DUT
DURBAN UNIVERSITY OF TECHNOLOGY

2018 HANDBOOK
INDUSTRIAL ENGINEERING

FACULTY OF ENGINEERING & THE BUILT ENVIRONMENT

HANDBOOK FOR 2018

FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

DEPARTMENT of INDUSTRIAL ENGINEERING

Programmes on offer:
Bachelor of Engineering Technology in Industrial Engineering
B. Tech. Engineering: INDUSTRIAL
Master of Engineering
Doctor of Engineering

Programmes on Phase Out:
N. Dip. Engineering: INDUSTRIAL

CONTENTS

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IMPORTANT NOTICE

The Departmental rules in this handbook must be read in conjunction with the Durban University of Technology's General Rules

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 first time 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.

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.

STAFF

Head of Department:	Mr A K Naicker, (Pr Tech Eng), B Tech: Industrial Eng (MLST); MBA (UKZN) MSAIIE
Senior Lecturer:	Mr R Singh, (Pr Tech Eng); M Tech: Industrial Eng (DUT); MSAIIE
Lecturers:	Mr C Lourens, B Tech: Industrial Eng (MLST); MSAIIE
	Mr U Pancha, B Tech: Industrial Eng (DUT); MSAIIE
	Mrs H Jackson, B Tech: Industrial Eng (MLST); MEng (DUT); MSAIIE
	Mr M Dewa, (Pr Eng); B. Eng: Industrial Eng (NUST); MSc. MSOM (UZ), MSAIIE
Secretary:	Mrs K Dhavraj, (B. Tech: Management)
Technician:	Mr M Herelall, National Diploma: Mechanical Engineering

IE1 GENERAL INFORMATION

Modern Industrial Engineering is concerned with the integration of resources and processes into cohesive strategies, structures and systems for the effective and efficient production of quality goods and services in any undertaking.
Industrial Engineering draws upon specialized knowledge and skills in the mathematical, physical, behavioural, economic and management sciences, and fuses with the principles and methods of engineering analysis and design, to find optimal and practical solutions. They contribute to the success and prosperity of an industrial undertaking, thereby making a fundamental contribution to the creation of wealth.

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 and professional career education programmes."

What do Industrial Engineers do?

The planning, design, re-design and implementation of processes that would encompass all aspects of the business
To be able to combine technical with specialised management to improve the business in such a manner that would ensure sustainable growth and prosperity
There is a great need for the knowledge and skills of Industrial Engineers in the South African Economy. The Department of Industrial Engineering strives to fill this need by providing quality education to our students.

Vision

To be a strategic partner that communicates progressive knowledge of organized human activity and socio-technical systems.

Mission

Our mission is to: -
Strengthen partnership with relevant stakeholders
Provide innovative teaching and learning practices
Develop research capacity in Industrial Engineering

Purpose Statements:

National Diploma (N. Dip) [SAQA NO. 72229]

Diplomats obtaining this qualification will be competent in applying Operations Management techniques and strategies resulting in effectiveness and productivity in industry. Diplomats will be able to register with the Engineering Council of South Africa (ECSA) as a candidate engineering technician.

Bachelor of Technology (B. Tech) [SAQA NO. 72130]

Graduates achieving this qualification will be competent in the leading of programs regarding productivity improvement, integrated manufacturing systems, operating information systems, and those of project and logistics management. Graduates will be able to register with the Engineering Council of South Africa (ECSA) as a candidate engineering technologist.

Bachelor of Engineering Technology in Industrial Engineering (SAQA NO: 99639)

This is a three-year application oriented qualification which would provide students with a sound knowledge base in the field of Industrial Engineering and the ability to apply their knowledge and skills within a professional context. The qualification serves to equip graduates with the necessary learning skills, in order for them to pursue degree studies at the higher levels.

The programme has a strong professional career focus and graduates from this programme would be compliant to meeting the exit level outcome requirement as required by the Engineering Council of South Africa.

The purpose of this educational programme is to build the necessary knowledge, skills and attributes required for a graduate to be able to register with ECSA as a candidate Engineering Technologist.

Industrial Engineering Technologists are characterized by the ability to apply established and newly developed engineering technologies to solve broadly- defined problems, develop components, systems, services and processes. Industrial Engineering Technologists have a specialized understanding of systems that would integrate both human and machine processes.

