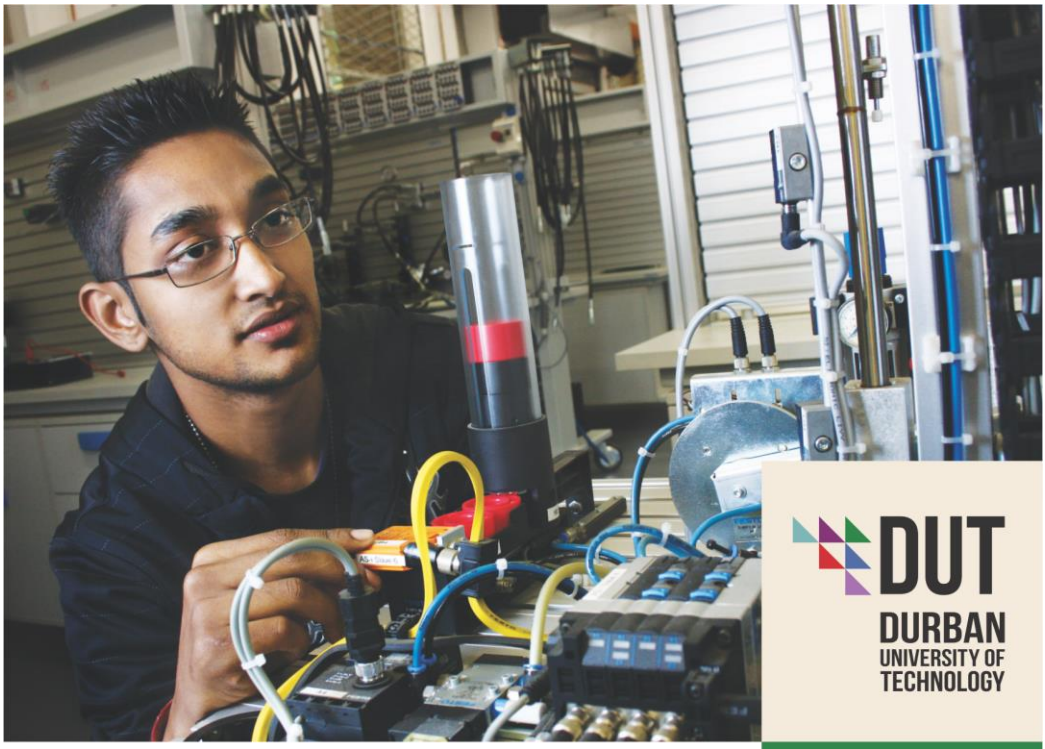

DUT
DURBAN UNIVERSITY OF TECHNOLOGY

2016 HANDBOOK
MECHANICAL ENGINEERING

FACULTY OF ENGINEERING & THE BUILT ENVIRONMENT

HANDBOOK FOR 2016

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 synthesising 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 Bachelor's 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 (Senior Lecturer)	Mr G Thurbon, BSc Eng (NU); GCC (factories); M.Ed (UKZN); MSAI Mech E
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)
Lecturers	Mr D W Bennett, Cert Arch Dr (TN); MSA Inst D; MSAI Mech E Mr S Govender, BSc Eng (UDW) Mr B Graham, BTech (DUT), Pr TechniEng Mr T Macholo, BSc Eng (UDW) Mr M Moutlana, BSc Eng (MIT), MSc Eng (UKZN) Mr F Mwangi, M Tech (Mech Eng) (DUT) Mr K J Nwamba, HED Dip (Technical), M Tech (Mech Eng) (TUT) 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. 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
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

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 subject done within the department at a level other than IV or any B. Tech subject pre-requisite may be used as a B. Tech credit.

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 subjects.

MASTER OF ENGINEERING

Bachelor of Technology (B Tech) degree or equivalent qualification.

DOCTOR OF ENGINEERING

Master of Engineering degree or equivalent qualification.

