NATIONAL DIPLOMA: ENGINEERING: MECHANICAL
Qualification code: NDME05 - NQF Level 6

Campus where offered: Pretoria Campus (day classes)
Last year of new intake: 2017
Teach-out (phase-out) date: 31 December 2022

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

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

Key to asterisks:
*   Information does not correspond to information in Report 151.
    (Deviations approved by the Senate in August 2005 and May 2008.)

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

FIRST YEAR

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
FIRST SEMESTER			
CAI101T	Computer-Aided Draughting I*	(0,068)*	
EGN101T	Engineering Communication I*	(0,083)	
ETT101T	Electrotechnology I	(0,068)*	
MAT171T	Mathematics I	(0,083)	
MDR101T	Mechanical Engineering Drawing I	(0,068)*	
MHC101T	Mechanics I	(0,068)*	
MME101T	Mechanical Manufacturing Engineering I	(0,068)*	
	TOTAL CREDITS FOR THE SEMESTER:	0,506	
SECOND SEMESTER			
FMS211T	Fluid Mechanics II	(0,083)	Engineering Communication I Mathematics I Mechanics I
MAT271B	Mathematics II	(0,083)	Mathematics I
MMH211T	Mechanics of Machines II	(0,083)	Mechanics I
SMT211T	Strength of Materials II	(0,083)	Mathematics I Mechanics I
TDN201T	Thermodynamics II	(0,083)	
	plus one of the following subjects:		
ETT211T	Electrotechnology II	(0,083)	Electrotechnology I
MME201T	Mechanical Manufacturing Engineering II	(0,083)	Computer-Aided Draughting I Mechanical Engineering Drawing I Mechanical Manufacturing Engineering I
	TOTAL CREDITS FOR THE SEMESTER:	0,498	
	TOTAL CREDITS FOR THE FIRST YEAR:	**1,004**	

SECOND YEAR

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)

FIRST SEMESTER

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
FMS331T	Fluid Mechanics III	(0,083)	Fluid Mechanics II
MAT351T	Mathematics III	(0,083)	Mathematics II
MED201T	Mechanical Engineering Design II	(0,083)	Computer-Aided Draughting I Engineering Communication I Mechanical Engineering Drawing I Mechanical Manufacturing Engineering I Mechanics I Strength of Materials II
MMH331T	Mechanics of Machines III	(0,083)	Engineering Communication I Mechanics of Machines II
SMT331T	Strength of Materials III	(0,083)	Engineering Communication I Strength of Materials II
TDN321T	Thermodynamics III	(0,083)	Engineering Communication I Thermodynamics II

TOTAL CREDITS FOR THE SEMESTER: 0,498

SECOND SEMESTER

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
ASA301T	Applied Strength of Materials III	(0,083)	Mathematics II Strength of Materials III
HYM301T	Hydraulic Machines III	(0,083)	Fluid Mechanics III Mathematics II
MED321T	Mechanical Engineering Design III	(0,083)	Mathematics II Mechanical Engineering Design II Mechanics of Machines II
SMP301T	Steam Plant III	(0,083)	Mathematics II Thermodynamics III
TMH301T	Theory of Machines III	(0,083)	Mathematics II Mechanics of Machines III

plus one of the following subjects:

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
EIE301T	Electric Machines	(0,083)*	Electrotechnology II
MME301T	Mechanical Manufacturing Engineering III	(0,083)	Mechanical Manufacturing Engineering II

TOTAL CREDITS FOR THE SEMESTER: 0,498

TOTAL CREDITS FOR THE SECOND YEAR: **0,996**

THIRD YEAR

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)

FIRST SEMESTER

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
EXP1ENM	Work-Integrated Learning I	(0,500)	

TOTAL CREDITS FOR THE SEMESTER: 0,500

SECOND SEMESTER

EXP2ENM	Work-Integrated Learning II	(0,500)	Work-Integrated Learning I

TOTAL CREDITS FOR THE SEMESTER: 0,500

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

TOTAL CREDITS FOR THE QUALIFICATION: **3,000**

SUBJECT INFORMATION (OVERVIEW OF SYLLABUS)

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

A

APPLIED STRENGTH OF MATERIALS III (ASA301T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Slope and deflection of beams. Struts, compound stresses and compound strains. Thick cylinders. Practical laboratory work. (Total tuition time: ± 68 hours)

C

COMPUTER-AIDED DRAUGHTING I (CAI101T) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Introduction to computer-aided design (CAD), various software application packages, component and assembly modeling. Students operate CAD software in order to produce three-dimensional models, providing a basis for more advanced CAD applications and compound drawings. (Total tuition time: ± 80 hours)

