DUT
DURBAN
UNIVERSITY OF
TECHNOLOGY

2018 HANDBOOK
MECHANICAL ENGINEERING

FACULTY OF
ENGINEERING
& THE BUILT
ENVIRONMENT

HANDBOOK FOR 2018

FACULTY OF ENGINEERING AND THE BUIILT ENVIRONMENT

DEPARTMENT of MECHANICAL ENGINEERING

DEPARTMENTAL MISSION

Vision:

To graduate fit for purpose Mechanical Engineering professionals and provide innovative and appropriate solutions to our stakeholders.

Mission:

1. To equip our students with specialist knowledge in the fields of either design or mechatronics.
2. To be recognised as leaders in composites and moulded plastics research and development.
3. To partner with our Governmental Organisations, Non-Government Organisations, State Owned Enterprises, Professional Bodies and Industry in order to solve engineering problems timeously.

Purpose Statement: National Diploma: Engineering: Mechanical

Persons achieving this qualification will be able to, independently, as well as under supervision, integrate analytical and practical engineering techniques and engineering knowledge to solve well-defined and open-ended engineering problems. They will also be able to select criteria to judge processes and outcomes. This qualification is intended for engineering practitioners in industry.

Completion of this accredited qualification may enable the diplomat to register with the Engineering Council of South Africa as a Candidate Mechanical Engineering Technician.

Purpose Statement: Bachelor of Technology (B Tech): Engineering: Mechanical

Persons achieving this qualification will be able to independently integrate mechanical engineering principles, apply these to determine appropriate ways of approaching activities and establish and use criteria to judge processes and outcomes. This qualification is intended for engineering practitioners in industry.

Completion of this accredited qualification may enable the diplomat to register with the Engineering Council of South Africa as a Candidate Mechanical Engineering Technologist.

Purpose Statement: Master of Engineering

Students who have successfully completed the Master of Engineering degree should:

- Be capable of assimilating and evaluating appropriate literature and resources to the field of study;
- Be capable of determining and stating the objectives of a specific research topic and planning an appropriate strategy to reach the objectives;
- Efficiently expedite the research strategy in order to generate an effective solution;
- Be capable of evaluating the quality of the solution in terms of the stated objectives.

Purpose Statement: Doctor of Engineering
Students who have successfully completed the degree should:

- Be capable of assimilating and evaluating appropriate literature and resources to the field of study;
- Be capable of determining and stating the objectives, a specific research topic and planning an appropriate strategy to reach the objectives;
- Efficiently expedite the research strategy in order to generate an effective solution;
- Be capable of evaluating the quality of the solution in terms of the stated objectives;
- Be capable of guiding inexperienced researchers with research projects;
- Be capable of synthesizing unique solutions to research problems.

GENERAL INFORMATION

It is becoming increasingly obvious that in order to produce wealth in South Africa, more value must be added to our exports. It is no longer good enough to just export raw materials; we have to expand our manufacturing facilities locally, and export finished goods to a global market. In addition, global competition has increased, and thus sales are more difficult.

Mechanical Engineering is one of the most important fields of technology, and the Department of Mechanical Engineering has developed a mission statement in line with the demands of the country. To assist with wealth creation and upliftment, the department strives to be amongst the best with regards to education, training, research and development. To that end, we have nurtured expertise in the areas of materials, design and manufacturing, and our R&D efforts are recognised both locally and internationally. More importantly, our diplomates and graduates are well received and respected by industry.

In order to educate students effectively, we expect that students who enter the department take their studies seriously. Those who fail repeatedly congest classes and prevent others from taking up studies. Thus, the learner will need to be motivated and diligent in his/her efforts.

The diploma courses will equip the learner with the skills necessary to excel as a technician, while our BTech degree will allow the learner, as a young technologist, to move into materials, design and manufacturing.

Further postgraduate studies will help the learner to develop expertise in these fields, and rise to the top of the profession. The end result will depend on the learner.

What is a University of Technology?
The objective of a University of Technology such as DUT is "to create, apply and transfer knowledge and technology of an international standard through cooperative, professional, career education programmes."

Committee of Technikon Principals (CTP) (2004), *Universities of Technology in South Africa.*

CONTENTS

IMPORTANT NOTICE

The departmental rules in this handbook must be read in conjunction with the University of Technology's General Rules contained in the current General Handbook for Students.

NOTE TO ALL REGISTERED STUDENTS

Your registration is in accordance with all current rules of the Institution. If, for whatever reason, you do not register consecutively for every year/semester of your programme, your existing registration contract with the Institution will cease. Your re-registration anytime thereafter will be at the discretion of the Institution and, if permitted, will be in accordance with the rules applicable at that time.

1. CONTACT DETAILS

All departmental queries to:

Secretary:	Mrs A Van Wyk
Tel No:	031-3732115
Fax No:	031 3732139
Email:	adelev@dut.ac.za
Location of Department:	Steve Biko Campus, S5 Level 3

All Faculty queries to:

Faculty officer:	Mrs N Singh
Tel No:	031 3732718
Fax No:	031 3732719
Location of Faculty office:	Steve Biko Campus, S4 Level 3

Executive Dean:	Prof T Andrew
Dean's Secretary:	Ms P Nadar
Tel No:	031 3732762
Fax No:	031 3732724
Location of Executive Dean's office:	Steve Biko Campus, S6 Level 5

2. STAFFING	Name and Qualification
Head of Department (Acting)	Mr B Graham, MEng (DUT), Pr TechniEng
Deputy Head of Department	Mr IS Radebe, MSc Eng (UKZN), BTech (TN)
Professors	Prof K Kanny, PhD (TU-USA); Pr.Tech (Eng); MSc (NU); GCC (factories) MSAIMechE
	Prof P Tabakov, PhD (NU)
	Prof M Walker, MSc Eng; PhD (NU)
Associate Professors	Prof D Jonson, PhD (NU)
Senior Lecturer	Mr R Ranjit, MSc Eng (UKZN); UHDE (NU)
	Mr G Thurbon, BSc Eng (NU); GCC (factories); M.Ed (UKZN); MSAI Mech E
Lecturers	Dr M Gilpin, MSc Eng (UKZN), DEng (DUT) Mr S Govender, BSc Eng (UDW) Mr T Macholo, BSc Eng (UDW) Mr M Moutlana, BSc Eng (MIT), MSc Eng (UKZN) Mr F Mwangi, M Tech (Mech Eng) (DUT) Mr D van Wyk, M Tech (Mech Eng) (DUT)
Senior Technician	Mr A Ramsaroop, M Tech (Mech Eng) (DUT)
Technicians:	Mr A Ramcharan, N Dip (MLS) Mr M Mokeretla, M Tech (Mech Eng) (CUT) Mr M. Moletsane, M Tech (Mech Eng) (DUT), BTech (DUT)
Senior Technical Assistant:	Mr R Veerasamy
Technical Assistant:	Mr P Nyawo
General Assistant:	Vacant Post

3. PROGRAMMES OFFERED BY THE DEPARTMENT

Programmes are offered in this Department which, upon successful completion, lead to the award of the following qualifications:

Qualification	SAQA NLRD Number
National Diploma: Engineering: Mechanical	16428
Bachelor of Technology: Engineering: Mechanical	1737
Bachelor of Engineering Technology	99599
Master of Engineering	96827
Doctor of Engineering	96812

4. PROGRAMME INFORMATION AND RULES

On the basis of a variety of placement assessments, successful applicants will be accepted into a three-year minimum programme of study. An augmented curriculum is devised in order to enhance student development and to improve the student's chances of successful throughput.

MINIMUM ADMISSION REQUIREMENTS: NATIONAL DIPLOMA

For the current National Diploma In addition to the relevant General Rules pertaining to Registration (e.g. Rules G3, G4, G5, G6, G7, G8, G9 & G10); persons must, as a minimum, have obtained the following Senior Certificate, or equivalent, subject results:

Maths & Science (E) on Higher Grade, or (C) on Standard Grade and a pass in English. In addition a learner must obtain a minimum of a total score of 35 when using the following scoring system for Senior Certificate subject results in order to be accepted into the programme.