5. PROGRAMME STRUCTURE

EM1 NATIONAL DIPLOMA: ENGINEERING: MECHANICAL PROGRAMME CODE: NDMCH1/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) Semester 1	Credit Value	Mechatronics Stream Semester 1	Credit Value
*Mathematics I	0,084	*Mathematics I	0,084
*Mechanics I	0,083	*Mechanics I	0,083
*Mechanical Engineering Drawing I	0,083	*Computer Aided Drafting I	0,083
*Computer Programming Skills I	0,083	*Computer and Programming Skills I	0,083
*Mechanical Manufacturing Engineering I	0,083	*Electronics I	0,083
*Engineering Materials & Science I	0,083	*Electrotechnology I	0,083
*Communication Studies I	0,083	* Communication Studies I	0,083
Semester 2		**Semester 2**	
*Mathematics II	0,083	*Mathematics II	0,083
*Mechanics of Machines II	0,084	*Mechanics of Machines II	0,084
*Fluid Mechanics II	0,083	*Fluid Mechanics II	0,083
*Strength of Materials II	0,083	*Digital Systems I	0,083
*Thermodynamics II	0,083	*Electrotechnology II	0,083
*Mechanical Engineering Design II	0,085	*Mechanical Engineering Design II	0,085
Semester 3		**Semester 3**	
*Mechanics of Machines III	0,083	*Mechanics of Machines III	0,083
*Strength of Materials III	0,083	*Process Instrumentation	0.083
*Mechanical Engineering Design III	0,085	*Mechanics Engineering Design III	0,085
*Computer Aided Drafting I	0,083	*Control Systems II	0,083
Fluid Mechanics III **OR** Thermodynamics III (1)	0,083	*Fluid Mechanics III	0,083
*Electrotechnology I	0,083	*Mathematics III	0,083
Semester 4		**Semester 4**	
*Mathematics III	0,083	*Control Systems III	0,083
*Theory of Machines III	0,083	*Theory of Machines III	0,083
*Applied Strength of Materials III	0,083	*Process Instrumentation I	0,083
*Machine Design III	0,085	*Machine Design III	0,085
Hydraulic Machines **OR** Steam Plant III (1)	0,083	*Hydraulic Machines III	0,083
		*Industrial Electronics II	0,083

MECHANICAL STREAM:

The 22 academic subjects marked with a * are compulsory. A student must also pass a further 2 elective academic subjects in order to be awarded the National Diploma: Engineering: Mechanical at DUT. The two elective subjects can either be Fluid Mechanics III + Hydraulic Machines III OR Thermodynamics III + Steam Plant III. A student may choose to do additional subjects in other departments but these cannot be substituted for the 22 compulsory subjects or the two sets of elective subjects.

EM2 INSTRUCTIONAL PROGRAMME: ENGINEERING: MECHANICAL with Marine Engineering Electives

Code	Subject	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 subjects are at NQF Level 5 for the S1 semester of study. All subjects compulsory.		

FMEC202	Fluid Mechanics II	MATH101 and MECH101
THMM201	Thermodynamics II	MECH101
MMAC202	Mech of Machines II	MATH101 and MECH101
ETEC101	Electrotechnology I	MATH101
NAME101	Naval Architecture I	MATH101 and MECH101
MEKN101	Marine Eng Knowledge I	MECH101
MALW101	Marine Law I	CSKI103
The above subjects are at NQF Level 5 for the S2 semester of study.		All subjects compulsory
SMAT202	Strengths of Materials II	MECH101
FMEC302	Fluid Mechanics III	FMEC202
THMM301	Thermodynamics III	THMM201
ETEC202	Electrotechnology II	ETEC101
NAME202	Naval Architecture II	NAME101
MEKN202	Marine Eng Knowledge II	MEKN101
MALW201	Marine Law II	MALW101
The above subjects are at NQF Level 6 for the S3 semester of study.		All subjects compulsory
MMAC302	Mechanics of Machines III	MMAC202
HMAC301	Hydraulic Machines III	FMEC302
SMAT302	Strength of Materials III	SMAT202
SPLT302	Steam Plant III	THMM301
ETEC302	Electrotechnology III	ETEC202
NAME301	Naval Architecture III	NAME202
MEKN302	Marine Eng Knowledge III	MEKN202
The above subjects are at NQF Level 6 for the S4 semester of study.		All subjects compulsory.

EM3 BACHELOR OF TECHNOLOGY (B Tech): ENGINEERING: MECHANICAL PROGRAMME CODE: BTMCH1/BTMCH2

The programme comprises a minimum of 1 credit formal time.
Mechanical Stream - 0, 75 credits are compulsory and 0, 25 credits are elective.