E

ELECTRIC MACHINES (EIE301T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
A variety of electrical motors and generators are used on a large scale in the industry. This subject serves as an introduction to electrical machines and provides exposure to the principles on which such machines operate. Single-phase transformers, induction machines and direct-current machines are discussed in this subject. (Total tuition time: ± 70 hours)

ELECTROTECHNOLOGY I (ETT101T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
The correct use of SI units and their applications. Construction and care of batteries. WS theory and different measuring instruments. The influence of magnetic lines, the application and use of magnetic fields, inductance and the factors that influence it. Capacitors and their functioning. (Total tuition time: ± 70 hours)

ELECTROTECHNOLOGY II (ETT211T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Electrical Engineering)
Students acquire sound knowledge of systems, machines and equipment used in the field of electrical engineering for the conversion of energy, which mechanical engineers may encounter during their careers. In practical work, students learn to handle and connect equipment. Presentation, alternating current circuit theory, electrical measurements, direct-current machines and single-phase transformers are also dealt with. (Total tuition time: ± 68 hours)

ENGINEERING COMMUNICATION I (EGN101T) 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: ± 68 hours)

FLUID MECHANICS II (FMS211T)   1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Properties of fluids. Pressure. Hydrostatic forces. Buoyancy. Hydrostatic machines. Principles of pneumatic and hydraulic control systems. Flow of fluids – conservation of mass, momentum and energy. Flow in pipes. Flow measurement. (Total tuition time: ± 68 hours)

FLUID MECHANICS III (FMS331T)   1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Pipe friction losses. Introduction to pumps – ram, jet, air, helix rotor, centrifugal and reciprocating pumps. Piping: losses, water hammer. Channel flow. Viscous flow. Vortices. Forces exerted by a moving fluid – on vanes, on vehicles. (Total tuition time: ± 68 hours)

HYDRAULIC MACHINES III (HYM301T)   1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Water turbines: Pelton, Kaplan. Centrifugal pumps: construction, characteristic curves, pump systems, net positive suction head. Fans and fan systems: design principles, fan laws, design of ducting. Hydraulic machines: components, pumps, motors, accumulators, design of systems. Fluid couplings. (Total tuition time: ± 68 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)

MATHEMATICS III (MAT351T)   1 X 3-HOUR PAPER
(Subject custodian: Department of Mathematics and Statistics)
First-order differential equations. Higher-order differential equations. Basic mathematical modelling. Laplace transforms. Systems of differential equations. Numerical solutions of differential equations. Fourier Series. (Total tuition time: ± 70 hours)

MECHANICAL ENGINEERING DESIGN II (MED201T)   1 X 3-HOUR PAPER (PRESCRIBED OPEN BOOK)
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
General introduction to design. Basic principles of design in respect of knuckle, coffered, rivetted and lozenge joints, thin cylinders, gears, shafts, keys, arms for gears, bearings, shaft couplings, pipes and pipe joints, eccentric loading of connections, welding. Drawing projects. (Total tuition time: ± 68 hours)

MECHANICAL ENGINEERING DESIGN III (MED321T)   1 X 3-HOUR PAPER (PRESCRIBED OPEN BOOK)
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Theory: design and applications of flat-belt drives, V-belt drives, advanced tooth gearing, shafts, single-plate, multi-plate, conical and centrifugal clutches, band and block brakes, members that fail by buckling, thick cylinders, bearings and lubrication, steel ropes, helical springs, piping - fittings and valves, stays for tanks and containers. Drawing: construction of helical springs, gear teeth and helical profile of square screw thread. Conventional representation of items. Assembly drawings of designed projects. (Total tuition time: ± 68 hours)

MECHANICAL ENGINEERING DRAWING I (MDR101T)   CONTINUOUS ASSESSMENT
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Printing, freehand sketches. Construction of scales, ellipse, square screw thread. Isometric drawing. Oblique drawings. Development of pipes. Curve of interpenetration of T-ends and pipe connections. Projections of prisms and pyramids. Drawing language; for example, of machining symbols. First-angle and third-angle orthographic projection drawings of single objects, assembly drawings and detail drawings. (Total tuition time: ± 68 hours)

MECHANICAL MANUFACTURING ENGINEERING I (MME101T)   1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Safety and safety legislation. Identification and application of various types of steel. Heat treatment of steel. Hand and machine tools. Metal cutting and machining. Alloy metals. Casting processes. Welding. (Total tuition time: ± 68 hours)