Scoring system: Using the table below determine the scores associated with each Senior Certificate subject result obtained, multiply the mathematics and science scores by two and add all the scores together to obtain a total.

Symbol	A	B	C	D	E	F
Higher Grade	8	7	6	5	4	3
Standard Grade	6	5	4	3	2	1

Thereafter selection is made at the full discretion of the Head of the Mechanical Engineering Department, based on the senior certificate or equivalent results and the number of students, which the department can accommodate. An interview may also be required.

For students who matriculate with the NSC Rating:
In addition to the relevant General Rules pertaining to Registration (eg. Rules G3); learners must, as a minimum, have obtained the following NSC, or equivalent, subject results:

	Result
Mathematics	4 (Adequate achievement)
Science	4 (Adequate achievement)
English (Primary)	4 (Adequate achievement)
English (First additional)	4 (Adequate achievement)

In addition, a learner must obtain a minimum of a total score of 28 when using the following scoring system for NSC subject results in order to be conditionally accepted into the programme.

Scoring system: using the table below, determine the scores associated with each NSC subject result obtained, multiply the mathematics and science scores by two and add all the scores together to obtain a total.

NSC Rating Code	7	6	5	4	3	2	1
Score	7	6	5	4	3	2	1

A student having an N4 or equivalent with passes of 50% or higher in four (4) subjects, two of which must be Mathematics and Mechanotechnics or equivalent, plus a pass at senior certificate level in English and one other language, will be accepted provided there is sufficient space.

For Students who matriculate with the NCV Level 4 Rating:
A student must have a 60% pass in all of the following subjects:-

- *fundamental subjects*
  English
  Maths
  Life Orientation
- and three vocational subjects, one of which must be Physical Science

Thereafter, selection is made at the full discretion of the Head of Department based on a number of factors including class size, equity etc.

Note: No module done within the department at a level other than IV or any B. Tech module pre-requisite may be used as a B. Tech credit.

MINIMUM ADMISSION REQUIREMENTS:
BACHELOR OF ENGINEERING TECHNOLOGY

The minimum admission requirement is the National Senior Certificate or the National Certificate (Vocational) with appropriate subject combinations and levels of achievement as defined in the *Government Gazette*, Vol 751, No 32131 of 11 July 2008, and in the *Government Gazette,* Vol. 533, No. 32743, November 2009. In addition the minimum admission requirements, rule G7, is stipulated in the General Rules Handbook.

Further to the above, the following are required for admission into Mechanical Engineering:

1) NSC, NCV, SC:

Compulsory Subjects	National Senior Certificate	National Certificate, (Vocational)	Senior Certificate	
	Rating	Mark	HG	SG
Mathematics (Not Mathematics Literacy)	4			
Physical Science	4			
English (Primary), or	4			
English (First additional)	4			
English		60 %		
Mathematics		70 %		
Life Orientation		60 %		
Physical Science		70 %		
Two other relevant NCV vocational subjects		70 %		
English			E	C
Mathematics			E	C
Physical Science			E	C

In addition to the subject requirements above, applicants with an NSC will be ranked according to the sum of their marks for Mathematics and Physical Science, subject to a minimum combined score of 120.

Note:

(i) The subject NSC Mathematical Literacy will not be accepted as a substitute for the subject NSC Mathematics.

(ii) The exit certificate of the candidate must qualify the candidate for degree study at an institution of higher learning.

2) Other:

Applicants, that **qualify for degree study** at an institution of higher learning, but do not meet the departmental mathematics and/or physical science requirements, may present the following N4 subjects, for consideration for entry to the BET programme:

Mathematics and Engineering Science, plus two of:
Mechanotechnics

Engineering Drawing
Electrotechnics

The above are all to be passed, in the same sitting, with a minimum of 50%. Students will then be ranked, alongside the NSC students, according to the sum of their marks for N4 Mathematics and Engineering Science, subject to a minimum combined score of 120.

Applicants may present a cognate level 6 Diploma for entry into the BET program, Credit transfer will be considered dependent on the content thereof being presented.

Applicants may present a cognate National N Diploma for entry into the BET program. Credit transfer is not possible.

BACHELOR OF TECHNOLOGY (B Tech): ENGINEERING: MECHANICAL

The basic requirement is one of the following:

- New National Diploma: Engineering: Mechanical
- Old National Diploma for Technicians
- Old National Higher Diploma: Mechanical Engineering
- A qualification equivalent to any of the above.

In addition prospective students with other mechanical engineering or engineering qualifications plus considerable experience can apply for conferment of status.

The following pre-requisite subjects are required:
Theory of Machines III; Applied Strength of Materials III; Mathematics III, and Machine Design III.

No students will be allowed to register for the B. Tech programme unless they have passed all the pre-requisite modules.

MASTER OF ENGINEERING

Bachelor of Technology Honours degree or equivalent qualification. Conferment of status of the above mentioned qualification.

DOCTOR OF ENGINEERING

Master of Engineering degree or equivalent qualification.

5. PROGRAMME STRUCTURE

EM1 NATIONAL DIPLOMA: ENGINEERING: MECHANICAL PROGRAMME CODE: NDMCH2

The programme comprises a minimum of 2 credits formal time and 1 credit non-formal or experiential time. The programme must include at least 0,5 credits of formal time at Level 3.

NATIONAL DIPLOMA: ENGINEERING: MECHANICAL

Mechanical Stream NDMCH2	Credit Value
Semester 1	
*Mathematics I	0,084
*Mechanics I	0,083
*Mechanical Engineer'g Drawing I	0,083
*Computer Programming Skills I	0,083
*Mechanical Manuf'g Engineer'g I	0,083
*Engineering Materials & Science I	0,083
*Communication Studies I	0,083
Semester 2	
*Mathematics II	0,083
*Mechanics of Machines II	0,084
*Fluid Mechanics II	0,083
*Strength of Materials II	0,083
*Thermodynamics II	0,083
*Mechanical Engineering Design II	0,085
Semester 3	
Mechanics of Machines III (e)	0,083
Strength of Materials III (e)	0,083
*Mechanical Engineering Design III	0,085
*Computer Aided Drafting I	0,083
Fluid Mechanics III (e)	0,083
Thermodynamics III (e)	0,083
*Electrotechnology I	0,083
Semester 4	
*Mathematics III	0,083
Theory of Machines III (e)	0,083
Applied Strength of Materials III (e)	0,083
*Machine Design III	0,085
Hydraulic Machines III (e)	0,083
Steam Plant III (e)	0,083

Mechatronics Stream NDMCT1	Credit Value
Semester 1	
*Mathematics I	0,084
*Mechanics I	0,083
*Computer Aided Drafting	0,083
*Computer Programming Skills I	0,083
*Electronics I	0,083
*Electrotechnology I	0,083
*Communication Studies I	0,083
Semester 2	
*Mathematics II	0,083
*Mechanics of Machines II	0,084
*Fluid Mechanics II	0,083
*Digital Systems I	0,083
*Electrotechnology II	0,083
*Mechanical Engineering Design II	0,085
Semester 3	
*Mechanics of Machines III	0,083
*Process Instruments	0,083
*Mechanics Engineering Design III	0,085
*Control Systems II	0,083
*Fluid Mechanics III	0,083
*Mathematics III	0,083
Semester 4	
*Control Systems III	0,083
*Theory of Machines III	0,083
*Process Instruments II	0,083
*Machine Design III	0,085
*Hydraulic Machines III	0,083
*Industrial Electronics II	0,083

MECHANICAL STREAM:

The 18 academic modules marked with a * are compulsory. A student must also pass any two of the following combinations:

Mechanics of Machines II, III and Theory of Machines III
Strength of Materials II, III and Applied Strength of Materials III
Fluid Mechanics II, III and Hydraulic Machines III
Thermodynamics II, III and Steam Plant III

PLUS a further 2 elective modules

together with the Mechanical Engineering Practice I and II, in order to be awarded the National Diploma: Engineering: Mechanical at DUT. In addition the programme must include a minimum of 0,5 credits (approximately 6 modules) of formal time at level 3. A student may choose to do additional modules in other departments but these cannot be credited towards your diploma.

