AND TIMBER DESIGN III (SST301T)****1 X 4-HOUR PAPER (OPEN BOOK)****(Subject custodian: Department of Civil Engineering)**

Design of steel structures, beams, plate girders, connections (bolted and welded), trusses, columns, composite columns. Timber design, element design as for steel, form work and support systems. Design projects. (Total tuition time: ± 90 hours)

**SURVEYING: CIVIL: PRACTICAL II (SUC20YT)****PROJECT ASSESSMENT****(Subject custodian: Department of Geomatics)**

Determining points for staking out roads by means of a traverse, identifying and output of a defined suggested centre line for constructing a road that includes a simple curve. Calculation and placing of geometrical data. Calculation and setting out of the centre line at 20 m intervals for the straight line, as well as the curve. Levelling and check levelling of the longitudinal and cross sections. Drawing of L/S and x sections, calculation and setting out of profile and site slope pegs according to formation line on L/S, with consideration of underground drainage. Calculation and setting out of drainage pipe underneath road. (Total tuition time: ± 40 hours)

**SURVEYING: CIVIL: THEORY II (SUC20XT)****1 X 3-HOUR PAPER****(Subject custodian: Department of Geomatics)**

EAM and lasers. Levelling, reciprocal and reverse levelling, longitudinal and transverse sections, setting out profiles and site-slope pegs, area and strip surveying, planning and setting out projects, construction measurements, horizontal curve calculations and setting out procedures. (Total tuition time: ± 80 hours)

**SURVEYING: PRACTICAL (EXTENDED) I (FPSURZT, FPSURZR)****PROJECT ASSESSMENT****(Subject custodian: Department of Geomatics)**

Introduction to engineering (chemical, metallurgical, civil, surveying, electrical, clinical, digital technology, high-frequency technology, power engineering, process instrumentation, mechanical, industrial, mechatronics), factory safety, measurements, engineering materials, projects. 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: ± 200 hours)



**SURVEYING: THEORY (EXTENDED) I (FPSURYT, FPSURYR)****1 X 3-HOUR PAPER****(Subject custodian: Department of Geomatics)**

Introduction to engineering (chemical, metallurgical, civil, surveying, electrical, clinical, digital technology, high-frequency technology, power engineering, process instrumentation, mechanical, industrial, mechatronics), factory safety, measurements, engineering materials, projects. Geometrical principles, trigonometry, applications and uses of trigonometry in surveying, spherical triangles, indication of point position on the surface of the earth, coordinate geometry, South African coordinate system. Calculation of joins and polars. Distance measurement and improvements of tape measurements, manipulation of formulas, order sizes, identities, arithmetic and mental arithmetic, calculation of surfaces and volumes of straight and curved figures, conversion of levelling readings. (Total tuition time: ± 150 hours)

**T****THEORY OF STRUCTURES II (TSC211T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Civil Engineering)**

Elementary structural analysis, calculation of sectional properties, that is centroids, moment of inertia, etc. Stresses and strains of structural materials, theory of elastic bending. Calculations of bending moments, shear forces, deflections. Loads on structures. (Total tuition time: ± 75 hours)

**TRANSPORTATION ENGINEERING II (TEN201T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Civil Engineering)**

Transport planning, methods of transport, transport demand. Traffic engineering, traffic flow theory, traffic studies, parking layout, safety. Geometric design, horizontal and vertical alignment of roads and railroads, basic planning, detail design, supervision. (Total tuition time: ± 60 hours)

**TRANSPORTATION ENGINEERING III (TEN301T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Civil Engineering)**

Design of earthworks for roads and railroads. Materials requirements and selection for road construction, design methods for various classes of pavements, pavement layers, standard specifications. Road drainage requirements and drainage systems. (Total tuition time: ± 75 hours)

**W****WATER ENGINEERING II (WEN201T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Civil Engineering)**

Basic principles of hydraulics, pressures, pipe flow, design of elementary pipe reticulation networks. Pump applications. Water quality, elementary design of water purification works and wastewater treatment plants, legislation. (Total tuition time: ± 90 hours)

**WATER ENGINEERING III (WEN301T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Civil Engineering)**

Hydrology cycle, precipitation, evaporation, hydrographs. Stormwater management, calculation of run-off water. Open-channel flow, clear-water storage, sewerage reticulation, pump installations and pumping mains. (Total tuition time: ± 60 hours)

**WORK-INTEGRATED LEARNING I (EXP1ECI)****WORK-INTEGRATED LEARNING****WORK-INTEGRATED LEARNING II (EXP2ECI)****WORK-INTEGRATED LEARNING****(Subject custodian: Department of Civil Engineering)**

Training on site or in the office of a contractor or consultant under the guidance of a mentor. Students must gain practical experience in civil engineering aspects, such as administration, drawing (CAD), design, surveying, construction supervision, contracts and geotechnical and laboratory work. A comprehensive report on the above must be submitted to the Head of the Department, for approval. (Total tuition time: minimum 24 weeks)