MECHANICAL MANUFACTURING ENGINEERING II (MME201T)   1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Measurement. Operative practical testing. Quality and dimensional control. Gauging and measurement. Measuring instruments. Comparators. Surface measurement. (Total tuition time: ± 68 hours)

MECHANICAL MANUFACTURING ENGINEERING III (MME301T)   1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Flow and handling of materials. Automatic machines. Management techniques to reduce work content and ineffective time. Movements of workers in the shop. Factory organisation. Design and location of a factory. The elements of costs. Factory organisation in conjunction with the costing system. Purchasing procedure. Stores routine (buying and store-keeping). Labour (engagement, time keeping and time booking, methods of remuneration). Wages. Overheads (depreciation and interest on capital). Contract costs. Factory job cost accounting. Estimating and planning. Personnel administration. Incentive schemes. The factory manager and the computer. (Total tuition time: ± 68 hours)

MECHANICS I (MHC101T)   1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Moments, centroids, kinematics, forces and Newton's laws, momentum and impulse, work and energy, circular motion, statics. (Total tuition time: not available)

MECHANICS OF MACHINES II (MMH211T)   1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Force systems, rectangular components, moment, couple resultants, equilibrium, free body diagram, structures, plane trusses, method of joints, frames and machines, centers of mass and centroids, types of friction, dry friction, applications of frictions in machines, wedges, journal bearings, thrust bearings, flexible belts, area moments of inertia. (Total tuition time: ± 68 hours)

MECHANICS OF MACHINES III (MMH331T)   1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Rectilinear motion, plane curvilinear motion, rectangular coordinates (x-y), normal and tangential coordinates (n-t), polar coordinates (r-o), relative motion, constrained motion of connected particles, Newton's second law, equation of motion, rectilinear motion, curvilinear motion, work and kinetic energy, potential energy, impulse and momentum. (Total tuition time: ± 68 hours)

S

STEAM PLANT III (SMP301T)   1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Steam plant: theory and calculations, diagrams, efficiency, work ratio. Nozzles, applications, important ratios and velocities. Steam turbines, blade fixing, velocity diagrams, graphical and analytical. Gas turbines, line and TS diagrams, modifications, calculations, efficiencies of compressor and turbine. Cool towers: types, cooling methods, losses, maintenance. Rotary compressor, air control, efficiency, torque, power. Psychrometry: mixtures, saturation, bulb thermometry, chart, air-conditioning systems, flow rate. Legislation, Machinery and Occupational Safety Act, 1983 (Act No. 6 of 1983), applicable knowledge of plants and pressure vessels. (Total tuition time: ± 68 hours)

STRENGTH OF MATERIALS II (SMT211T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Analysis of simple structures. Simple stress and strain. Shearing forces and bending moments. Thin cylinders (stationary and rotating). Torsion of circular shafts. Helical springs. Laboratory work. (Total tuition time: ± 68 hours)

STRENGTH OF MATERIALS III (SMT331T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Temperature stresses. Strain energy due to direct stress. Beam sections. Theory of bending. Fatigue and creep. Reinforced concrete beams. Structures. Shear stress in beams. Shearing forces and bending moments. Laboratory work. (Total tuition time: ± 68 hours)

T

THEORY OF MACHINES III (TMH301T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Plane kinematics of rigid bodies, rotation, absolute motion, relative motion, velocity and acceleration diagrams, coriolis component, general equations of motion, translation, fixed-acis rotation, general plane motion, work-energy relations, general plane motion, impulse-momentum equations, basic concept of vibration, classification of vibration, free vibration, damped vibration. (Total tuition time: ± 68 hours)

THERMODYNAMICS II (TDN201T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Gases: gas laws, processes, cycles, calculations, steam tables, chart, throttling, boilers and efficiencies, line diagrams, calculations. Condensers: Dalton's laws, efficiency, losses, calculations. Combustion: composition, heat values, excess air, calculations: gravimetric and volumetric. (Total tuition time: ± 68 hours)

THERMODYNAMICS III (TDN321T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Gases, vapours and entropy. Principles and calculations. IC engines, petrol, diesel. Combustion and engine test bench calculations. Dynamometer: description and calculations. Reciprocating compressors: single and double staging. Refrigeration: cycles and calculations. (Total tuition time: ± 68 hours)

W

WORK-INTEGRATED LEARNING I (EXP1ENM) WORK-INTEGRATED LEARNING
WORK-INTEGRATED LEARNING II (EXP2ENM) WORK-INTEGRATED LEARNING
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
Industry-related training, as determined by the industry and the University. (Total tuition time: six months)