EM2 INSTRUCTIONAL PROGRAMME: ENGINEERING: MECHANICAL with Marine Engineering Electives NDMCM1

Code	Module	Pre-requisite Code
CSTD101 CMPP101 MATH101 MECH101 MEDR101	Communication Studies I Computer and Programming Skills I Mathematics I Mechanics I Mechanical Engineering Drawing I	FET Certificate at NQF Level 4, with Numeracy Skills, Physical Science and English or Equivalent Qualification
The above modules are at NQF Level 5 for the S1 semester of study.		All modules compulsory.
FMEC202 THMM201 MMAC202 ETEC101 NAME101 MEKN101 MALW101	Fluid Mechanics II Thermodynamics II Mech of Machines II Electrotechnology I Naval Architecture I Marine Eng Knowledge I Marine Law I	MATH101 and MECH101 MECH101 MATH101 and MECH101 MATH101 MATH101 and MECH101 MECH101 CSKI103
The above modules are at NQF Level 5 for the S2 semester of study.		All modules compulsory
SMAT202 FMEC302 THMM301 ETEC202 NAME202 MEKN202 MALW201	Strengths of Materials II Fluid Mechanics III Thermodynamics III Electrotechnology II Naval Architecture II Marine Eng Knowledge II Marine Law II	MECH101 FMEC202 THMM201 ETEC101 NAME101 MEKN101 MALW101
The above modules are at NQF Level 6 for the S3 semester of study.		All modules compulsory
MMAC302 HMAC301 SMAT302 SPLT302 ETEC302 NAME301 MEKN302	Mechanics of Machines III Hydraulic Machines III Strength of Materials III Steam Plant III Electrotechnology III Naval Architecture III Marine Eng Knowledge III	MMAC202 FMEC302 SMAT202 THMM301 ETEC202 NAME202 MEKN202
The above modules are at NQF Level 6 for the S4 semester of study.		All modules compulsory.

EM3 IMPORTANT NOTICE REGARDING NEW BTECH RULES

B TECH: ENGINEERING: MECHANICAL
PROGRAMME CODE: BTMCH2 (Mechanical Stream)
In order to graduate a student must have a minimum of 1 credit formal time.
Instructional offerings:

Mechanical Stream – Semester 1	Credit Value	Code
Strength of Materials IV	0,125	SMAT402
Fluid Mechanics IV	0,125	FMEC402
Engineering Materials & Science IV	0,125	EMSC402
Engineering Design Project IV	0,250	EDPR401
Semester 2		
Mechanics of Machines IV	0,125	MMAC402
Stress Analysis IV	0,125	SANL401
Refrigeration & Air Conditioning IV	0,125	RACN401
Automatic Control IV	0,125	ACTL401
Thermodynamics IV	0,125	THRM401
Turbo Machines IV	0,125	TMAC402

Compulsory instructional offerings:
Engineering Design Project IV
And any two of the following combinations:
Mechanics of Machines IV and Automatic Control IV
Strength of Materials IV and Stress Analysis IV
Fluid Mechanics IV and Turbo Machines IV
Thermodynamics IV and Refrigeration and Air Conditioning IV

Elective Instructional offerings:
Any other 2 modules offered in the a programme above

PROGRAMME CODE: BTMCT1 (Mechatronics Stream)
In order to graduate a student must have a minimum of 1,016 credit formal time
Instructional offerings:

Mechatronics Stream – Semester 1	Credit Value	Code
Engineering Mathematics IV	0,100	EMTH402
Fluid Mechanics IV	0,125	FMEC402
Process Instruments III	0,083	PRSI301
Engineering Design Project IV	0,250	EDPR401
Semester 2		
Mechanics of Machines IV	0,125	MMAC402
Power Electronics III	0,083	PETR301
Turbo Machines IV	0,125	TMAC402
Control Systems IV	0,125	CSYS402

Compulsory instructional offerings:
The instructional offerings listed in the table above are all compulsory

B.TECH: ENG: MECHANICAL STREAM REQUISITE MODULES:

Module	Pre-Requisite Modules
Strength of Materials IV	Applied Strength of Materials III or equivalent, Mathematics III, Engineering Materials & Science I
Mechanics of Machines IV	Theory of Machines III or equivalent, Engineering Materials & Science I Mathematics III
Eng Design Project IV	Machine Design III or equivalent,
Fluid Mechanics IV	Hydraulic Machines III or equivalent
Thermodynamics IV	Steam Plant III or equivalent
Stress Analysis IV	Mathematics III, Engineering Materials & Science I
Automatic Control IV	Mathematics III
Eng Materials & Science IV	Eng Materials & Science I or equivalent
Refrig & Air-conditioning IV	Steam Plant III or equivalent

Students must pass the pre-requisite modules before registering for the respective B.Tech module.

The course will be run on a part-time and/or full-time basis but students only have two years to complete as per rule G23A(4).

PHASE OUT INFORMATION FOR THE BACHELOR OF TECHNOLOGY (B. TECH) MECHANICAL ENGINEERING

Important information for current and prospective students (effective as of January 2018):

Mechanical Stream BTMCH2

Due to phase out of non HEQSF aligned programmes by the Department of Higher Education, the last registration for 1st time entering students into the B. Tech Mechanical Engineering program (Mechanical Stream) will be July 2019. All registrations at this time will be for full-time study only.

Notwithstanding all the current rules (both General rules and Departmental rules) that regulate this degree, the last semester in which any student may register for each of the modules is listed as follows:

Module Name	Last Possible Semester of Registration
Strength of Materials IV	January 2021
Fluid Mechanics IV	January 2021
Engineering Materials & Science IV	January 2021
Engineering Design Project IV	January 2021
Mechanics of Machines IV	July 2021
Stress Analysis IV	July 2021
Refrigeration & Air Conditioning IV	July 2021
Automatic Control IV	July 2021
Thermodynamics IV	July 2021
Turbo Machine IV	July 2021

Mechatronics Stream programme BTMCT1

The last registration for 1st time entering students into the B. Tech Mechanical Engineering program (Mechatronics option) will be January 2018. All registrations at this time will be for full-time study only.

Notwithstanding all the current rules (both General rules and Departmental rules) that regulate this degree, the last semester in which any student may register for each of the modules is listed as follows:

Module Name	Last Possible Semester of Registration
Process Instruments III	January 2019
Power Electronics III	January 2019
Engineering Mathematics IV	January 2019
Fluid Mechanics IV	January 2021
Engineering Design Project IV	January 2021
Mechanics of Machines IV	July 2021
Automatic Control IV	July 2021
Thermodynamics IV	July 2021
Turbo Machines IV	July 2021

EM3a INSTRUCTIONAL PROGRAMME: BACHELOR OF ENGINEERING: TECHNOLOGY IN MECHANICAL ENGINEERING

This is a three year full-time programme which focuses on the development of graduates with critical problem solving skills that support theory and practice in application.