This qualification provides:

1. Preparation for a career in Industrial Engineering and for achieving a level of technological proficiency in order to make a positive contribution to the economy and national development;
2. The educational base required for registration as a Candidate Engineering Technologist;
3. Entry to NQF level 8 programmes e.g. Honours, Post Graduate Diploma and B Eng programmes leading to Masters and Doctoral programmes.
   (Inserted w.e.f. 2017/09)

Master of Engineering (MEng) [SAQA NO. 96827]

This qualification is intended for persons who will make a contribution, through research, to understanding the application and evaluation of existing knowledge in a specialized area of technology. They will also demonstrate a high level of overall knowledge in that area, ranging from fundamental concepts to advanced theoretical or applied knowledge.

(Amended w.e.f. 2015/08)

Doctor of Engineering (DEng) [SAQA NO. 96812]

This qualification is intended for persons who will make a significant and original contribution to knowledge in a specialised area of technology. They will have a high level of overall knowledge in that specialised area ranging from fundamental concepts to advanced theoretical or applied knowledge.

(Amended w.e.f. 2015/08)

NOTE: As gazetted in the Government Gazette, Vol. 613, No. 40123, 06 July 2016, the last date for first time entering students enrolling in academic programs that are not aligned with the Higher Education Qualifications Sub-Framework is the 31st December 2019.

IE2 ENTRANCE REQUIREMENTS FOR:

(i) Bachelor of Engineering Technology in Industrial Engineering (SAQA NO: 99639)

The minimum admission requirement is the National Senior Certificate; the National Certificate (Vocational) and the Senior Certificate with appropriate subject combinations and levels of achievement as defined in the *Government Gazette*, Vol. 751, No. 32131 of 11 July 2008, and in the *Government Gazette*, Vol. 533, No. 32743, November 2009.

In addition to the above, the following is required for admission:

Compulsory Subjects	**National Senior Certificate**	**National Certificate, (Vocational)**	**Senior Certificate**	
	Rating	**Mark**	**HG**	**SG**
Mathematics (Not Mathematics Literacy)	4	70%	E	C
Physical Science	4	70%	E	C
English (Primary), or	4	60%	E	C
English (First additional)	4	60%	E	C
Three additional 20 credit NSC subjects	4			
Life Orientation		60 %		
Two other relevant NCV vocational subjects		70 %		

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

(ii) Applicants will be ranked according to the sum of their scores for Mathematics and Physical Science, subject to a minimum combined score of 120.

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

Mathematics and Engineering Science, plus two of:
Mechanotechnics
Engineering Drawing
Electrotechnics

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

Applicants may also present a cognate level 6 Diploma for entry into the Bachelors program.

(Inserted w.e.f. 2017/09)

(ii) B.TECH: ENGINEERING: INDUSTRIAL [SAQA NO. 72130]

Eligible applicants are required to have graduated with a National Diploma: Engineering: Industrial with Maths III as one of the exit level modules.
Prospective students with other engineering diplomas who have completed additional industrial engineering specific coursework plus experience in the field of Industrial Engineering may apply for the qualification using rule G10 – Conferment of Status.
Applications are made directly with the department.
(Amended w.e.f. 2014/01)

(iii) MASTER of ENGINEERING [SAQA NO. 96827]

Eligible applicants are required to have completed an appropriate honours degree or equivalent in the field of Industrial Engineering. Graduates with an appropriate honours degree or equivalent in any of the engineering disciplines within the engineering profession plus related experience in the field of Industrial Engineering can apply for the qualification using rule G10 – Conferment of Status.
Applications are made directly with the department.
(Amended w.e.f. 2015/08)

(iv) DOCTOR of ENGINEERING [SAQA NO. 96812]

Students are required to have completed a Masters degree in Industrial Engineering. Graduates with an honours degree or equivalent in Industrial Engineering plus a Masters degree relevant to the field of Industrial Engineering can apply for the qualification using rule G10 – Conferment of Status.
Applications are made directly with the department.
(Amended w.e.f. 2015/08)

IE3 GRADUATE ATTRIBUTES / EXIT LEVEL OUTCOMES

(i) Bachelor of Engineering Technology in Industrial Engineering (SAQA NO: 99639)

(a) **DUT Graduate Attributes:**

Graduates completing this qualification would be deemed to have met the following DUT Graduate Attributes:

DUT 1 Creative thinkers who work within a broadly defined environment with limited or no supervision. They are able to work collaboratively with others on broadly defined tasks

DUT 2 Knowledgeable practitioners who are able to source, evaluate and implement technologies as appropriate to the tasks at hand

DUT 3 Effective communicators within a team and between various levels of management and shop floor personnel.

