BACCALAUREUS TECHNOLOGIAE: ENGINEERING: MECHANICAL (Field of specialisation: Mechatronics)

Qualification code: BTMR09/BTMR05 - NQF Level 7

Campus where offered: Pretoria Campus

Important notification to new applicants:
Students who intend to enrol for this qualification should take note that no new applications will be accepted as from 2020. Potential students are advised to consult the University's website for possible new qualifications which are aligned with the newly-implemented Higher Education Qualification Sub-Framework.

REMARKS

a. *Admission requirement(s):*
A National Diploma: Engineering: Mechanical or a NQF Level 6 (old NQF and the new HEQF) qualification in Mechanical Engineering (or a closely related field) obtained from an accredited South African university. Preference will be given to candidates with an average of 60% or more. Candidates who do not meet the 60% requirement will be evaluated by the Department and may be requested to provide a portfolio of relevant work experience (excluding P1 and P2) in order to be considered for selection.

National Diploma students at TUT who are busy with their final semester (P2) and do not have more than one theoretical subject outstanding may also apply for admission and may be considered based on the average of their completed theoretical subjects, but admission will be subject to the successful completion of the National Diploma and the Faculty's Student Enrolment Plan (SEP).

Holders of any other equivalent South African or international qualifications may also be considered, but will have to apply at least six months in advance for the recognition of such qualifications. Candidates will be required to submit an evaluation of their qualifications by the South African Qualifications Authority (SAQA) with their application forms for admission. The University and/or Faculty reserves the right to assess these qualifications and the applicant's suitability and/or competence for admission to the programme. Depending on the nature of such an equivalent qualification, the completion of certain additional subjects may be required. Proof of English proficiency may be required.

b. *Selection criteria:*
Due to capacity constraints, candidates will be selected based on academic performance and/or work experience. Selection will be done after the closing date for applications. Please note that meeting the minimum requirements does not guarantee admission.

c. *Minimum duration:*
One year.

d. *Presentation:*
Block-mode classes presented three days per month over a period of one or two years. Classes and assessments may take place on Friday afternoons and Saturdays.

e. *Intake for the qualification:*
January and July.

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

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

h. Engineering Design Project IV:
A student may register (and re-register) for the subject Engineering Design Project IV (EDP400T/R) only with the permission of the Head of the Department. The purpose of the re-registration is to provide students with an opportunity to complete the project only and to prevent them from failing and having to re-do it.

i. 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).

j. 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 SENEX on 29 August 2005 and Senate in March 2009.)

CURRICULUM

FIRST OR SECOND SEMESTER
Subjects are offered as determined by the Head of the Department.

CODE	SUBJECT	CREDIT	PREREQUISITE SUBJECT(S)
OPTION 1 (BTMR09): **Only for students who completed the National Diploma: Engineering: Mechatronics (NDMR06).**			
ASA301T	Applied Strength of Materials III	(0,083)	Mathematics II
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) (NDMR01).**			
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/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)

AUTOMATIC CONTROL IV (ATC411B) **1 X 3-HOUR PAPER**
(Subject custodian: Department of Mechanical Engineering, Mechatronics and Industrial Design)
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 Engineering, Mechatronics and Industrial Design)
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 Engineering, Mechatronics and Industrial Design)
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)

*T*he emphasis is on applications of embedded C language programming for microcontrollers. Memories (ROM, EPROM, EEPROM, FLASH, RAM and NVRAM) as used with a microcontroller will be explained. 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 and implemented. 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. Structured C programming will be taught, developed and applied. 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. Students will be expected to solve home problems and exercises in order to master the subject. (Total tuition time: ± 70 hours)

STRENGTH OF MATERIALS IV (SMT411T) **1 X 3-HOUR PAPER**

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

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 Engineering, Mechatronics and Industrial Design)

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 Engineering, Mechatronics and Industrial Design)

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)