Bachelor of Engineering Technology in Mechanical Engineering

Year	Module Name	Study Sem	NQF level	SAQA credits	Module Code	Pre-req	Co-req
1	Engineering Mathematics 1A	1	5	12	TBA		
	Engineering Physics 1A	1	5	12	TBA		
	Technical Literacy	1	5	8	TBA		
	Computing & IT	1	6	8	TBA		
	Cornerstone 101	1	5	12	TBA		
	Design 1	1	5	16	TBA		
	Electrical Principles 1	2	5	12	TBA		Engineering Physics 1B
	Mechanics of Machines 1	2	6	12	TBA		
	Engineering Mathematics 1B	2	5	12	TBA		
	Thermofluids 1	2	5	12	TBA		
	Strength of Materials 1	2	6	12	TBA		
	Engineering Physics 1B	2	5	12	TBA		
	Total - year 1			**140**			
2	Computer Aided Draughting	1	5	12	TBA		
	Analogue Electronics 1A	1	5	12	TBA		
	Electrical Principles 2	1	6	12	TBA	Electrical Principles 1	
	Fluid Mechanics 2	1	6	12	TBA	Thermofluids 1 Engineering Mathematics 1A Engineering Physics 1A	
	Engineering Mathematics 2A	1	6	12	TBA	Engineering Mathematics 1A Engineering Mathematics 1B	
	Materials Science	1	5	12	TBA		
	Mechanics of Machines 2	2	6	12	TBA	Mechanics of Machines 1 Engineering Mathematics 1A Engineering Physics 1A	
	Strength of Materials 2	2	6	12	TBA	Strength of Materials 1 Engineering Mathematics 1A Engineering Physics 1A	
	Design 2	2	6	12	TBA	Design 1	
	Thermodynamics 2	2	6	12	TBA	Thermofluids 1 Engineering Mathematics 1A Engineering Physics 1A	
	Digital Electronics 1A	2	5	12	TBA		
	Project Management	2	7	8	TBA		
	Total - year 2			**140**			
3	Design 3	1	7	12	TBA	Design 2	
	Strength of Materials 3	1	7	12	TBA	Strength of Materials 2	
	Mechanics of Machines 3	1	7	12	TBA	Mechanics of Machines 2	
	Thermodynamics 3	1	7	12	TBA	Thermodynamics 2	
	Fluid Mechanics 3	1	7	12	TBA	Fluid Mechanics 2	

	Instrumentation and Control 1	1	6	12	TBA	Analogue Electronics 1A Electrical Principles 1	
	Advanced Mechanical Manufacturing	2	7	12	TBA	Computing & IT	
	Electrical Technology Applications	2	7	12	TBA	Electrical Principles 2	
	Principles of Management	2	7	8	TBA		
	Environmental Engineering	2	7	8	TBA		
	Capstone Design Project	2	7	16	TBA	Design 3 Computer Aided Draughting	
	Numerical methods	2	7	12	TBA	Engineering Mathematics 1A Engineering Mathematics 1B	
	Total - year 3			**140**			
	Grand Total			**420**			

Exit Level Outcomes

Exit Level Outcomes defined below are stated generically and may be assessed in various engineering disciplinary or cross-disciplinary contexts in a provider-based or simulated practice environment. Words and phrases having specific meaning are defined in this document or in the ECSA document E-01-P.

Notes:

1. For Critical Cross-field Outcomes linked to Exit Level Outcomes refer to normative information in Appendix B.
2. For exemplified informative associated assessment criteria, refer to Appendix C.
3. The Level Descriptor: *Broadly-Defined engineering problems* applicable to this Qualification Standard is characterised by:
   a. require coherent and detailed engineering knowledge underpinning the technology area;

   and one or more of:

   b. are ill-posed, or under or over specified, requiring identification and interpretation into the technology area;
   c. encompass systems within complex engineering systems;
   d. belong to families of problems which are solved in well-accepted but innovative ways;

   and one or more of:

   e. can be solved by structured analysis techniques;
   f. may be partially outside standards and codes; must provide justification to operate outside;
   g. require information from practice area and source interfacing with the practice area that is incomplete;
   h. involves a variety of issues which may impose conflicting needs and constraints; technical, engineering and interested or affected parties.

General Range Statement: The competencies defined in the ten exit level outcomes may be demonstrated in a provider-based and / or simulated workplace context.

Exit Level Outcome 1: Problem Solving
Apply engineering principles to systematically diagnose and solve *broadly-defined* engineering problems.

Exit Level Outcome 2: Application of scientific and engineering knowledge
Apply knowledge of mathematics, natural science and engineering sciences to defined and applied engineering procedures, processes, systems and methodologies to solve *broadly-defined* engineering problems.

***Range Statement*:** Knowledge of mathematics, natural science and engineering science is characterized by:

1. A knowledge of mathematics using formalism and oriented toward engineering analysis and modelling; fundamental knowledge of natural science: both as relevant to a sub-discipline or recognised practice area.
2. A coherent range of fundamental principles in engineering science and technology underlying an engineering sub-discipline or recognised practice area.
3. A systematic body of established and emerging knowledge in specialist area or recognized practice area.
4. The use of mathematics, natural sciences and engineering sciences, supported by established models, to aid solving *broadly-defined* engineering problems.

Exit Level Outcome 3: Engineering Design
Perform procedural and non-procedural design of *broadly defined* components, systems, works, products or processes to meet desired needs normally within applicable standards, codes of practice and legislation.

***Range Statement*:** Design problems used in assessment must conform to the definition of *broadly-defined* engineering problems.

1. A major design project must be used to provide a body of evidence that demonstrates this outcome.
2. The project would be typical of that which the graduate would participate in a typical employment situation shortly after graduation.
3. The selection of components, systems, engineering works, products or processes to be designed is dependent on the sub-discipline.
4. A major design project should include one or more of the following impacts: social, economic, legal, health, safety, and environmental.

Exit Level Outcome 4: Investigation
Conduct investigations of *broadly-defined* problems through locating, searching and selecting relevant data from codes, data bases and literature, designing and conducting experiments, analysing and interpreting results to provide valid conclusions.

Range Statement: The balance of investigation and experiment should be appropriate to the discipline. An investigation or experimental study should be typical of those in which the graduate would participate in an employment situation shortly after graduation.

Note: An investigation differs from a design in that the objective is to produce knowledge and understanding of a phenomenon.

Exit Level Outcome 5: Engineering methods, skills, tools, including Information technology

Use appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modelling, for the solution of *broadly-defined* engineering problems, with an understanding of the limitations, restrictions, premises, assumptions and constraints.

***Range Statement*:** A range of methods, skills and tools appropriate to the sub-discipline of the program including:

1. Sub-discipline-specific tools, processes or procedures.
2. Computer packages for computation, modelling, simulation, and information handling;
3. Computers and networks and information infra-structures for accessing, processing, managing, and storing information to enhance personal productivity and teamwork;
4. Techniques from economics, management, and health, safety and environmental protection.

Exit Level Outcome 6: Professional and Technical Communication

Communicate effectively, both orally and in writing, with engineering audiences and the affected parties.

***Range Statement*:** Material to be communicated is in an academic or simulated professional context.

1. Audiences range from engineering peers, related engineering personnel and lay persons. Appropriate academic or professional discourse is used.
2. Written reports range from short (300-1000 words plus tables and diagrams) to long (10 000 to 15 000 words plus tables, diagrams and appendices), covering material at exit level.
3. Methods of providing information include the conventional methods of the discipline, for example engineering drawings, as well as subject-specific methods.

Exit Level Outcome 7: Impact of Engineering Activity

Demonstrate knowledge and understanding of the impact of engineering activity on the society, economy, industrial and physical environment, and address issues by analysis and evaluation.

***Range Statement*:** The combination of social, workplace (industrial) and physical environmental factors must be appropriate to the sub-discipline of the qualification. Evidence may include case studies typical of the technological practice situations in which the graduate is likely to participate.

Issues and impacts to be addressed:

1. Are generally within, but may be partially outside of standards and code of practice
2. Involve several groups of stakeholders with differing and conflicting needs.
3. Have consequences that are locally important but may extend more widely.
4. May be part of, or a system within a wider engineering system.

Exit Level Outcome 8: Individual and Teamwork

Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member and leader in a team and to manage projects.

***Range Statement*:**

1. The ability to manage a project should be demonstrated in the form of the project indicated in ELO 3.
2. Tasks are discipline specific and within the technical competence of the graduate.
3. Management principles include:
4. Planning: set objectives, select strategies, implement strategies and review achievement.
5. Organising: set operational model, identify and assign tasks, identify inputs, delegate responsibility and authority.
6. Leading: give directions, set example, communicate, motivate.
7. Controlling: monitor performance, check against standards, identify variations and take remedial action.