DUT 4 Culturally, environmentally, and socially aware within a local context with exposure to global technologies

DUT 5 Active learners who can take cognisance of their environment and adapt accordingly

(b) **Exit Level Outcomes (ELOs):**

Graduates completing this qualification will demonstrate competence in the following ELOs as prescribed by the Engineering Council of South Africa (ECSA) in the Engineering Standard (E-02-PT_Rev1):

Exit Level Outcome 1: Problem Solving:

Apply engineering principles to systematically diagnose and solve broadly-defined industrial engineering problems

Exit Level Outcome 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural science and engineering sciences to define and apply engineering procedures, processes, systems and methodologies to solve broadly-defined industrial 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.

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.

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

Use appropriate techniques, resources, and modern industrial engineering tools, including information technology, prediction and modelling, for the

solution of broadly-defined industrial engineering problems, with an understanding of the limitations, restrictions, premises, assumptions and constraints.

Exit Level Outcome 6: Professional and Technical Communication
Communicate effectively, both orally and in writing, with engineering audiences and the affected parties.

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.

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.

Exit Level Outcome 9: Independent Learning
Engage in independent and life-long learning through well-developed learning skills.

Exit Level Outcome 10: Engineering Professionalism
Comprehend and apply ethical principles and commit to professional ethics, responsibilities and norms of engineering technology practice.

(c) Exit Level Outcome (ELO) mapping for the qualification:

	Module Name	Problem Solving	Scientific & Eng Knowledge	Engineering Design	Investigation	Eng Methods, Skills, Tools & IT	Professional & Technical Communication	Impact of Engineering Activity	Individual & Teamwork	Independent Learning	Engineering Professionalism
		ELO 1	ELO 2	ELO 3	ELO 4	ELO 5	ELO 6	ELO 7	ELO 8	ELO 9	ELO 10
FIRST YEAR	Engineering Mathematics 1A	D									
	Engineering Physics 1A		D								
	Statistics for Engineers		D		D						
	Industrial Drawing and CAD			D		D	D	D		D	
	Cornerstone 101								D		D
	Technical Literacy						D			D	
	Engineering Mathematics 1B	D									
	Engineering Physics 1B		D								
	Financial Accounting for Engineers										
	Sociology of Work						D	D			
	Computing & IT					D					
	Electrical Principles 1	D	D		D						
SECOND YEAR	Engineering Mathematics 2A	D									
	Strengths of Materials 1	D	D							D	
	Mechanics of Machines 1	D	D								
	Computer programming & IT	D				D					
	Management Accounting for Engineers							D			
	Industrial Engineering Design 1		D	D			D		D	D	D
	Engineering Mathematics 2B	D									
	Engineering Work Systems 1										
	Production Engineering 1										
	Information System Design	D				D					D
	Manufacturing Engineering 1					D		D			
	Industrial Engineering Design 2	D	D	D			D		D	D	
THIRD YEAR	Facilities Planning										
	Engineering Work Systems 2		D			D					
	Production Engineering 2					D		D			
	Operations Research	D								A	
	Project Management								D		A
	Industrial Project Part 1	D		D	D		A				
	Engineering Work Systems 3		A								
	Production Engineering 3					A		A			
	Simulation Modelling										
	Principles of Management								A		
	Quality Engineering										
	Industrial Project Part 2	A		A	A						

D - Denotes modules where the outcome is developed

A - Denotes where the outcome is assessed

IE4 ASSESSMENT

In addition to the Rule Book for Students the following specific rules apply to all modules for the programmes on offer: -

(1) The method of evaluation and compilation of the semester/progress mark in all modules would be indicated in the learner guide for the module.

