2023
HANDBOOK

DUT
DURBAN UNIVERSITY OF TECHNOLOGY
INYUVESI YASETHEKWINI YEZOBUCHWEPHESHE

FACULTY OF ENGINEERING & THE BUILT ENVIRONMENT

MECHANICAL ENGINEERING

HANDBOOK FOR 2023

FACULTY of ENGINEERING AND THE BUIILT ENVIRONMENT

DEPARTMENT OF MECHANICAL ENGINEERING

DEPARTMENTAL MISSION

Vision:

Inspire & Empower Scholars in Pursuit of Knowledge in a Dynamic World.

Mission:

Develop engineering professionals to drive entrepreneurship and sustainability for disruptive innovations through scholarship.

Purpose Statement: National Diploma: Engineering: Mechanical (Phased Out)

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 (Phased Out)

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: Bachelor of Engineering Technology: Mechanical

This qualification is primarily industry oriented. The knowledge emphasizes general principles and application of technology transfer. The qualification provides students with a sound knowledge base in the discipline of mechanical engineering and the ability to apply their knowledge and skills to particular career or professional contexts, while equipping them to undertake more specialised and intensive learning. This learning programme has a strong professional and career focus and holders of this qualification are normally prepared to enter the mechanical and allied industries.

Specifically the purpose of the learning programme is to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing engineering technologist in the discipline of mechanical engineering. This qualification provides for:

1. preparation for a career in mechanical engineering and areas that potentially benefit from engineering skills, for achieving technological proficiency and to make a contribution to the economy and national development.
2. the educational base required for registration as a Professional Engineering Technologist with the Engineering Council of South Africa (ECSA).
3. the education base for achieving proficiency in mining/factory plant and marine operations for certificated engineers.
4. entry to NQF level 8 programmes e.g. Honours, Post Graduate Diploma and B Eng Programmes and then to proceed to Masters Programmes and subsequently Doctoral Programmes.

Purpose Statement: Bachelor of Technology Honours: Mechanical

The Bachelor of Engineering Technology Honours Degree in Mechanical Engineering is a post graduate specialisation qualification designed to prepare students for postgraduate study. This programme is designed specifically to follow the Bachelors of Engineering Technology in Mechanical Engineering, as offered at the Durban University of Technology.

The qualification consolidates and deepens the graduate's expertise in a specialised area of Mechanical Engineering and develops research capacity in the methodology and techniques of this discipline, while equipping them to undertake more specialised and intensive learning. Programmes leading to this qualification allow students to work independently and responsibly, applying original thought and judgment to technical and risk-based decisions in complex situations and holders of this qualification are normally prepared to enter a specific niche in the labour market, or to further their studies through Masters and Doctoral programmes.

Specifically the purpose of this programme is to further the necessary knowledge, understanding, abilities and skills required towards becoming a competent practicing Mechanical Engineering technologist.

This qualification provides:

1. Preparation for careers in engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to make a contribution to the economy and national development.

2. Entry to NQF level 9 Masters Programmes and the ability to then proceed to Doctoral Programmes.

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.*

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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 F Nemavhola
Dean's Secretary:	Mrs P Jonson
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	Dr FM Mwangi, DEng (DUT), M-Tech (DUT), BSc (Mech) Eng (UoN) CPA(K), MSAIMechE
Deputy Head of Department	Dr A Ramsaroop, DEng (Mech Eng) (DUT)
Professors	Prof K Kanny, PhD (TU-USA); Pr.Tech (Eng); MSc (NU); GCC (factories) MSAIMechE
	Prof P Tabakov, PhD (NU)
	Prof M Walker, PhD (NU), MSc Eng;
Senior Lecturer	
Lecturers	Dr M Gilpin, DEng (DUT), MSc Eng (UKZN)
	Dr TP Mohan, PhD (Mat. Sci.) (IIT Madras), M. E (Mat. Sci.) (REC Trichy), MSc (Mat. Sci.) (Anna University), BSc(Physics) (Univ. of Mandras)
	Mr B Graham, MEng (DUT), Pr TechniEng
	Mr T Macholo, MSc Eng (UKZN), BSc Eng (UKZN)
	Dr M Moutlana, PhD (UKZN), MSc Eng (UKZN), BSc Eng (MIT)
	Mr IS Radebe, MSc Eng (UKZN)
	Dr DRE Ewim, BEng (FUTO), MEng (UAM), PGCE (UNISA), BEd Honors (UNISA), PhD Eng (Pretoria)
	Ms M Mphahlele, MTech Chem Eng (UJ)
	Mr T Bright, MSc Eng (UKZN)
Senior Technician	Vacant Post
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	Phased Out
Bachelor of Technology: Engineering: Mechanical	1737	Phased Out
Bachelor of Engineering Technology: Mechanical	99599	
Bachelor of Technology Honours: Mechanical	117977	
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: BACHELOR OF ENGINEERING TECHNOLOGY

In addition to rule G7 – Minimum Admission Requirements, the following is required for admission to the program:

(A) NSC, NCV, SC:

Compulsory Subjects	National Senior Certificate	National Certificate (Vocational)	Senior Certificate	
	Rating	Mark	HG	SG
English	4	60%	E	C
Mathematics	4	70%	E	C

Physical Science	4	70%	E	C
Life Orientation		60%		
+ 2 Vocational Subjects		70%		

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 100.