Exit Level Outcome 9: Independent Learning

Engage in independent and life-long learning through well-developed learning skills.

***Range Statement*:** The learning context is varying and unfamiliar. Some information is drawn from the technological literature.

Exit Level Outcome 10: Engineering Professionalism

Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of engineering technology practice.

***Range Statement*:** Evidence includes case studies typical of engineering practice situations in which the graduate is likely to participate.

MASTER OF ENGINEERING (MEng)
PROGRAMME CODE: MNMCHI

This is a research-based qualification, which may require further studies on behalf of the student in any subject/s related to the research.

DOCTOR OF ENGINEERING (DEng)
PROGRAMME CODE: DNMCHI

This is a research-based qualification, which may require further studies on behalf of the student in any subject/s related to the research.

6. ASSESSMENT RULES

EM4 WORK DONE DURING THE SEMESTER

In addition to Rules G12 to G15 the following specific rules apply to all modules:

1. The method of evaluation and compilation of the semester/progress mark in all modules will appear in the study guide for the module.
2. A student who for any reason is absent from a particular laboratory/practical or test, must provide proof of his/her reason for absence to the particular lecturer concerned immediately on his/her return to class on the date indicated on the medical certificate and be prepared to sit a make-up test/laboratory or practical that same day or as determined by the particular staff member. Refusal to accept this will result in a zero mark for the particular test/laboratory or practical.
3. In the case where a module is 100% coursework any student failing to obtain a final result of 50% or higher will have to repeat that module.
4. Any student who elects to re-attend a particular module where there is a semester mark and final examination will forfeit his previous semester mark, irrespective of whether it was higher than the new mark obtained.

EM5 EXAMINATIONS

Students who fail a module will be eligible to write a Supplementary exam in that module provided that they have obtained a final mark (semester and examination mark) of at least 45%:

The semester mark that applied to the preceding examination will apply to the supplementary examination.

Supplementary examinations are offered every semester to those students who are eligible.

EM6 STUDENT DRESS

Students must be neat and tidy at all times. Closed shoes must be worn for the duration of the time spent in any laboratory or workshop. Appropriate safety equipment needs to be worn where applicable.

EM7 SEMESTER MARK

In all examination modules where there is a laboratory/assignment/ practical component included in the semester mark then students must obtain a minimum of 50% for the laboratory/assignment/ practical in order to be eligible to write the final examination.

EM9 STUDENTS WHO REGISTER FOR MECHANICAL MANUFACTURING I and who can show proof of at least 18 months appropriate practical trade-orientated experience, can apply to the HOD to be credited with the module.

EM10 SERVICE MODULES

The following modules are service modules in the Department of Mechanical Engineering and students must refer to their respective study guides to ascertain specific rules applicable to these modules.

Communication Studies I
Computer Programming Skills I
Digital Systems I
Production Eng I
Electrotechnology I, II
Electronics I and II
Marine Law I and II
Marine Eng Knowledge I, II and III
Naval Architecture I, II and III
Mathematics I, II, III and Engineering Mathematics IV
Process Instrumentation I, II, III and IV
Control Systems II, III and IV
Power Electronics III
Automatic Control IV

EM10a REQUIREMENT TO PASS THE EXIT LEVEL OUTCOME

In modules where Exit Level Outcomes (ELO) are assessed, the student must achieve a final minimum pass mark of 50% in that module as well as being deemed competent in achieving the ELO requirements, as specified in the relevant study guide, in order to pass that module.

7. RE-REGISTRATION RULES (if more stringent than General Rules) incl. Pre/Co-requisite

EM11 PROMOTION TO THE NEXT SEMESTER

In addition to Rule G21 and at the discretion of the Head of Department:
No student shall be promoted to the next semester unless he/she has passed at least four full credits (i.e. 0,083 each) of the previous semester package.

PROMOTION TO A HIGHER LEVEL (G21)

No student is permitted to register for a higher level in a module before having passed the lower level in that module or the lower level pre-requisite module/s.

EM11a PROMOTION TO A HIGHER LEVEL/PROGRESSION RULES

A student will be considered a second year student if they have passed 70 or more first year credits.

A student will be considered a third year student if they have passed 70 or more second year credits in addition to passing all the first year credits.

EM12 EXPERIENTIAL LEARNING

The National Diploma programme requires the student/candidate to undergo a period of experiential learning as part of the course. All prescribed compulsory and elective modules and the prescribed experiential component must be passed in order to obtain sufficient credits to qualify for the qualification.

Although the Institution undertakes to assist the student/candidate in obtaining suitable experiential learning placement, the onus is on the student/candidate to find an "employer". An experiential learning agreement creates a separate contract between the "employer" and the student/ candidate.
Students must register at the department for the module Mechanical Engineering Practice and are advised to contact the Department of Co-operative Education to enquire about job opportunities.
Students are allowed to register for Experiential Learning at any time during the year.
No "backdating" of experiential Learning will be allowed.
The Experiential Learning Co-ordinator will only regard the student as being registered once he/she has received the WIL I form from the student.

Exclusion Rules (if more stringent than General Rules)

EMI3 EXCLUSION DUE TO LACK OF PROGRESS (UNSATISFACTORY ACADEMIC PROGRESS)

Further to Rule G17, a student is required to have minimally obtained the following module credits after each completed semester of study as stipulated in the table below. The credit value of each module is indicated in section 5. of this Handbook.

Semesters enrolled in programme (Excl WIL)	Credits Obtained
I	0
2	0.582
3	0.7
4	0.95
5	1.2
6	1.45
7	1.7
8	2

Notwithstanding the above, if a student does not pass both Mechanics I and Mathematics I within two consecutive semesters of registered study, he/she will be excluded.

A student who fails to comply with Rule EM13 will be excluded for a minimum of one year. He/she will only be considered for re-admission by the Departmental Admissions Committee if he/she has passed, at another higher education and training institution that is recognized by DUT as an equivalent institution, the module/s, or equivalent/s as stipulated by the Department at the time of the student's exclusion.

Any appeal by a student against academic exclusion must be made within ten working days of receipt of the notice of exclusion, on an 'APPEAL FOR RE-REGISTRATION' form obtainable from the Faculty Office/Department.

EM13a EXCLUSION DUE TO LACK OF PROGRESS (UNSATISFACTORY ACADEMIC PROGRESS)

Further to Rule G17, Should a student not fulfil the below, the student will be excluded.

- To have passed all first year modules by the end of their second year of registration;
- To have passed all second year modules by the end of their third year of registration;
- To have passed at least half of the third year modules by the end of their fourth year of registration;
- To complete the qualification by the end of five years of registration

EM14 LATE REGISTRATION

14.1 No registration for any module will be allowed later than one week after the commencement of lectures, without prior written permission from the Head of Department.

14.2 No student will be permitted to add or delete modules later than one week after the commencement of lectures.

EM15 LECTURE CLASHES

15.1 No student will be permitted to register for any module combination where there will be any timetable clashes in the case where all modules are first time registrations

15.2 In the case where a student is repeating modules the student will be allowed a maximum of one period clash per repeated registered module.

15.3 It is the responsibility of the student to check, prior to registration, their timetable for potential clashes as the department reserves the right to deregister students from modules registered in contravention of 15.1 & 15.2

EM16 Students are to register for the maximum number of modules available to them, according to EM1, for the level in which they are registering. If a student is registering for modules on two different levels the student must register for all available modules on the lower level and may add additional modules on the higher level, module to EM15

PHASE OUT RULES FOR THE NATIONAL DIPLOMA: ENGINEERING: MECHANICAL

EM17 PHASE OUT RULES

The dates stated in this rule are module to change depending on the effective approval date for the new HEQSF aligned programmes.