(2) In conjunction with rule G13 (3)(a) of the student handbook, any student who for any reason is absent from a particular assessment, must provide proof of their reason for the absence to the lecturer concerned upon their immediate return to class. Any makeup assessment will be determined at the discretion of the lecturer concerned. Refusal to accept this will result in a zero mark for the particular assessment.

(3) Supplementary examinations are offered as per the General handbook (Rule G13).

(4) In modules where ELOs are Assessed:
   (i) The assessment for the ELO is compulsory
   (ii) The module would be externally moderated

IE5 PROMOTION:

(i) National Diploma (N. Dip) [SAQA NO. 72229]

In addition to rule G16 no student shall be allowed to register for a higher level unless they meet the following criteria:

(1) The student must have completed all Semester 1 modules in order to register for any Semester 3 modules.

(2) The student must have completed all Semester 1 and Semester 2 modules in order to register for any Semester 4 modules.

(3) The student must have completed all academic coursework prior to being allowed to register for Industrial Engineering Practice P1 and P2.

(Amended w.e.f. 2015/08)

(ii) Bachelor of Engineering Technology in Industrial Engineering (SAQA NO: 99639)

In addition to rule G16 no student shall be allowed to register for a higher level unless they meet the following criteria:

(1) All modules would have a minimum pass mark of 50%. In certain modules, where applicable, the student would need to pass both the practical component (minimum 50%) and theoretical component (minimum 50%) of the module in order to achieve a pass for that module.

(2) In modules where Exit Level Outcomes (ELOs) are assessed, the student must meet both the academic and the ELO requirements, as specified in the relevant study guide, in order to pass the module.

(3) In addition to the prerequisite, co-requisite and exposure requirements of the individual modules, a student needs to:
   (a) pass all 1st Year – 1st semester modules to progress to 2nd Year – 2nd semester
   (b) pass all 1st Year – 2nd semester modules to progress to 3rd Year – 1st semester

(c) pass all 2nd Year - 1st semester modules to progress to 3rd Year – 2nd semester

(4) To be promoted from one year of study to the next, a student must accumulate a minimum of 23 SAQA credits or 0.5 HEMIS credits per year.

(Inserted w.e.f. 2017/09)

IE6 STUDENTS AT RISK:

Students that are incapable of achieving the minimum credit requirements as indicated in the table below, would be identified as students that are at risk i.e. students that may not complete their qualification in the maximum time as prescribed.

END OF YEAR	MINIMUM SAQA CREDITS	HEMIS CREDITS
1	84	0.6
2	168	1.2
3	252	1.8
4	336	2.4
5	420	3

Students that fall into this category will be monitored by the department for academic performance and interventions may be suggested as deemed necessary. Students that fail to maintain or improve their academic progress run the risk of contravening rule G17 as per the General Handbook. Students have the right to appeal as per rule G1 (8) of the General Handbook

(Inserted w.e.f. 2017/09)

IE7 LATE REGISTRATION

(1) No student will be permitted to register for any programme offered by the Department later than one week after the commencement of lectures unless the student has written authority from the HOD (Application for Late Registration forms) to attend lectures and participate in assessments.

(2) Executive Dean's approval is required for all late registrations and the department reserves the right not to allow a registration if the student has not been attending or participating in class.

(3) No student will be permitted to register or make changes to their curriculum after the dates specified in the General Handbook calendar.

IE8 PROGRAMME STRUCTURE:

(i) NATIONAL DIPLOMA: ENGINEERING: INDUSTRIAL [SAQA NO. 72229] [Phase-out]

The programme comprises a minimum of two (2) credits formal time and one (1) credit non-formal or experiential time. The Programme includes at least 0,5 credits of formal time at level 3. All modules for the NDip: Engineering: Industrial are offered every semester and are compulsory.