NB. Meeting the minimum admission requirements does not guarantee selection.

Note:

(1) The exit certificate of the candidate must qualify the candidate for degree study (Bachelor's Pass) at an institution of higher learning.

(2) The NSC subjects Mathematical Literacy and Technical Mathematics will not be accepted as a substitute for the NSC subject Mathematics.

(3) The NSC subject Technical Science will not be accepted as a substitute for the NSC subject Physical Science.

(4) Applicants will be ranked according to the sum of their scores for Mathematics and Physical Science, subject to a minimum combined score of 100 and with a minimum rating of 4 for Mathematics and for Physical Science.

(B) OTHER:

Applicants that qualify for degree study (Bachelor's Pass) 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 any two of the following:
- Industrial Electronics OR Electronics
- Digital Systems OR Logic Systems
- Electrotechnics

The above subjects must be passed with a minimum of 50% and all in the same sitting. Students will then be considered alongside the NSC students according to the sum of their marks for N4 Mathematics and Engineering Science.

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.

(A) MINIMUM ADMISSION REQUIREMENTS: BACHELOR OF TECHNOLOGY HONOURS

The number of students enrolled each year will be determined the University and the departmental growth policies. In addition to the minimum University admission requirements, the following criteria must be met by students wishing to study this programme:

The minimum entry requirement is:

1. The Bachelor of Engineering Technology in Mechanical Engineering. This is also in line with the DUT General Rules handbook, for registration for a Bachelor Honours Degree (Rule G23c).
2. Holders of the phased out Nated-151 BTech Qualification (NQF7 in old framework) may apply for admission into the programme.
3. Applicants that complete a BEngTech at institutions other than DUT will be evaluated on an individual basis, and may need to complete additional undergraduate courses to gain admission.

In addition to the minimum requirements specified above, applicants will be ranked according to their performance in the preceding Bachelor of Engineering Technology. The average mark, for all degree subjects, divided by the number of semesters taken to complete the qualification will be used for ranking. Consideration will also be given to work experience, attainment of relevant industry certifications, completion of short courses and workplace training with regards to ranking and admission into the programme.

DURATION

The duration of the programme is 1 years full-time.

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 [PHASED OUT]

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 [PHASED OUT]

Mechanical Stream NDMCH2	**Credit**	**Mechatronics Stream NDMCT1**	**Credit**
Semester 1	**Value**	**Semester 1**	**Value**
*Mathematics I	0,084	*Mathematics I	0,084
*Mechanics I	0,083	*Mechanics I	0,083
*Mechanical Engineer'g Drawing I	0,083	*Computer Aided Drafting	0,083
*Computer Programming Skills I	0,083	*Computer Programming Skills I	0,083
*Mechanical Manuf'g Engineer'g 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 (e)	0,083	*Mechanics of Machines III	0,083

Strength of Materials III (e)	0,083	*Process Instruments	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 (e)	0,083	*Fluid Mechanics III	0,083
Thermodynamics III (e)	0,083	*Mathematics III	0,083
*Electrotechnology I	0,083		

Semester 4		**Semester 4**	
*Mathematics III	0,083	*Control Systems III	0,083
Theory of Machines III (e)	0,083	*Theory of Machines III	0,083
Applied Strength of Materials III (e)	0,083	*Process Instruments II	0,083
*Machine Design III	0,085	*Machine Design III	0,085
Hydraulic Machines III (e)	0,083	*Hydraulic Machines III	0,083
Steam Plant III (e)	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 [PHASED OUT]

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 [PHASED OUT]
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
Refrigeration & Air Conditioning IV	0,125	RACN401
Engineering Design Project IV	0,250	EDPR401
Semester 2		
Mechanics of Machines IV	0,125	MMAC402
Stress Analysis IV	0,125	SANL401
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) [PHASED OUT]
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.

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) was in July 2019.

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) was in January 2018.