Important information for current and prospective students (effective as of January 2017):

The current National Diploma: Engineering: Mechanical will be phased out starting in 2017 to allow for the introduction of the new Bachelor of Engineering in Mechanical Engineering.

The last cohort of first-time entering students admitted to this National Diploma qualification will be in January 2017.

Notwithstanding all the current rules (both General rules and Departmental Rules) that regulate this diploma, the last semester in which any student may register for each of the modules is listed as follows:

Module Name	Last Possible Semester of Registration
Computer Programming Skills I	July 2017
Communication Studies I	July 2017
Mathematics I	July 2017
Engineering Materials and Science I	July 2017
Mechanical Engineering Drawing I	July 2017
Mechanics I	July 2017
Mechanical Manufacturing Engineering I	July 2017
Electronics I	July 2017
Digital Systems I	July 2017
Electrotechnology II	July 2017
Naval Architecture I	July 2017
Marine Engineering Knowledge I	July 2017
Legal Knowledge I	July 2017
Mathematics II	July 2018
Mechanics of Machines II	July 2018
Fluid Mechanics II	July 2018
Strength of Materials II	July 2018
Thermodynamics II	July 2018
Mechanical Engineering Design II	July 2018
Process Instruments I	July 2018
Control Systems II	July 2018
Naval Architecture II	July 2018
Marine Engineering Knowledge II	July 2018
Legal Knowledge II	July 2018
Mechanics of Machines III	July 2019
Strength of Materials III	July 2019
Mechanicals Engineering Design III	July 2019
Computer Aided Drafting I	July 2019
Fluid Mechanics III	July 2019
Thermodynamics III	July 2019
Electrotechnology I	July 2019
Control Systems III	July 2019
Process Instruments II	July 2019
Industrial Electronics II	July 2019
Naval Architecture III	July 2019
Marine Engineering Knowledge III	July 2019
Electrotechnology III	July 2019
Mathematics III	July 2020
Theory of Machines III	July 2020
Applied Strength of Materials III	July 2020
Machine Design III	July 2020
Hydraulic Machines III,	July 2020
Steam Plant III	July 2020
Experiential Learning I (P1)	January 2021
Experiential Learning II (P2)	July 2021

No student may register for Experiential Learning I or Experiential Learning II unless they have completed the following prerequisites.

Experiential Learning I (P1)
Pre-requisites: Complete ALL Diploma modules BEFORE commencing Experiential Learning I

Experiential Learning II (P2)
Pre-requisites: Complete Experiential Learning I (See EM12 for further details)

Please note that due to National legislation, signed into effect by the Minister of Higher Education in the Government Gazette no. 40123 of 6th July 2016, the last permitted enrolment for any non-HEQSF aligned programme will be the 31st December 2019. This means that you will not be able to enrol in a Bachelor of Technology (BTech) degree at DUT, or at any other institution in South Africa after this date

INDICATIVE CONTENT

NB: Students: to read this section in conjunction with the relevant learner guide.

APPLIED STRENGTH OF MATERIALS III (APSM301) Credit Value 0,083
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Lectures & Tutorials: 3 periods per week
Practicals: 1 period per week average
Minimum semester mark of 40% required (Rule EM 8.2)
SYLLABUS:
1. Theory of elasticity (introductory)
2. Struts (buckling)
3. Internal forces, slope and deflection in beams (including statically indeterminate). Castigliano (incl modified one) theorem. Superposition and integration methods, moment-area method.
4. Internal forces, slope and deflection in simple frame. (this is extension of beam theory)
5. Beams subjected to asymmetrical loading

AUTOMATIC CONTROL IV (ACTL401) Credit Value: 0,125
Duration: Semester
Evaluation: Semester mark and one three-hour examination
SYLLABUS:
1. Elements of automatic control
2. Automatic control
3. Transducers
4. System design

Periods of Tuition:
Contact Time: 4 periods per week

COMMUNICATION STUDIES I (CSTD101) Credit Value 0,083
Duration: Semester
Evaluation: 100% coursework.
Periods of Tuition:
Theory: 1 period per week
Tutorials: 2 periods per week
SYLLABUS:
1. Communication theory
2. Oral presentations
3. Technical writing skills

4. Group communication skills

COMPUTER AIDED DRAUGHTING I (CADG101) Credit Value 0,083

Duration: Semester
Evaluation: 100% coursework as detailed below.
Periods of Tuition:
Contact Time:
Lectures + Practicals: 3 periods per week

SYLLABUS

1. Introduction to the CAD
2. Creating and saving folders and files
3. Exploring the basic commands of the programme
4. Pictorial (PART) Drawings
5. Orthographic (DRAFT) Drawings
6. Assembly Drawings
7. Motion

COMPUTER AND PROGRAMMING SKILLS I (CMPP101) Credit Value 0,083

Duration: Semester
1. 100% Course work

Periods of Tuition:
Contact Time:
Practicals: 3 periods per week

SYLLABUS:

The development of computers and the basic elements of the computer hardware and software.
Introduction to email and the internet.
Word processing, Spreadsheets, Presentation software used in engineering.
Basic programming and problem solving using pseudocode algorithms.

CONTROL SYSTEMS II (CSYS202) Credit Value 0,083

Duration: Semester
Evaluation: Semester Mark & one 3 hour exam

SYLLABUS:

Introduction
Dynamic Models
Control System Inputs
Model Solutions
System Response
Stability

CONTROL SYSTEMS III (CSYS301) Credit Value 0,083

Duration: Semester
Evaluation: Semester Mark & one 3 hour exam

SYLLABUS:

Introduction
Root Locus Plots
Frequency Response
Stability
Closed Loop Response
Compensator Design

DIGITAL SYSTEMS I (DSYS102) Credit Value 0,083
Please refer to the learner guide which is available from the relevant department.

ELECTRONICS I (ETRS101) Credit Value 0,083
Please refer to the learner guide which is available from the relevant department.

ELECTROTECHNOLOGY I (ETEC101) Credit Value 0,083
Duration: Semester
Evaluation: Semester mark and one three (3) hour examination
Periods of Tuition:
Contact Time:
Lectures + Tutorials: 4 periods per week
Practicals: 1 period per week average
Minimum semester mark of 40% required (Rule EM 8.2)
SYLLABUS:
1. The fundamental laws
2. Circuit elements
3. Simple dissipative circuits
4. Analysis of dissipative circuits
5. Magnetic circuits
6. Inductance
7. Capacitance
8. Response of RL and RC circuits

ELECTROTECHNOLOGY II (ETEC202) Credit Value 0,083
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Lectures + Tutorials: 3 periods per week
Practicals:: 1 period per week average
Minimum semester mark of 40% required (Rule EM13.2)
SYLLABUS:
1. Basic electrical measurements
2. Alternating current circuits
3. Transformers
4. Distribution

ENGINEERING DESIGN PROJECT IV (EDPR401) Credit Value 0,250
Duration: Annual
Evaluation: 100% course work
Period of Tuition:
Contact Time:
Lectures: 4 periods per week
SYLLABUS:
1. Formal Instruction
   1.1 How and from where is information collected?
   1.2 Guidelines to writing an Engineering Design Report.
   1.3 Suitable topics to broaden a student's knowledge in fields such as industrial design. Design practice, fatigue, failure analysis, practical applications of FEA, CAD/D, etc., will be introduced if and where considered necessary at the discretion of the individual mechanical engineering departments at the participating universities.

2. Select only one topic from ANY major engineering system. At least 150 hours (credits) must be spent on the project. (The 150 hours project time is only given as a guide and if little work emerges from this period it will be assumed that the time was insufficiently utilised.)

EXAMPLES OF ENGINEERING SYSTEMS ARE:

Steam plant
Solar heating plant
Internal combustion engines - petrol, diesel, rotary or two-stroke, etc.
Hydraulic and pump machines
Machine tools and accessories
Material handling machinery
Automobile systems
Aircraft systems
Marine systems
Hydraulic and pneumatic control systems with cylinders, valves, accumulators and intensifiers.
Any problem solution required by industry of such a nature that it may form a practical assessment of a student's engineering design ability at this level.