Module Title	Course Code	HEMIS Credits	Pre-requisite module/s
Semester 1 (Phased out)			
Communication Skills	COSK101	0.050	-
Computer Skills	CPSK101	0.050	-
Mathematics 1	MATH101	0.083	-
Mechanics 1	MCHN101	0.083	-
Mechanical Eng. Drawing 1	MCHD101	0.083	-
Mechanical Manufacturing Eng. 1	MMFE101	0.083	-
Electro-technology 1	ETEC101	0.083	-
Semester 2			
Computer Aided Draughting 1	CADN102	0.083	MCHD101
Engineering Work Study 1	EWOR103	0.083	-
Mathematics 2	MATH201	0.083	MATH101
Mechanical Manufacturing Engineering 2	MMFE201	0.083	MMFE101
Production Engineering 1	PEIN102	0.083	
Qualitative Techniques 1	QTES101	0.083	MATH101
Semester 3			
Costing 2	COST201	0.083	All Semester 1 modules
Engineering Work Study 2	EWOR203	0.083	All Semester 1 modules
Facilities Layout & Material Handling 2	FLYH201	0.083	All Semester 1 modules
Mathematics 3	MATH301	0.083	All Semester 1 modules
Manufacturing Relations 2	MREL201	0.083	All Semester 1 modules
Production Engineering 2	PEIN202	0.083	All Semester 1 modules
Semester 4			
Automation 3	AUMA301	0.083	All Semester 2 modules
Engineering Work Study 3	EWOR302	0.083	All Semester 2 modules
Industrial Leadership 3	ILEA301	0.083	All Semester 2 modules
Industrial Accounting 3	INDA303	0.083	All Semester 2 modules
Operational Research 3	OPRS303	0.083	All Semester 2 modules
Quality Assurance 2	QASS201	0.083	All Semester 2 modules
Semester 5			
Industrial Engineering Practice 1	EXEI101	0.500	All theory modules must be completed
Semester 6			
Industrial Engineering Practice 2	EXEI201	0.500	EXEI101 must be completed

(ii) Bachelor of Engineering Technology in Industrial Engineering (SAQA NO: 99639)

The programme comprises a minimum of:
(1) three (3) years' full time duration of study
(2) three (3) HEMIS credits formal time
(3) four hundred and twenty (420) SAQA credits
All modules for the qualification are offered once per annum and are compulsory.

Module Title	Course Code	NQF level	SAQA Credit	HEMIS Credits	Semester offered (S)	Pre-requisite module/s	Exposure Modules/s
Year 1 (Y1)							
Engineering Mathematics 1A	EMTA101	5	12	0.088	1	-	-
Engineering Physics 1A	EPHA101	5	12	0.088	1	-	-
Statistics 1	STST101	6	12	0.088	1	-	-
Industrial Drawing and CAD	ICAD101	6	16	0.148	1	-	-
Cornerstone 101	CSTN101	5	12	0.094	1	-	-
Technical Literacy	TCLT101	5	8	0.067	1	-	-
Engineering Mathematics 1B	EMTB101	5	12	0.088	2	-	EMTA101
Engineering Physics 1B	EPHB101	5	12	0.088	2	-	EPHA101
Financial Accounting for Engineers	FAEN101	5	8	0.046	2	-	-
Sociology of Work 101	SCWK101	6	8	0.067	2	-	-
Computing & IT	CPIT101	6	8	0.05	2	-	-
Electrical Principles 1	ELEP101	5	12	0.088	2	-	EPHA101
YEAR 2 (Y2)							
Engineering Mathematics 2A	EMTA201	6	12	0.088	1	EMTA101	EMTB101
Strengths of Materials 1	STMT102	5	12	0.088	1	-	EMTA101 EPHA101
Mechanics of Machines 1	MCHM102	6	12	0.088	1	-	EMTA101 EPHA101
Computer Programming & IT	CPRI101	6	8	0..59	1	-	CPIT101
Management Accounting for Engineers	MACE101	6	8	0.058	1	-	-
Industrial Design 1	IDES101	5	16	0.104	1	-	-
Engineering Mathematics 2B	EMTB201	6	12	0.088	2	All Y1 – S1 Modules EMTB101	EMTA201
Engineering Work Systems 1	EWSY101	5	12	0.088	2	All Y1 – S1 Modules	-
Production Engineering 1	PENG101	5	12	0.088	2	All Y1 – S1 Modules	-
Information System Design	ISYD101	7	16	0.104	2	All Y1 – S1 Modules CPIT101	-
Manufacturing Engineering 1	MNFE101	6	8	0.059	2	All Y1 – S1 Modules	-
Industrial Design 2	IDES201	6	12	0.088	2	All Y1 – S1 Modules	IDES101