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 (BNMCH1)

Year	Module Name	Study Sem	NQF level	SAQA credits	Module Code	Pre-req	Co-req
1	Engineering Mathematics 1A	1	5	12	EMTA101		
	Engineering Physics 1A	1	5	12	EPHA101		
	Technical Literacy	1	5	8	TCLT101		
	Computing & IT	1	6	8	CMIT101		

	Cornerstone 101	1	5	12	CSTN101		
	Design 1	1	5	16	DESG101		
	Electrical Principles 1	2	5	12	ELEP101		Engineering Physics 1B
	Mechanics of Machines 1	2	6	12	MCHM102		
	Engineering Mathematics 1B	2	5	12	EMTB101		
	Thermofluids 1	2	5	12	THFL101		
	Strength of Materials 1	2	6	12	SMTL101		
	Engineering Physics 1B	2	5	12	EPHB101		
	Total - year 1			**140**			
2	Computer Aided Draughting	1	5	12	CADR101		
	Analogue Electronics 1A	1	5	12	ANLE101		
	Electrical Principles 2	1	6	12	ELEP201	Electrical Principles 1	
	Fluid Mechanics 2	1	6	12	FLDM201	Thermofluids 1 Engineering Mathematics 1A Engineering Physics 1A	
	Engineering Mathematics 2A	1	6	12	EMTA201	Engineering Mathematics 1A Engineering Mathematics 1B	
	Materials Science	1	5	12	MTLS101		
	Mechanics of Machines 2	2	6	12	MCHM201	Mechanics of Machines 1 Engineering Mathematics 1A Engineering Physics 1A	
	Strength of Materials 2	2	6	12	SMTL201	Strength of Materials 1 Engineering Mathematics 1A Engineering Physics 1A	
	Design 2	2	6	12	DESG201	Design 1	
	Thermodynamics 2	2	6	12	THRM202	Thermofluids 1 Engineering Mathematics 1A Engineering Physics 1A	
	Digital Electronics 1A	2	5	12	DGTE102		
	Project Management	2	7	8	PROM101		

	Total - year 2			**140**			
3	Design 3	1	7	12	DESG301	Design 2	
	Strength of Materials 3	1	7	12	SMTL301	Strength of Materials 2	
	Mechanics of Machines 3	1	7	12	MCHM301	Mechanics of Machines 2	
	Thermodynamics 3	1	7	12	THRM302	Thermodynamics 2	
	Fluid Mechanics 3	1	7	12	FLDM301	Fluid Mechanics 2	
	Instrumentation and Control 1	1	6	12	INCT101	Analogue Electronics 1A Electrical Principles 1	
	Advanced Mechanical Manufacturing	2	7	12	AMNF101	Computing & IT	
	Electrical Technology Applications	2	7	12	ELTA101	Electrical Principles 2	
	Principles of Management	2	7	8	PMNT101		
	Environmental Engineering	2	7	8	EVLE101		
	Capstone Design Project	2	7	16	CDSP101	Design 3 Computer Aided Draughting	
	Numerical methods	2	7	12	NMRM101	Engineering Mathematics 1A Engineering Mathematics 1B	
	Total - year 3			**140**			
	Grand Total			**420**			

LINKING OF MODULES

The following modules are linked as per Rule G1 and G14 (3) (approved by Senate on 14 March 2018) of the general handbook. As such, where the credit-weighted average of all the modules in the linked group is 50% or more, the result of those modules with less than 50% will be recorded as a PASS, with no mark indicated:

Engineering Mathematics 1A and Engineering Mathematic 1B

Engineering Mathematics 2A and Engineering Mathematic 2B

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 subdiscipline 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.

BACHELOR OF TECHNOLOGY HONOURS

Module Name	Compulsory / Elective	Credits
Semester 1		
EDPR811 Engineering Design and Research Project (annual course)	C	44
SMAT801 Strength of Materials 4	C	16
ECPM801 Engineering Computational Methods	C	16
MECH801 Mechanics 4	C	16
Semester 2		
STEM801 Selected Topics in Engineering	C	16
PRGE802 Programming for Engineers	E	16
COMA802 Composite Materials	E	16
TMDN802 Thermodynamics 4	E	16
COSY801 Control Systems	E	16

RULES OF COMBINATION

32 credits must be selected from the available electives. A minimum of 140 credits is required to obtain the qualification.

ASSESSMENT PLAN

The class mark shall be made up of a number assessments, of specific weightings. There is an examination for most subjects at the end of the semester. The final mark is a weighted average of the class mark and examination mark and students must achieve a minimum of 50% in the final result, together with sub minimums on various mark components.

ASSESSMENT RESULTS

All assessment results will be available via the DUT online mechanisms (Internet, result line, sms line) as soon as they become available. These constitute the officially published results. The onus therefore is on the student to obtain their results via any of these mechanisms. Non-receipt of results will not be accepted as a valid reason for missing deadlines for applications for remarks, scanning, reassessment, etc.

	Module	ECSA Graduate Attributes										
		Problem Solving	Scientific & Eng. Knowledge	Engineering Design	Investigation	Eng Methods, Skills, Tools & IT	Communication	Sustainability & Impact	Individual & Teamwork	Independent Learning	Engineering Professionalism	Engineering Management
		1	2	3	4	5	6	7	8	9	10	11
Compulsory	Strength of Materials 4	A										
	Engineering Computational Methods					A				A		
	Control Systems											
	Mechanics 4		A									
	Selected Topics in Engineering							A			A	A
	Engineering Design and Research Project			A	A		A		A			

Elective	Programming for Engineers											
	Thermodynamics 4											
	Composite Materials											

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 GI5 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.