3. **INSTRUCTIONS**

3.1 Each student will be required to submit detailed calculations, detailed drawings and an assembly drawing to be drawn to current international standards e.g. DIN, ANSI, etc. (The extent and balance of the work required here to be at the discretion of Mechanical Engineering Department. A large project could require extensive drawings to be produced, which could take considerable time to complete. Repetitive drawing work examines a student's draughting ability not his/her design ability. In some cases there may be no alternative, in others the GA could be executed with only a few representative detail drawings plus a list of remaining drawings or sketches which would in practice be passed on to a draughtsman to execute.)

3.2 If the design is from a work environment it must be accompanied by a declaration signed by the head of department certifying that the drawings, hand sketches, etc. are the student's own work.

3.3 Students must quote in their paper any books of reference employed in the preparing of their design. The mere copying of drawings and calculations from works of reference will receive little or no credit.

3.4 All selected topics must be approved by the Mechanical Engineering Department and must preferably be industry related.

3.5 The method of tuition (i.e. formal tuition, tutorials, practicals, individual or group consultations, etc.) to be decided by the Mechanical Engineering Department and to be structured as deemed necessary to suit the project.

ENGINEERING MATERIALS AND SCIENCE I (EMSC102) Credit Value 0,083

Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Lectures + Tutorials: 3 periods per week

SYLLABUS:

1. Atomic structure of materials
2. Modifications to structure
3. Properties of materials including mechanical properties
4. Materials processing
5. Electrical properties

ENGINEERING MATERIALS & SCIENCE IV (EMSC402) Credit Value 0,125
Duration: Semester
Evaluation: Semester mark and one three (3) hour examination
Periods of Tuition:
Contact Time:
Lectures: 4 periods per week
SYLLABUS:
1. Corrosion
2. Fatigue
3. Creep
4. Impact
5. Welding

ENGINEERING MATHS IV (EMTH402) Credit Value 0,125
Duration: Semester
Evaluation: 20% from average 5 tests (one on each section); 80% examination
SYLLABUS:
1. Linear differential equations
2. Complex analysis
3. Difference equations
4. Linear algebra
5. Z Transforms

FLUID MECHANICS II (FMEC202) Credit Value 0,083
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Minimum semester mark of 40% required (Rule EM8.2)
Periods of Tuition:
Contact Time:
Lectures + Tutorials: 3 periods per week
Practicals: 1 period per week average
SYLLABUS:
1. Hydrostatics
2. Fluid flow

FLUID MECHANICS III (FMEC302) Credit Value 0,083
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Lectures + Tutorials: 3 periods per week
Practicals: 1 period per week average
Minimum semester mark of 40% required (Rule EM8.2)
SYLLABUS:
1. Pipe flow
2. Viscous flow
3. Hydrodynamics
4. Vortex theory

FLUID MECHANICS IV (FMEC402) Credit Rating 0,125
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Theory: 4 periods per week
Syllabus:
1. Model Analysis
2. Immersed Body Flow
3. Compressible Flow
4. Pipe Network Analysis for Steady Incompressible Flow
5. Boundary Layers

HYDRAULIC MACHINES III (HMAC301/HYMC301) Credit Value 0,083
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Lectures + Tutorials: 3 periods per week
Minimum semester mark of 40% required (Rule EM 8.2)
SYLLABUS:
1. Centrifugal pumps
2. Fans and fan systems
3. Water turbines
4. Hydraulic machines

INDUSTRIAL ELECTRONICS II (ITRS201) Credit Value 0,083
Please refer to the learner guide which is obtainable from the relevant department

MACHINE DESIGN III (MDES302) Credit Value 0,085
Duration: Semester
Evaluation: 100% coursework.
Periods of Tuition:
Contact Time:
Lectures + Tutorials: 3 periods per week
Discussion: 1 period per week average
SYLLABUS:
1. Specific design

MARINE ENGINEERING KNOWLEDGE I (MEKN101) Credit Value 0,083
Duration: Semester
Evaluation: Two test equally weighted
One three hour examination
Periods of Tuition:
To be advised, depending on student numbers
SYLLABUS:
1. Watch keeping practice
2. Materials
3. Instrumentation
4. Internal combustion engines and auxiliary systems.

MARINE ENGINEERING KNOWLEDGE II (MEKN201) Credit Value (0,083)
Duration: Semester
Evaluation: Semester mark and one three-hour examination.
Periods of Tuition:
To be advised, depending on student numbers.
SYLLABUS:
1. Steam plant and auxiliary systems
2. Power transmission systems
3. Pumps and pumping systems
4. Marine electrical equipment
5. Refrigeration systems
6. Ship handling and maneuvering equipment
7. Pollution control
8. Safety equipment and fire fighting
9. Ship maintenance
10. Management

MARINE ENGINEERING KNOWLEDGE III (MEKN301) Credit Value 0,083
Duration: Semester
Evaluation: Semester mark and one three-hour examination.
Periods of Tuition:
To be advised, depending on student numbers.
SYLLABUS:
1. Materials
2. Instrumentation and control
3. Fluids and lubricants
4. Internal combustion engines and auxiliary systems
5. Steam plant and auxiliary systems.
6. Power transmission systems
7. Pumps and pumping systems
8. Marine electrical equipment
9. Refrigeration systems
10. Ship Maneuvering equipment
11. Auxiliary equipment design and maintenance
12. Ship safety and safety equipment
13. Maintenance management
14. Management.

MATHEMATICS I (MATH101) Credit Value 0,084
Duration: Semester
The final mark a student obtains will be based on 100% coursework as detailed in the study guide
Periods of Tuition:
Contact Time:
Lectures + Tutorials: 6 periods per week
SYLLABUS:
1. Determinants, Logarithms, Formulae, Trigonometry (Radian measure)
2. Complex Numbers (Forms +; - x; roots)
3. Statistics (Descriptive, Central Tendency and Dispersion)
4. Calculus (Differentiation & Elementary Integration)

MATHEMATICS II (MATH201) Credit Value 0,083

Duration: Semester

The final mark a student obtains will be based on 100% coursework as detailed in the study guide.

Periods of Tuition:

Contact Time:

Lectures + Tutorials: 6 periods per week

SYLLABUS:

1. Differentiation and applications
2. Integration and applications
3. 1st order differential equations and applications
4. Matrices

MATHEMATICS III (MATH301) Credit Value 0,083

Duration: Semester

Evaluation: 40% course mark; 60% exam mark

SYLLABUS:

1. The solution of ODE by:
   i) D-operators
   ii) LaPlace transforms
   iii) Numerical technique
2. Eigen values and eigenvectors
3. Fourier series:
   i) Analytical
   ii) Numerical

MECHANICAL ENGINEERING DESIGN II (MEDS201) Credit Value 0,085

Duration: Semester

Evaluation: 100% coursework

Periods of Tuition:

Contact Time:

Lectures + Tutorials: 4 periods per week

SYLLABUS:

1. Introduction to the Design Process
2. Designing for assembly:
   a) Fits and tolerances
   b) Permanent & detachable fastening methods
3. Load carrying capacity of simple machine elements

MECHANICAL ENGINEERING DESIGN III (MEDS301) Credit Value 0,085

Duration: Semester

Evaluation: Semester mark and 1 x 4 hour examination

Periods of Tuition:

Contact Time:

Lectures + Tutorials: 4 periods per week

SYLLABUS:

1. Review of the Design Process
2. Dynamic loading and Basic Fatigue in components
3. External/Internal braking systems
4. Single and multi-plate clutches
5. Spur/bevel/helical gears

6. Shafts under combined bending and twisting
7. Bearings
   (a) shell/lubricant
   (b) rolling element
8. Spring Design

MECHANICAL ENGINEERING DRAWING I (MEDR101) Credit Value 0,083
Duration: Semester
Evaluation: 100% coursework
Periods of Tuition:
Contact Time:
Lectures + Practicals: 5 periods per week
SYLLABUS:
Section 1. Use of instruments, line work, printing and dimensioning.
Freehand sketching.
Tangency blending of lines and curves.
Section 2. Pictorial drawing.
Section 3. Orthographic Engineering Drawing.
First and third angle projection of various shaped blocks and castings with sections.
Assembly drawings.