YEAR 3 (Y3)							
Facilities Planning	FCLP101	7	12	0.082	1	All Y1 – S2 modules	-
Engineering Work Systems 2	EWSY201	6	12	0.088	1	All Y1 – S2 modules	-
Production Engineering 2	PENG201	6	12	0.088	1	All Y1 – S2 modules	-
Operations Research	OPRS101	7	12	0.083	1	All Y1 – S2 modules	-
Project Management	PMAN102	7	8	0.067	1	All Y1 – S2 modules	-
Design Project Part 1	DPJT111	7	12	0.088	1	All Y1 – S2 modules	IDES210
Engineering Work Systems 3	EWSY301	7	16	0.089	2	All Y2 – S1 modules	-
Production Engineering 3	PENG301	7	16	0.089	2	All Y2 – S1 modules	-
Simulation Modelling	SMMD101	7	16	0.089	2	All Y2 – S1 modules	-
Principles of Management	PMGM102	6	8	0.067	2	All Y2 – S1 modules	-
Quality Engineering	QLTE101	6	12	0.082	2	All Y2 – S1 modules	-
Design Project Part 2	DPJT121	7	12	0.088	2	All Y2 – S1 modules	-

(iii) B.TECH: ENGINEERING: INDUSTRIAL [SAQA NO. 72130]

The programme comprises a minimum of one (1) HEMIS credit formal time.
All modules for the B. Tech: Engineering: Industrial are offered once per annum and are compulsory.

Module Title	Course Code	HEMIS Credits	Pre-requisite module/s
Semester 1			
Entrepreneurship 4	ENTR401	0.125	-
Information Systems 4	INSY401	0.125	-
Project Engineering 4	PJEN401	0.125	-
Production Technology 4	PTEH401	0.125	-
Semester 2			
Logistics Engineering 4	LENG401	0.125	-
Project Research 4	PJRE401	0.125	-
Quality Assurance 4	QASS401	0.125	-
Systems Dynamics 4	SDYS402	0.125	-

(iv) Master of Engineering [SAQA NO. 96827]

This is a research-based qualification requiring advanced studies on behalf of the student in any subject/s related to the specific field of study. Students are required to undertake research under the guidance of a supervisor.
MEng. studies may be undertaken on a part-time or full-time basis.
(Amended w.e.f. 2015/08)

(v) Doctor of Engineering [SAQA NO. 96812]

This is a research based qualification requiring advanced studies on behalf of the student in any subject/s related to the specific field of study. Students are required to undertake research under the guidance of a supervisor.
DEng. studies may be undertaken on a part-time or full-time basis
(Amended w.e.f. 2015/08)

IE9 TIMETABLE/LECTURE CLASHES

1) As all registrations are done using the online registration system, students are advised to consult the respective timetables for any module clashes prior to registration.
2) Timetable clashes have inherent risks relating to attendance and assessments and the onus falls upon the student to mitigate this risk by not registering modules where potential clashes could exist.
3) If the student knowingly registers modules where clashes exist, the onus is on the student to bring this to the attention of the relevant subject lecturer concerned for advice on how to proceed.
4) Timetable clashes also affects the examinations timetable where it could happen that both subjects are scheduled on the same day. The student by virtue of their registration assumes this risk.

IE10 INDUSTRIAL ENGINEERING PRACTICE (WORK PLACEMENT)

(1) This programme requires the student to undergo a one-year work place based training period as an integral part of the course. This year is broken up into two modules of six (6) months duration. This can only be attempted once the student has completed all theory modules as outlined in IE8 (i)
(2) Although the Durban University of Technology undertakes to assist the student in obtaining suitable work integrated learning placement, the onus is on the student to find placement. The Department of Co-Operative Education assists the students with possible placements.
(3) All prospective students that will be engaged in the work placement programme are required to attend the Work Preparedness Lecture series during their final semester on campus.
(4) Employers must be accredited by the University for the purposes of placing the student at the company. This is done through the process of a work place accreditation visit.
(5) Students must register at the department for the subject Industrial Engineering Practice as soon as they secured employment. Proof of an employment or training contract is required as part of the registration process. The period of training is only recognized from the date that the student registers. A one-month grace period can apply however the student needs to bring it to the attention of the Head of Department.
(6) The student is expected to submit monthly reports to his/her university mentor in addition to developing a comprehensive portfolio to showcase the work carried out for that particular placement period.