Engineering Mathematics IA
Engineering Mathematics 1A
Engineering Physics 1A
Cornerstone 101
Electrical Principles 1
Engineering Mathematics 1B

Engineering Physics 1B
Analogue Electronics 1A
Electrical Principles 2
Engineering Mathematics 2A
Digital Electronics 1A
Instrumentation and Control 1
Electrical Technology Applications
Control Systems 4

EM10a REQUIREMENT TO PASS THE GRADUATE ATTRIBUTES (GAs)

In modules where Graduate Attributes (GAs) 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 GA 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 Cooperative 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 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
1	0
2	0.582
3	0.7
4	0.95
5	1.2
6	1.45
7	1.7
8	2

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 REREGISTRATION' 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 <u>any</u> 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.

PART A (NATED PROGRAMMES- PHASED OUT)

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
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
SYLLABUS:

1. Corrosion
2. Fatigue
3. Creep
4. Impact
5. Welding

ENGINEERING MATHS IV (EMTH402) Credit Value 0,125
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
SYLLABUS:

1. Hydrostatics
2. Fluid flow

FLUID MECHANICS III (FMEC302) Credit Value 0,083
SYLLABUS:

1. Pipe flow
2. Viscous flow
3. Hydrodynamics
4. Vortex theory

FLUID MECHANICS IV (FMEC402) Credit Rating 0,125

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
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
SYLLABUS:

1. Specific design

MARINE ENGINEERING KNOWLEDGE I (MEKN101) Credit Value 0,083
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).
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 manoeuvring equipment
7. Pollution control
8. Safety equipment and fire fighting
9. Ship maintenance
10. Management

MARINE ENGINEERING KNOWLEDGE III (MEKN301) Credit Value 0,083
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 manoeuvring 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
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
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

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
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
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
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)
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
SYLLABUS:

1. Statics
2. Dynamics

MECHANICS OF MACHINES II (MMAC202) Credit Value 0,084
SYLLABUS:

1. Advanced Dynamics

MECHANICS OF MACHINES III (MMAC302) Credit Value 0,083
SYLLABUS:

1. Kinematics
2. Balancing
3. Gears
4. Simple Harmonic Motion
5. Vehicle Dynamics

MECHANICS OF MACHINES IV (MMAC402) Credit Value 0,125
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
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
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
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
SYLLABUS:
1. Nozzles
2. Steam Plant
3. Psychrometry
4. Legislation
5. Heat Transfer

STRENGTH OF MATERIALS II (SMAT202) Credit Value 0,083
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
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
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:
SYLLABUS:

1. The finite element method
2. Fracture and fatigue
3. Fracture mechanics

THEORY OF MACHINES III (THMC301) Credit Value 0,083
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
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
SYLLABUS:

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

THERMODYNAMICS IV (THRM401) Credit Value 0,125
SYLLABUS

1. Conduction of heat (steady and transient)
2. Convection (fundamental and forced)
3. Thermal Radiation
4. Heat Exchangers

TURBOMACHINES IV (TMAC402) Credit Value 0,125
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

PART B (NEW HEQSF PROGRAMMES)

(A) BACHELOR OF ENGINEERING TECHNOLOGY

ENGINEERING MATHEMATICS 1A
SYLLABUS:
Numbers and Algebra:

1. Algebra
2. Partial Fractions
3. Logarithms:
4. Exponents

5. Hyperbolic Functions

Areas and Volumes:

1. The Circle and its Properties
2. Volumes and Surface Areas of Common Solids

Trigonometry:

1. Introduction to Trigonometry
2. Trigonometric Waveforms
3. Cartesian and Polar Coordinates
4. Trigonometric Identities & Equations

Graphs:

1. Functions & their curves

Complex Numbers:

2. Complex Numbers
3. Euler's and De Moivre's Formulas and Theorems

Calculus – Differentiation:

1. Introduction to Differentiation
2. Methods of Differentiation
3. Applications of Differentiation
4. Differentiation of Implicit Functions
5. Logarithmic Differentiation

Calculus – Integration:

1. Standard Integration
2. Applications of Integration

ENGINEERING PHYSICS 1A
SYLLABUS

Units, Physical Quantities, Vectors:

1. Standards and Units
2. Unit Consistency and Conversions
3. Precision and Significant Figures
4. Vectors and Vector Addition
5. Components of vectors

Equilibrium of a particle:

1. Force
2. Equilibrium
3. Newton's first law
4. Newton's third law of motion
5. Idealized models
6. Equilibrium of a particle
7. Friction

Newton's Second Law, Gravitation:

1. Newton's second law

2. Newton's law of gravitation
3. Mass and weight

Work and Energy:

1. Work and kinetic energy
2. Gravitational and potential energy
3. Elastic potential energy
4. Conservation of energy
5. Internal work
6. Internal potential energy
7. Power
8. Power and velocity
9. Mass and energy

Impulse and Momentum:

1. Conservation of momentum
2. Collisions
3. Recoil
4. Centre of mass
5. Rocket propulsion

Torque:

1. Moments
2. Second condition for equilibrium
3. Centre of gravity

Elasticity:

1. Stress
2. Strain
3. Elasticity and plasticity
4. Elastic modulus

Periodic Motion:

1. Elastic restoring forces
2. Equations of SHM
3. The simple pendulum

Mechanical Waves:

1. Periodic waves
2. Mathematical description of a wave
3. Speed of a transverse wave
4. Speed of a longitudinal wave
5. Water waves

Vibrating Bodies:

1. Superposition and standing waves
2. Longitudinal standing waves
3. Vibration of string
4. Rods and plates
5. Interference of longitudinal waves
6. Resonance

Acoustic Phenomena:

1. Sound waves
2. Intensity
3. Loudness
4. Pitch
5. The Doppler effect

TECHNICAL LITERACY
SYLLABUS

Week 1	Introduction in to technical literacy
Week 2	Technological Literacy
Week 3,4	Introduction to writing a technical report
Week 5	Experiments and Practicals process
Week 6	Presentation skills
Week 7	Critical thinking
Week 8	Presentation 1
Week 9	Group Skills
Week 10,11	Directions and instructions: writing about process
Week 12-15	Writing the formal report
Week 16	Presentation 2
Week 17	Resubmission of technical report

COMPUTING & IT
SYLLABUS

1. Computer hardware:
2. Computer networks:
3. Microsoft Windows operating environment
4. Data Protection and Security
5. Word processing (Microsoft Word):
6. Spreadsheets (Microsoft Excel):
7. Introduction to C and MATLAB programming

CORNERSTONE 101
SYLLABUS

The module content will be developed around the concept of journeys, across time, across space, and across human relationships. It will take the journey of the uMngeni River (which is close to all DUT campuses) as a metaphor. The module will bring different disciplinary perspectives to this content – environmental, historical and sociological in particular.
The metaphor of the journey will be sustained across the module and will be applied to personal journeys, historical, political and environmental journeys, and social journeys, with a specific focus on gender. Each section will draw in issues of ethics, diversity and critical

citizenry. The design team may later take a different metaphor or theme, but with the same outcomes and attributes.
The final section of the module will identify and integrate learning from earlier sections and examine implications for further learning. At each stage of the module, activities such as the weekly online journal and class discussion will involve reflection and build communicative practices. There will be a concluding section in which students will identify their learning and examine the implications for their roles as students and as citizens

DESIGN 1
SYLLABUS

1. History of Engineering Design
2. The engineer in relation to society
3. Engineering sketching and drawing
4. Introduction to Mechanical Design
5. Basic materials properties and uses
6. Safety, Workshop theory and practice
7. Use of tools to manufacture components

ELECTRICAL PRINCIPLES 1
SYLLABUS

1. Established electrical principles and laws
2. Network theorems, conversions and applications
3. Passive components in DC circuits

MECHANICS OF MACHINES 1
SYLLABUS

1. Analytical Treatment of Co-planar forces
2. Moments of Co-planar forces
3. Reactions at Beam Supports
4. Systems of Co-planar forces
5. Location of Position of the Resultant force on a Body
6. Center of Gravity
7. Mass Moment of Inertia
8. Torque and Angular Acceleration
9. Linear Motion
10. Angular Motion
11. Work Done, Energy and Power
12. Conservation of Energy
13. Momentum and Impulse
14. Hoists and Haulage
15. Cams

ENGINEERING MATHEMATICS 1B

SYLLABUS

Linear Algebra:

1. The Theory of Matrices and Determinants
2. Solution of Simultaneous Equations by Matrices and Determinants

Trigonometry:

1. Relationship between Trigonometry and Hyperbolic Functions
2. Compound Angles

Series:

1. Maclaurin Series

Advanced Calculus - Differentiation:

2. Differentiation of Parametric Equations
3. Differentiation of Hyperbolic Functions
4. Differentiation of Inverse Trigonometry and Inverse Hyperbolic Functions
5. Partial Differentiation
6. Total Differentiation, Rates of Change & Small Change
7. Maxima, Minima and Saddle Points for Function of Two Variables

Advanced Calculus – Integration:

1. Integration using Algebraic Substitutions
2. Integration using Trigonometry and Hyperbolic Substitutions
3. Integration by Partial Fractions
4. t-Substitution
5. Integration by Parts
6. Applications of Integration

Differential Equations:

1. Solution of First-Order Ordinary Differential Equations (ODEs)
2. Separation of Variable
3. Homogenous First-Order ODEs
4. Linear First-Order ODEs