MECHANICAL MANUFACTURING ENGINEERING I (MMEN102)
Credit Value 0,083
Duration: Semester
Evaluation: 100% Coursework
Periods of Tuition:
Contact Time:
Lectures + Practicals: 4 periods per week
SYLLABUS:
1. Safety and safety legislation
2. Identification and application of materials
3. Elementary measuring equipment
4. Elementary hand and machine tools

MECHANICS I (MECH101) Credit Value 0,083
Duration: Semester
Evaluation: Semester Mark and one three-hour examination
Contact Time:
Periods of Tuition:
Lectures + Tutorials: 4 periods per week
Practicals: Average 1 period per week.
SYLLABUS:
1. Statics
2. Dynamics

MECHANICS OF MACHINES II (MMAC202) Credit Value 0,084
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Contact Time:
Periods of Tuition:
Lectures + Tutorials: 3 periods per week
Practical: 1 period per week
Minimum semester mark of 40% required (Rule EM8.2)
SYLLABUS:
1. Advanced Dynamics

MECHANICS OF MACHINES III (MMAC302) Credit Value 0,083
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Lectures + Tutorials: 3 periods per week
Practical: average 1 period per week
Minimum semester mark of 40% required (Rule EM8.2)
SYLLABUS:
1. Kinematics
2. Balancing
3. Gears
4. Simple Harmonic Motion
5. Vehicle Dynamics

MECHANICS OF MACHINES IV (MMAC402) Credit Value 0,125
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Theory: 4 periods per week
SYLLABUS:
1. Introduction to vibrations
2. Forced vibrations
3. Damped vibrations
4. Transverse vibrations of beams
5. Whirling of shafts
6. Shock and vibration control
7. Practical vibration measurement and analysis
8. Random vibration

NAVAL ARCHITECTURE I (NAME101) Credit Value 0,083
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Lectures + Tutorials: 3 periods per week
SYLLABUS:
1. Fundamental theorems
2. Principle and application of numerical and mechanical integration
3. Transverse stability and dynamical stability
4. Longitudinal stability
5. Dry docking
6. Resistance and propulsion
7. Structural strength
8. Stability data
9. Design features and structural detail in specialised ship types
10. Damage inspection

NAVAL ARCHITECTURE II (NAME202) Credit Value 0,083
Duration: Semester
Evaluation: Semester mark and one three-hour examination
SYLLABUS:
Ship Stability and basic construction and design concepts.

PROCESS INSTRUMENTATION I (PRSI101) Credit Value 0,083
Please refer to the learner guide which is obtainable from the relevant department.

PROCESS INSTRUMENTATION II (PRSI201) Credit Value 0,083
Please refer to the learner guide which is obtainable from the relevant department.

REFRIGERATION AND AIR CONDITIONING IV (RACN401) Credit Value 0,125
Duration: Semester
Evaluation: Semester mark plus one three-hour examination.
Periods of Tuition:
Contact Time:
Theory: 4 periods per week
SYLLABUS:
1. Refrigeration
2. Air-Conditioning Systems
3. Moist Air Properties and Conditioning Processes
4. Comfort and Health - Indoor Environmental Quality
5. Heat Transmission in Building Structures
6. Solar Radiation
7. Space Heating Load
8. The Cooling Head

STEAM PLANT III (SPLT302) Credit Value 0,083
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Lectures + Tutorials: 3 periods per week
Practicals: 1 period per week
Minimum semester mark of 40% required (Rule EM8.2)
SYLLABUS:
1. Nozzles
2. Steam Plant
3. Psychrometry
4. Legislation
5. Heat Transfer

STRENGTH OF MATERIALS II (SMAT202) Credit Value 0,083
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Lectures + Tutorials: 3 periods per week
Practicals: 1 period per week average
Minimum semester mark of 40% required (Rule EM8.2)
SYLLABUS:
Part A:
1. Stress and strain
2. Shear force and bending moment
3. Torsion of circular shafts
4. Strain energy
5. Thin cylinders
6. Framed structures

Part B:
Testing of Materials
It is suggested that Part B be handled during practical sessions, in conjunction with the practical work done by the student on the various machines

STRENGTH OF MATERIALS III (SMAT302) Credit Value 0,083
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Lectures + Tutorials: 4 periods per week
Practicals: 1 period per week
Minimum semester mark of 40% required (Rule EM8.2)
SYLLABUS:
1. Statically —Determinate (force and moment) systems
2. Stress (normal, shear and combined)
3. Deflection of beams
4. Fatigue

STRENGTH OF MATERIALS IV (SMAT402) Credit Value 0,125
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Theory: 4 periods per week
SYLLABUS:
1. Theories of elastic failure
2. Energy methods
3. Shear stresses in beams
4. Structural analysis
5. Statically indeterminate structures
6. Elementary plasticity
7. Thick cylinders and rotating disks
8. Variation of stress and strain
9. Deflection of flat plates (introduction)

STRESS ANALYSIS IV (SANL401) Credit Value 0,125
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Theory: 4 periods per week
SYLLABUS:
1. The finite element method
2. Fracture and fatigue
3. Fracture mechanics

THEORY OF MACHINES III (THMC301) Credit Value 0,083
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Lectures + Tutorials: 3 periods per week
Practicals: Average 1 period per week
Minimum semester mark of 40% required (Rule EM 8.2)
SYLLABUS:
1. Energy diagrams
2. Balancing of engines
3. Cams
4. Introduction of vibration
5. Acceleration diagram

THERMODYNAMICS II (THRM201/THMM201) Credit Value 0,083
Duration: Semester
Evaluation: Semester mark and one three-hour examination
Periods of Tuition:
Contact Time:
Lectures + Tutorials: 3 periods per week
Practicals: 1 period per week average
Minimum semester mark 40% required (Rule EM8.2)

SYLLABUS:

1. Introduction - terminology, processes, energies, calorimetry
2. Systems and Laws - closed (NFEE), open (SFEE), 0th, 1st and 2nd laws
3. Gases - Boyle's, Charles and Joule's Laws, characteristic equation, gas constants, processes and cycles
4. Vapours - 2 phase systems, properties of vapours, phase diagrams, processes and cycles
5. Entropy - of gases and vapours, phase diagrams, Mollier chart
6. Combustion - composition of air and fuels, stoichiometric combustion and products by mass and volume, excess air, flue gas analysis, HCV/LCV, calorimeters Steam Plant - component identification, energy transfers, boiler efficiency, equivalent evaporation, condensers and energy balance, Carnot & Rankine Cycle efficiencies, water treatment.

THERMODYNAMICS III (THRM301/THMM301) Credit Value 0,083

Duration: Semester

Evaluation: Semester mark and one three-hour examination

Periods of Tuition:

Contact Time:

Lectures + Tutorials: 3 periods per week

Practicals: 1 period per week average

Minimum semester mark of 40% required (Rule EM8.2)

SYLLABUS:

1. Compressors
2. Refrigeration
3. Ideal Cycles
4. Internal Combustion Engines
5. Gas Turbines

TURBOMACHINES IV (TMAC402) Credit Value 0,125

Duration: Semester

Evaluation: Semester mark and one three-hour examination

Periods of Tuition:

Contact Time:

Lectures + Tutorials: 4 periods per week

Practicals:

Minimum semester mark of 40% required (Rule EM8.2)

SYLLABUS:

1. Basic principles
2. Dimensional analysis: Similitude
3. Two dimensional cascades
4. Axial flow turbines
5. Axial flow compressors and fans
6. Centrifugal pumps, fan and compressor
7. Wind turbines

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