

BACCALAUREUS TECHNOLOGIAE: ENGINEERING: MECHANICAL (Field of specialisation: Mechatronics) Qualification code: BTMR09/BTMR05 - NQF Level 7

Campus where offered: Pretoria Campus (block-mode classes)
Last year of new intake: July 2019
Teach-out (phase-out) date: 30 June 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 in Report 151.

(Deviations approved by the SENEX on 29 August 2005 and Senate in March 2009.)

CURRICULUM

Consult the 2019 Faculty Prospectus for the full contents of the qualification.

FIRST OR SECOND SEMESTER

Subjects are offered as determined by the Head of the Department.

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
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OPTION 1 (BTMR09):

Only for students who completed the National Diploma: Engineering: Mechatronics (NDRM06).

ASA301T	Applied Strength of Materials III	(0,083)	Mathematics II Strength of Materials III
ATC411B	Automatic Control IV	(0,125)	Mathematics III
DCS401T	Digital Control Systems IV	(0,100)	Automatic Control IV
EDP400T	Engineering Design Project IV (year subject)	(0,342)*	
EDP401R	Engineering Design Project IV (re-registration)	(0,000)	
OWD301T	Software Design III	(0,100)	Computer Studies
TDN401T	Thermodynamics IV	(0,125)	Mathematics III

plus one of the following subjects:

SAN401T	Stress Analysis IV	(0,125)	Applied Strength of Materials III Mathematics III
SMT411T	Strength of Materials IV	(0,125)	Applied Strength of Materials III Mathematics III

TOTAL CREDITS FOR OPTION 1: **1,000**

OPTION 2 (BTMR05):

Only for students who completed the National Diploma: Engineering: Mechanical (Field of specialisation: Mechatronics) (NDRM01).

ATC411B	Automatic Control IV	(0,125)	Mathematics III Theory of Machines III
DCS401T	Digital Control Systems IV	(0,100)	Automatic Control IV
EDP400T	Engineering Design Project IV (year subject)	(0,300)*	Mechanical Engineering Design III
EDP401R	Engineering Design Project IV (re-registration)	(0,000)	



MMH411T	Mechanics of Machines IV	(0,125)	Mathematics III Theory of Machines III
SAN401T	Stress Analysis IV	(0,125)	Applied Strength of Materials III Mathematics III
SMT411T	Strength of Materials IV	(0,125)	Applied Strength of Materials III Mathematics III

plus one of the following subjects:

PWE311T	Power Electronics III	(0,100)	Electrical Machines II
SFD301T	Software Design III	(0,100)	Mathematics III Software Design II

TOTAL CREDITS FOR OPTION 2: **1,000**

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)

AUTOMATIC CONTROL IV (ATC411B) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
 Gyroscopes. Elements of automatic control. Automatic control. Transducers. System design. (Total tuition time: ± 68 hours)

D

DIGITAL CONTROL SYSTEMS IV (DCS401T) 1 X 3-HOUR PAPER (OPEN BOOK)
(Subject custodian: Department of Electrical Engineering)
 Discrete-time models and sampled data systems, difference equations, mathematical representation of the sampling process using the Z-transform, analysis of sampled data systems, stability considerations of sampled data systems, design of compensation for sampled data systems, using transform techniques. (Total tuition time: ± 70 hours)

E

ENGINEERING DESIGN PROJECT IV (EDP400T, EDP401R) PROJECT ASSESSMENT
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
 Engineering management, project management, human resource management, law of contract, accounting and financial management, budgeting and the completion of an industrial project. (Total tuition time: ± 68 hours)

M

MECHANICS OF MACHINES IV (MMH411T) 1 X 3-HOUR PAPER
(Subject custodian: Department of Mechanical and Mechatronics Engineering)
 Fundamentals of vibration, free vibration of single degree of freedom systems, free vibration of an undamped translational and torsional system, free vibration with viscous damping, response of an undamped and damped system under harmonic force, response of a damped system under the harmonic motion of the base and under rotating unbalance, two degree of freedom systems, multidegree of freedom systems, determination of natural frequencies and mode shapes of a multidegree of freedom system. (Total tuition time: ± 68 hours)



P**POWER ELECTRONICS III (PWE311T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Electrical Engineering)**

Principles of power semiconductor devices. Single-phase rectifiers, basic principles of DC choppers, basic control of inverters, AC voltage controllers and single-phase supplied DC drives. Design principles to protect semiconductor components against overvoltage, overcurrent, overheat, too high dV/dt and dI/dt and also ways to implement them in series and parallel. (Total tuition time: ± 70 hours)

S**SOFTWARE DESIGN III (OWD301T)****CONTINUOUS ASSESSMENT****(Subject custodian: Department of Electrical Engineering)**

The emphasis is on computer memory and the application of C programming language in micro controller applications. Static and dynamic characteristics of read-write memories (SRAM, DRAM), structure and applications. Read-only memories (ROM, EPROM, FLASH). The microcontroller architecture, memory arrangements, interrupts, timers and serial communication as well as peripheral devices such as ADC's, keypads, and LCD displays will be examined. The design and implementation of software and hardware for applications is supported by flow charts and C language and forms an important component of the subject. Developing and applying structured programming. Focus on developing and applying structured C programming. This includes basic input/output, conditional execution, statement repetition, functions and libraries. After completion of the subject, a student will be able to solve real life problems in industry. (Total tuition time: ± 70 hours)

SOFTWARE DESIGN III (SFD301T)**CONTINUOUS ASSESSMENT****(Subject custodian: Department of Electrical Engineering)**

Advanced programming topics will be presented, while still focusing on core skills. The basic principles of object-orientated programming, such as creation of abstract data types (ADTs), pointers, composite data types, linked lists, File I/O and string manipulation, will be covered. Windows programming may also be covered. The subject is practically orientated, and students are evaluated on a number of programming tasks completed during the semester. (Total tuition time: ± 70 hours)

STRENGTH OF MATERIALS IV (SMT411T)**1 X 3-HOUR PAPER****(Subject custodian: Department of Mechanical and Mechatronics Engineering)**

Theories of elastic failure. Deflection of beams. Energy methods – coplanar frames. Asymmetrical bending, shear stress in beams. Strains beyond the elastic limit. Struts. Contact stress (Hertz stress). (Total tuition time: ± 68 hours)

STRESS ANALYSIS IV (SAN401T)**1 X 3-HOUR PAPER****(Subject custodian: Department of Mechanical and Mechatronics Engineering)**

Energy methods (space frames). The finite element method. Finite element (modelling techniques). Solutions using a commercially available finite element programme. Stress concentration. Stress in rotation machinery. (Total tuition time: ± 68 hours)

T**THERMODYNAMICS IV (TDN401T)****1 X 3-HOUR PAPER****(Subject custodian: Department of Mechanical and Mechatronics Engineering)**

Basics of heat transfer, heat conduction equation, steady heat conduction, fundamentals of convection, external forced convection, internal forced convection, natural convection, fundamental of thermal radiation, radiation heat transfer, heat exchanger. (Total tuition time: ± 68 hours)