Statistics and Probability:

1. Presentation of Statistical Data
2. Measures of Central Tendency

THERMOFLUIDS I

Duration: Semester

SYLLABUS

For Thermodynamics:

Identify and define the properties used and their units

Define work and heat and use an appropriate sign convention

Define and use the Laws of Thermodynamics and apply them to systems

Define and use the gas laws and appropriate gas properties, together with the processes, to analyse gas systems and cycles

Define and use appropriate properties, together with the processes, to analyse vapour systems and cycles
Use appropriate process graphs in the analysis of systems and cycles

For Fluid Mechanics:
Identify and define the properties used and their units.
Calculate viscous drag on plane and cylindrical surfaces using Newton's Law of Viscosity
Define and use the continuity equation and find flow rates and velocities in variable area pipes
Differentiate between flow types (uniform, steady, unsteady, etc.)
Define the momentum equation and use it to determine the forces acting in pipe bends, reducers, nozzles, etc.
Calculate pipe friction losses by Darcy's and Chezy's formulae
Define Bernoulli's Theorem for incompressible fluids and apply it to pipe flow systems
Calculate frictional flow losses for pipeline systems
Describe loss coefficient, equivalent length and shock losses
Construct total energy grade lines and hydraulic gradients to represent pipeline flow and pumping applications
Calculate hydrostatic forces on various submerged surfaces, and components, in relation to centres of pressure and resultant forces
Define Archimedes' Principle and apply it to buoyancy and floating stability for fully- and semi-immersed bodies
Determine the metacentric height and relate it to the equilibrium of floating bodies.

STRENGTH OF MATERIALS I
SYLLABUS

1. Introduction to Strength of Materials
2. Statics - elements of equilibrium
3. Introduction to mechanics of deformable bodies and temperature effects
4. Mechanical properties of materials
5. Torsion and twisting of elements
6. Thin-walled pressure vessels

ENGINEERING PHYSICS 1B
SYLLABUS
Atomic and Molecular Structure

1. Structure of the Atom
2. Periodic Table
3. Relationship between Electronic Structure, Chemical Bonding and Atomic Order
4. Molecular theory of matter
5. Properties of matter

Coulomb's Law

1. Electric charges
2. Conductors and insulators
3. Charging by induction
4. Coulomb's law

Current, Resistance and Capacitance

1. Current
2. Resistance
3. Capacitance
4. Current-resistance relations
5. Work and power
6. Theory of metallic conduction

The Magnetic Field

1. Magnetism
2. The magnetic field
3. Flux
4. Motion of charges particles in magnetic fields

Inductance

1. Mutual induction
2. self-induction
3. energy in an inductor
4. the R-L circuit
5. the L-C circuit
6. the R-L-C circuit

Maxwell's Equations

1. The displacement current and Maxwell's equations

Electromagnetic Waves

1. Speed and energy of an electromagnetic waves
2. Radiation

The Nature and Propagation of Light

1. The nature of light
2. Sources of light
3. Speed of light
4. Waves
5. Wave fronts
6. Rays
7. Reflection and refraction
8. Total internal refraction
9. Dispersion
10. Interference and diffraction
11. Polarization
12. Refection
13. Lenses
14. Mirrors

Thermodynamics

1. Thermal processes and effects
2. The first and second laws

COMPUTER AIDED DRAUGHTING
SYLLABUS

Drawing introduction:

1. Basic fundamentals of Orthographic Drawing and Isometric Drawing and
2. Freehand Drawing techniques – all using SABS Drawing Standards.

Use of Computer Aided Drawing Program:

1. All basic Profile and Extrusion commands.
2. 2D (Draft) drawings from 3D (Part) drawings.
3. Assembly Drawing from saved Part drawings.

ANALOGUE ELECTRONICS 1A
SYLLABUS

1. The following topics are covered in this module:
2. Semiconductor Theory
3. Diode Applications
4. Special Purpose Diodes
5. Transistors
6. Transistors Amplifiers
7. Test Equipment

ELECTRICAL PRINCIPLES 2
SYLLABUS

1. The following topics will be covered in this module:
2. Introduction to Alternating Current (AC)
3. Capacitor and Inductor in AC circuit
4. RC and RL circuits
5. RLC circuits and Resonance
6. Analysis of AC circuits
7. Network theorems and conversions
8. Introduction to Three-Phase Systems

FLUID MECHANICS 2
SYLLABUS

1. Dimensional Analysis

2. Flow Measurement
3. Friction and pipe losses
4. Pipe systems – parallel and three-tank
5. Varying head flow
6. Hydraulic Power transmission
7. Open Channel Flow
8. Vortex Flow
9. Jet Impact

ENGINEERING MATHEMATICS 2A
SYLLABUS

Partial Differential Equations:

1. Introduction to Partial Differential Equations (PDEs)

Statistics and Probability:

1. Introduction to Probability
2. Probability
3. The binomial and Poisson distributions
4. The normal distribution
5. Linear regression

Differential Equations:

1. Second-Order Differential Equations

Laplace Transforms

1. Introduction to Laplace Transforms
2. Properties of Laplace Transforms
3. Inverse Laplace Transforms
4. Solution of Differential Equations using Laplace Transforms
5. Solution of Simultaneous Differential Equations using Laplace Transforms

Fourier Series:

1. Fourier Series for Periodic Functions of Period 2π
2. Fourier Series of Non-Periodic Functions over Period 2π

MATERIALS SCIENCE
SYLLABUS

1. Materials classification
2. Solidification of metals, crystalline imperfections & diffusion in solids
3. Mechanical properties of metals
4. Phase diagrams
5. Polymeric materials
6. Composite materials
7. Corrosion of metals

MECHANICS OF MACHINES 2
SYLLABUS
The objective of the course is to review and extend the fundamental principles and formulations of kinematics and kinetics for Newtonian mechanics in the context of problems/systems involving the dynamics of particles and rigid bodies. Topic includes vehicle dynamics, balancing, kinematics, simple harmonic motion, gears and gearing

STRENGTH OF MATERIALS 2
SYLLABUS
1. Shear force and bending moment diagrams
2. Properties of an area: first and second moment of the area
3. Bending of various types of beams
4. Transverse shear
5. Deflection of beams
6. Stress transformation
7. Strain transformation

DESIGN 2
SYLLABUS
The objective of the course is to extend the fundamental principles of design. Topics include:

1. Solid shafts
2. Hollow shafts
3. Keys
4. Splines
5. Knuckle joints
6. Clamp couplings
7. Flange couplings
8. Belt drives

THERMODYNAMICS 2
SYLLABUS
This module will include:
1. Combustion
2. Engines
3. Compressors
4. Refrigeration

DIGITAL ELECTRONICS 1A
SYLLABUS
1. Introduction to digital electronics

2. Number systems and codes
3. Basic logic functions
4. logic tools and techniques
5. Combinational logic circuits
6. Introduction to sequential logic
7. Simulation of logic circuits
8. Introduction to programmable logic devices (PLDs)

PROJECT MANAGEMENT
SYLLABUS

1. Introduction to Project Management
2. Need and advantages of Project management
3. Definition of Project Management
4. Modern Project planning methods, tool and computer applications
5. Communication and presentation of project plans
6. Project Implementation Support of the operational systems

DESIGN 3
SYLLABUS

1. Design for static strength
2. Design for dynamic strength
3. External/Internal braking systems
4. Single and multi-plate clutches
5. Gears
6. Bearings
7. Shafts
8. Spring design

STRENGTH OF MATERIALS 3
SYLLABUS

1. Stress-strain analysis of simple structures
2. Failure criteria
3. Buckling of struts
4. Moment-Area method
5. Energy (Castigliano) theorems
6. Unit force method (modified Castigliano theorem)
7. Internal forces in simple frames
8. Slope and deflection in simple frames
9. Statically indeterminate beams
10. Superposition method
11. Integration method
12. Asymmetrical bending

MECHANICS OF MACHINES 3
SYLLABUS
The aim of this course is to develop a more advanced understanding of dynamics. Topic includes:
1. Kinematics
2. Flywheels
3. Vibrations
4. Engine Balancing
5. Cams

THERMODYNAMICS 3
SYLLABUS
This module will include:
1. Heat Transfer
2. Steam Plant
3. Psychrometry

FLUID MECHANICS 3
SYLLABUS
1. Pipe Networks
2. Hydraulic machines
3. Similarity laws
4. Centrifugal pump blade diagrams
5. Centrifugal pump curves
6. Reciprocating pumps
7. Fans and fan systems
8. Hydraulic machines

INSTRUMENTATION AND CONTROL 1
SYLLABUS
The following topics will be covered in this module:
1. Modern industrial instrumentation
2. Process control and control methods
3. Measurement of physical variables
4. Signal processing and data presentation
5. Principles of operation of various transducers and their application to typical instrumentation systems
6. Programmable logic controllers (PLCS) and the programming thereof

ADVANCED MECHANICAL MANUFACTURING
SYLLABUS
1. Section 1: Introduction And Overview Of Manufacturing
2. Section 2: Fundamentals Of Metal Casting
3. Section 3: Shaping Processes For Plastics

4. Section 4: Powder Metallurgy
5. Section 5: Production Systems And Process Planning
6. Section 6: Survey Of Automation And Manufacturing Systems
7. Section 7: Rapid Prototyping
8. Section 8: Microfabrication And Nanofabrication Technologies

ELECTRICAL TECHNOLOGY APPLICATIONS
SYLLABUS

The following topics will be covered in this module:

1. Basic three phase circuit theory as applied to electrical distribution systems, voltage current, real, and reactive power
2. Essentials of electrical balanced faults and the protection thereof in distribution systems
3. The elements of distribution systems such as power transformers, circuit breakers, switch gear, cables, insulators and overhead lines
4. The synchronous machine and its role in electrical generation
5. The induction motor and its uses in industry
6. Principle of operation of DC motors

PRINCIPLES OF MANAGEMENT
SYLLABUS

PRIMARY

1. The environment in which people work:
2. Understanding the system theory of organizations.
3. Key concepts of Management:
4. An introduction to scientific theory of management.
5. Human Resources Management:
6. A focus on motivation, ability, and confidence building in people.
7. The Labour Relations Act:
8. A look into provisions & stipulations of Labour Relations Act 66 of 1995
9. Managing People and Teams:
10. Understanding the science / art of getting things done through others.

SECONDARY

1. Operations Management, and/or
2. Principles of Project Management, and/or
3. Introduction to Accounting, Economics, Financial Management and Budgeting, and/or
4. Entrepreneurship, and/or
5. Ethics for Engineering Professionals

ENVIRONMENTAL ENGINEERING
SYLLABUS

1. Introduction
2. Ecosystems
3. Sustainability
4. Remote Sensing of Environment
5. Environmental Risk

6. Water Supply
7. Water Pollution
8. Solid Waste Management
9. Air Pollution
10. Noise Pollution
11. Climate Change – Impact, Mitigation and Adaption

CAPSTONE DESIGN PROJECT
SYLLABUS

1. Design process
2. Intellectual property, copyright and patents
3. Industry Standards
4. Conceptual design
5. Material selection
6. Costing
7. Hazard and operability studies
8. Design calculations
9. Referencing
10. Reporting

NUMERICAL METHODS
SYLLABUS

1. Roots of equations (Part 2)
    - Bracketing methods (chapter 5)
    - Open Methods (chapter 6)
2. Numerical Differentiation and Integration
    - Newton-Cotes integration formulas (chapter 21) (PP 7eCh21-Part6)
    - Numerical Differentiation (chapter 23)
3. Ordinary Differential Equations
    - Runga-Kutta methods (chapter 25)

(B) BACHELOR OF TECHNOLOGY HONOURS

ENGINEERING DESIGN AND RESEARCH PROJECT
SYLLABUS

1. Product Design Specification
2. Functional Analysis
3. Concept Development and Selection
4. Design validation
5. Manufacture

STRENGTH OF MATERIALS 4
SYLLABUS

1. Sustainability and sustainable systems
2. Principles of sustainable engineering
3. Lifecycle costs
4. Introduction to ethics
5. Ethics and professionalism as relating to engineering
6. Continuing professional development
7. Interpretation of financial statements
8. Budgeting, forecasting and economic decision making

ENGINEERING COMPUTATIONAL METHODS
SYLLABUS

1. Application of the Finite Element Method (FEM) to structural analysis
2. Utilisation and implementation of FEM based software
3. Application of the Finite Volume Method (FVM) for analysis of fluid dynamics.
4. Utilisation and implementation of FVM based software

MECHANICS 4
SYLLABUS

1. Gyroscopic phenomena and analysis
2. Vibration of Single-DOF Systems
3. System Resonance
4. Vibration of Multi-DOF Systems
5. Vibration Isolation and Absorption

SELECTED TOPICS IN ENGINEERING
SYLLABUS

1. Sustainability and sustainable systems
2. Principles of sustainable engineering
3. Lifecycle costs
4. Introduction to ethics
5. Ethics and professionalism as relating to engineering
6. Continuing professional development
7. Interpretation of financial statements
8. Budgeting, forecasting and economic decision making

PROGRAMMING FOR ENGINEERINGS
SYLLABUS

1. Introduction
2. Structure of a programme

3. Types, variables, constants, identifiers and scope
4. Control constructs
5. Conditionals
6. Case statements and loops
7. Operations on arrays and strings
8. Data pre-processing and data post-processing
9. Functions, procedures and subroutines
10. Programming with objects and classes
11. Complex data types
12. Parameter passing by reference and value
13. Encapsulation
14. Debugging of the programme and error handling

COMPOSITE MATERIALS
SYLLABUS

1. Introduction to composite materials.
2. Fibres, matrix and interface
3. Mechanical and chemical aspects
4. Design, chemical synthesis, manufacturing and processing methods
5. Mechanical testing methods.
6. Failure mechanisms based on static, fatigue, impact and other properties
7. Microstructural consideration
8. Engineering applications including case studies

THERMODYNAMICS 4
SYLLABUS

1. Steady heat conduction
2. Transient conduction
3. Numerical methods in heat conduction
4. Convection
5. External flow
6. Internal flow
7. Natural convection
8. Boiling and Condensation
9. Heat Exchangers
10. Radiation Heat Transfer
11. Mass transfer
12. Thermodynamics of Materials

E&OE