(7) Outlined below is the departmental procedure that applies:

(i) Student must register for Industrial Engineering Practice (EXEI1101/ EXEI201) within one month after commencing their training. When registering the student must complete a DUT EL2 form, obtainable from the department, and must ensure that the form is returned to the department completed with all the necessary details pertaining to their training.

(ii) The student is required to furnish proof of employment from the company where he/she is doing their training. If the student has enrolled into a learnership or a specialized training program offered by the company or a SETA accredited institution, the student needs to verify that the content being taught or experience gained is in line with the field of Industrial Engineering. It is preferable that the student contacts the department prior to enrolling into such a program.

(iii) It is recommended that the student submits a draft portfolio, completed in accordance to the guidelines given by the department, just prior to the last week of the relevant training period.

(iv) Portfolios should be submitted in the last week of the training period and the student should ensure that they have received confirmation that the portfolio has been received.

(v) The portfolio is then assessed and the student informed of the outcome. A letter of completion is also done and it is the student's responsibility to ensure that the letter of completion is handed to their respective HR department. From the assessment of the portfolios to the capturing of the marks should be approximately three (3) weeks. If this is not done by then the student is encouraged to contact the department.

(vi) If there is to be any deviation from the above process and timelines, documented evidence in the form of written correspondence, must be submitted to the HOD for approval.

(vii) If the student defaults in keeping to the above procedure without written consent from the department, they would be required to re-register that part of their training module applicable and complete the full duration of the training as required.

Once a student has completed all the modules and work integrated learning components, the student would be eligible for graduation as determined by the Faculty office.

IE11 N4 EQUIVALENTS

(i) NATIONAL DIPLOMA: ENGINEERING: INDUSTRIAL [SAQA NO. 72229]

A student can apply for credits on the above program for the following modules provided that they have passed the N-modules with 50% or higher at an accredited FET College.

DUT Module	FET Exemption
Communication skills 1	Communication N4 & N5
Computer skills 1	Computer practice N4 & N5
Mechanical Engineering Drawing 1	Mechanical Draughting N4 with a pass of 60% or more.
Mathematics 1	Mathematics N4 & N5
Mechanics 1	Mechanotechnics N5 and Engineering Science N4
Mechanics of Machines 2	Mechano Technics N5 & N6
Mathematics 2	Mathematics N5 & N6
Strength of Materials 2	Strength of Materials N5 & N6
Mechanical Engineering Design 2	Mechanical Drawing and Design N5 & N6
Electrotechnology 1 *(Amended w.e.f. 2014/01)*	Electrotechnics N4 & N5 & N6
Mechanical Manufacturing Engineering 1	The student must show proof of at least 18 months' appropriate practical trade-oriented experience.

IE12 PHASE OUT RULES:
Important information for current and prospective students

(i) NATIONAL DIPLOMA: ENGINEERING: INDUSTRIAL [SAQA NO. 72229]

The current National Diploma: Engineering: Industrial is in phase out effective from January 2017 to allow for the introduction of the new Bachelor of Engineering Technology in Industrial Engineering. The last cohort of first-time entering students admitted to the National Diploma qualification was in January 2017 and no new registrations will be allowed onto this qualification (inclusive of transfer students)

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

Subject Name	Last Possible Semester of Registration
Communication Skills I	July 2017
Computer Skills I	July 2017
Mathematics I	July 2017
Mechanics I	July 2017
Mechanical Eng. Drawing I	July 2017
Mechanical Manufacturing Eng. I	July 2017
Mechanical Manufacturing Engineering I	July 2017
Electro-technology I	July 2017
Computer Aided Draughting	July 2018
Engineering Work-study I	July 2018
Mathematics 2	July 2018
Mechanical Manufacturing Engineering 2	July 2018
Production Engineering I	July 2018
Qualitative Techniques I	July 2018
Costing II	July 2019
Engineering Work-study 2	July 2019
Facilities Layout & Material Handling 2	July 2019
Mathematics 3	July 2019
Manufacturing Relations 2	July 2019
Production Engineering 2	July 2019
Automation 3	July 2020
Engineering Work-study 3	July 2020
Industrial Leadership 3	July 2020
Industrial Accounting 3	July 2020
Operations Research 3	July 2020
Quality Assurance 2	July 2020
Experiential Learning I (P1)	January 2021
Experiential Learning II (P2)	July 2021

