

NATIONAL DIPLOMA: ENGINEERING: MECHANICAL

(Extended curriculum programme with foundation provision)

Qualification code: NDMEF0 - 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.

Key to asterisks:

* 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.

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)
FPCA101	Computer-Aided Draughting (Extended) I	(0,083)	
FPCA1R1	Computer-Aided Draughting (Extended) I (for repeaters)	(0,000)	
FPEGN01	Engineering Communication (Extended) I	(0,008)	
FPEGNR1	Engineering Communication (Extended) I (for repeaters)	(0,000)	
FPETT01	Electrotechnology (Extended) I	(0,083)	
FPETTR1	Electrotechnology (Extended) I (for repeaters)	(0,000)	
FPMAT04	Mathematics (Extended) I	(0,083)	
FPMATR4	Mathematics (Extended) I (for repeaters)	(0,000)	
FPMDR01	Mechanical Engineering Drawing (Extended) I	(0,083)	
FPMDRR1	Mechanical Engineering Drawing (Extended) I (for repeaters)	(0,000)	
FPMHC01	Mechanics (Extended) I	(0,083)	
FPMHCR1	Mechanics (Extended) I (for repeaters)	(0,000)	
FPMME01	Mechanical Manufacturing Engineering (Extended) I	(0,083)	
FPMMER1	Mechanical Manufacturing Engineering (Extended) I (for repeaters only)	(0,000)	
TOTAL CREDITS FOR THE FIRST YEAR:		0,506	

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).

FMS211T	Fluid Mechanics II	(0,083)	
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MAT271B	Mathematics II	(0,083)
MMH211T	Mechanics of Machines II	(0,083)
SMT211T	Strength of Materials II	(0,083)
TDN201T	Thermodynamics II	(0,083)

plus one of the following subjects:

ETT211T	Electrotechnology II	(0,083)
MME201T	Mechanical Manufacturing Engineering II	(0,083)

TOTAL CREDITS FOR THE SEMESTER: 0,498

SECOND SEMESTER

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 (Extended) I Engineering Communication (Extended) I Mechanical Engineering Drawing (Extended) I Mechanical Manufacturing Engineering (Extended) I Mechanics (Extended) I Strength of Materials II
MMH331T	Mechanics of Machines III	(0,083)	Engineering Communication (Extended) I Mechanics of Machines II
SMT331T	Strength of Materials III	(0,083)	Engineering Communication (Extended) I Strength of Materials II
TDN321T	Thermodynamics III	(0,083)	Engineering Communication (Extended) I Thermodynamics 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			
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
SMP301T	Steam Plant III	(0,083)	Mechanics of Machines II Mathematics II
TMH301T	Theory of Machines III	(0,083)	Thermodynamics III Mathematics II Mechanics of Machines III



plus one of the following subjects:

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

SECOND SEMESTER

EXP1ENM Work-Integrated Learning I* (0,500)

TOTAL CREDITS FOR THE SEMESTER: 0,500

TOTAL CREDITS FOR THE THIRD YEAR: **0,998**

FOURTH YEAR

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
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FIRST SEMESTER

EXP2ENM	Work-Integrated Learning II*	(0,500)	Work-Integrated Learning I
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TOTAL CREDITS FOR THE SEMESTER: 0,500

TOTAL CREDITS FOR THE FOURTH YEAR: **0,500**

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

APPLIED STRENGTH OF MATERIALS III (ASA301T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)
 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 (EXTENDED) I (FPCA101, FPCA1R1) CONTINUOUS ASSESSMENT
(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)
 Students will be introduced to operating systems (Windows environment), basic word-processing skills (MS-Word), spreadsheets (MS-Excel), presentations tools (PowerPoint), communications, connectivity, the internet and the Web, computer-aided draughting (CAD), various software packages and compound drawings. (Total tuition time: ± 136 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 (EXTENDED) I (FPETT01, FPETTR1)

1 X 3-HOUR PAPER

(Subject custodian: Department of Electrical Engineering)

Atom theory, electricity, magnetism and electromagnetism, inductors, capacitors, RLC networks. 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: ± 140 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 (EXTENDED) I (FPEGN01, FPEGNR1) 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, non-verbal communication (body language). Oral presentations, interviews, developing leadership and participation skills. Technical reports and correspondence. (Total tuition time: ± 136 hours)

F

FLUID MECHANICS II (FMS211T)

1 X 3-HOUR PAPER

(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)

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 Engineering, Mechatronics and Industrial Design)

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)

H

HYDRAULIC MACHINES III (HYM301T)

1 X 3-HOUR PAPER

(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)

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)

M

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)

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 Engineering, Mechatronics and Industrial Design)**

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 Engineering, Mechatronics and Industrial Design)**

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**CONTINUOUS ASSESSMENT****(EXTENDED) I (FPMDR01, FPMDDR1)****(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)**

Lettering, line work and freehand sketches, geometric construction, fasteners, dimensioning, methods of projection, sectioning, interpenetration curves and pipe developments, conversions: imperial to metric, terms and abbreviations used in engineering drawing, piping diagrams. Letter and number notation. Line notation. Handling of apparatus. Measurement notation. Geometrical construction. Orthographic projections. Isometric projections. Arcs of penetration and development. Detailed working drawings. Composite drawings. (Total tuition time: ± 120 hours)

MECHANICAL MANUFACTURING ENGINEERING**1 X 3-HOUR PAPER****(EXTENDED) I (FPMME01, FPMMER1)****(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)**

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. 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: ± 136 hours)

MECHANICAL MANUFACTURING ENGINEERING II (MME201T)**1 X 3-HOUR PAPER****(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)**

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 Engineering, Mechatronics and Industrial Design)**

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 (EXTENDED) I (FPMHC01, FPMHCR1)**1 X 3-HOUR PAPER****(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)**

Module 1: measurements, mechanics, motion in one-dimension kinematics, laws of motion dynamics, kinetic theory of matter and properties of matter. Module 2: 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. Motion in one dimension. Uniform motion. Instantaneous velocity. Motion with constant acceleration. Free fall. Instantaneous acceleration, scalars, vectors, coordinate systems and vector components, vector algebra, force, Newton's first law, Newton's second law, Newton's third law, ropes and pulleys, motion in a circle. Impulse and momentum. Energy. Work. Fluids and elasticity. Thermodynamics. (Total tuition time: ± 180 hours)

MECHANICS OF MACHINES II (MMH211T)**1 X 3-HOUR PAPER****(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)**

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 Engineering, Mechatronics and Industrial Design)**

Rectilinear motion, plane curvilinear motion, rectangular coordinates (x-y), normal and tangential coordinates (n-t), polar coordinates (r- θ), 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 Engineering, Mechatronics and Industrial Design)**

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 Engineering, Mechatronics and Industrial Design)**

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 Engineering, Mechatronics and Industrial Design)**

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 Engineering, Mechatronics and Industrial Design)**

Plane kinematics of rigid bodies, rotation, absolute motion, relative motion, velocity and acceleration diagrams, coriolis component, general equations of motion, translation, fixed-axis 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 Engineering, Mechatronics and Industrial Design)**

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 Engineering, Mechatronics and Industrial Design)**

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 Engineering, Mechatronics and Industrial Design)**

Industry-related training, as determined by the industry and the University. (Total tuition time: six months)