Bachelor of Technology: Engineering: Mechanical

Mechanical Stream			**Mechatronics Stream**		
Semester 1	**Credit Value**	**Subject Codes**	**Semester 1 (Effective 2011)**	**Credit Value**	**Subject Codes**
Strength of Materials IV	0,125	SMAT402	Engineering Mathematics IV	0,100	EMTH402
Fluid Mechanics IV (E)	0,125	FMEC402	Fluid Mechanics IV	0,125	FMEC402
Engineering Materials & Science IV (E)	0,125	EMSC402	Process Instrumentation III (E)	0,083	PRSI301
Engineering Design Project IV (A)	0,250	EDPR401	Engineering Design Project IV (A)	0,250	EDPR401
Semester 2			**Semester 2 (Effective 2011)**		
Mechanics of Machines IV	0,125	MMAC402	Mechanics of Machines IV	0,125	MMAC402
Stress Analysis IV	0,125	SANL401	Power Electronics III (E)	0,083	PETR301
Refrigeration & Air Conditioning IV (E)	0,125	RACN401	Turbo Machines IV	0,125	TMAC402
Engineering Design Project IV (B)	N/A	EDPR401	Engineering Design Project IV (B)	N/A	EDPR401
Automatic Control IV	0,125	ACTL401	Control Systems IV	0,125	CSYS402

All subjects as listed above are compulsory unless stated otherwise (See note below)
(E) Indicates elective subjects.

B.TECH: ENG: MECHANICAL STREAM REQUISITE SUBJECTS:

Subject	Pre-Requisite Subjects
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 subject before registering for the respective B Tech subject.
The course will be run on a part-time and/or full-time basis.

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 subjects:

1. The method of evaluation and compilation of the semester/progress mark in all subjects will appear in the study guide for the subject.
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 subject is 100% coursework any student failing to obtain a final result of 50% or higher will have to repeat that subject.
4. Any student who elects to re-attend a particular subject 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 subject will be eligible to write a Supplementary exam in that subject 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 subjects 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 subject.

EM10 SERVICE SUBJECTS

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

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 and III and IV
Power Electronics III
Automatic Control IV

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 subject before having passed the lower level in that subject or the lower level pre-requisite subject/s.

EM12 EXPERIENTIAL LEARNING

This programme requires the student/candidate to undergo a period of experiential learning as part of the course. All prescribed compulsory and elective subjects 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 subject 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)

EM13 EXCLUSION DUE TO LACK OF PROGRESS (UNSATISFACTORY ACADEMIC PROGRESS)

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

Semesters enrolled in programme (Excl WIL)	Credits Obtained
1	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 subject/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.

EM14 LATE REGISTRATION

14.1 No registration for any subject 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 subjects later than one week after the commencement of lectures.

EM15 LECTURE CLASHES

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

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

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 subjects registered in contravention of 15.1 & 15.2

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

PHASE OUT RULES FOR THE NATIONAL DIPLOMA: ENGINEERING: MECHANICAL

EM17 PHASE OUT RULES

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

Important information for current and prospective students (effective as of January 2016):

The current National Diploma: Engineering: Mechanical will be phased out starting in 2016 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 2016.

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 subjects is listed as follows:

Subject Name	Last Possible Semester of Registration
Computer Programming Skills I	July 2016
Communication Studies I	July 2016
Mathematics I	July 2016
Engineering Materials and Science I	July 2016
Mechanical Engineering Drawing I,	July 2016
Mechanics I	July 2016
Mechanical Manufacturing Engineering I	July 2016
Electronics I	July 2016

Digital Systems I	July 2016
Electrotechnology II	July 2016
Naval Architecture I	July 2016
Marine Engineering Knowledge I	July 2016
Legal Knowledge I	July 2016
Mathematics II	July 2017
Mechanics of Machines II	July 2017
Fluid Mechanics II	July 2017
Strength of Materials II	July 2017
Thermodynamics II	July 2017
Mechanical Engineering Design II	July 2017
Process Instruments I	July 2017
Control Systems II	July 2017
Naval Architecture II	July 2017
Marine Engineering Knowledge II	July 2017
Legal Knowledge II	July 2017
Mechanics of Machines III	July 2018
Strength of Materials III	July 2018
Mechanicals Engineering Design III	July 2018
Computer Aided Drafting I	July 2018
Fluid Mechanics III	July 2018
Thermodynamics III	July 2018
Electrotechnology I	July 2018
Control Systems III	July 2018
Process Instruments II	July 2018
Industrial Electronics II	July 2018
Naval Architecture III	July 2018
Marine Engineering Knowledge III	July 2018
Electrotechnology III	July 2018
Mathematics III	July 2019
Theory of Machines III	July 2019
Applied Strength of Materials III	July 2019
Machine Design III	July 2019
Hydraulic Machines III,	July 2019
Steam Plant III	July 2019
Experiential Learning I (P1)	January 2020
Experiential Learning II (P2)	July 2020

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 subjects BEFORE commencing Experiential Learning I

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

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.
Wordprocessing, 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