Students that have incomplete qualifications and who are not able to adhered to the deadlines stated above would unfortunately not be able to be accommodated to complete the programme.
(W.e.f. 2016/08)

(ii) B.TECH: ENGINEERING: INDUSTRIAL [SAQA NO. 72130]

The last registration for 1st time entering students into the B. Tech Industrial Engineering programme would be in July 2019. Thereafter only repeating students would be allowed to register for B. Tech modules subject to the phase out plan as specified below. 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
Project Research IV	July 2021
Quality Assurance IV	July 2021
Entrepreneurship IV	July 2021
Production Technology IV	July 2021
Project Engineering IV	January 2022
Information Systems IV	January 2022
Production Technology IV	January 2022
Entrepreneurship IV	January 2022

IE13 SYLLABUS STRUCTURES:

The curriculum reflected in all the courses below is an indicative guideline. Changes may occur through periodic module review. For the latest curriculum on offer kindly refer to the relevant module learner guide obtainable from the department.

(i) NATIONAL DIPLOMA: ENGINEERING: INDUSTRIAL [SAQA NO. 72229]

AUTOMATION III (AUMA301)

Why automate, cost of automation, Automation strategies, where to automate, how to automate, Automation of one workstation using pneumatics and PLC's, Presswork as a method to save labour and material, Jigs and fixtures employed as a toll to improve quality and labour savings, CNC applications from parts programming to flexible machining centres, Automation of a production line. Automatic transfer of parts, feeding and sorting of parts with mechanical, pneumatic and electronic means, Auto sizing of parts during and after manufacture.

COMMUNICATION SKILLS I (COSK101)

Communication theory, oral presentations, Technical writing skills, Group communication skills

COMPUTER AIDED DRAUGHTING I (CADN101)

Introduction to Inventor, Directory and file handling, Exploring the Inventor commands, Orthographic machine drawing, Drawing Graphics for WordPerfect, Isometric Drawings, 3 Dimensional Drawings, Plotting and Printing

COMPUTER SKILLS (CPSK101)

General Introduction to Computers, Basic Keyboard Skills, Word Processing, Spreadsheets, Email and Internet, Preparation of CV's.

COSTING II (COST201)

Introduction to Cost & Management Accounting, Classification of costs, Material and inventory control, Labour costs, Classification and analysis of overheads, Cost/volume and Profit Analysis, Basic job costing systems, Budgets, Standard costing systems

ELECTROTECHNOLOGY I (ETEC101)

The fundamental laws, Circuit elements, Simple dissipative circuits, Analysis of dissipative circuits, Magnetic circuits, Inductance, Capacitance, Response of RL and RC circuits

ENGINEERING WORK STUDY I (EWOR103)

Introduction to Work Study, Choice of method study Techniques, Method Study (Standard level), Jigs and fixture, Work measurement (Time Study), Working conditions and environment

ENGINEERING WORKSTUDY II (EWOR201)

Problem solving & creative thinking, Choice of method study techniques, Method study techniques [High level], Work measurement [High level], Ergonomics, Value analysis, Performance index of production factors [Low Level], Incentive schemes, Work study in the administrative function

ENGINEERING WORK STUDY III (EWOR303)

Introduction to systems thinking using simul8, Concepts in simulation with simul8, developing a simulation model, Design Project, group project using the F1 concept,

FACILITY LAYOUT AND MATERIAL HANDLING II (FLYH201)

Fundamentals of facilities planning and design, Product design and process planning: scrap estimates, flow patterns, Layout procedures: product layout, process layout, fixed position layout and cellular layout, Material handling principles, equipment and system design, Storage and warehouse systems, Office and personnel planning

INDUSTRIAL ACCOUNTING III (INDA303)

The role and environment of finance, Financial statements and analysis, Cash Flow and Financial planning, Time Value of money, Capital budgeting cash flows, Capital budgeting techniques, Working capital and current assets management, Computer applications

INDUSTRIAL LEADERSHIP III (ILEA303)
Introduction of management, Project planning, Organizing, Leading, Control, Case studies

MANUFACTURING RELATIONS II (MREL201)
Personnel and The Personnel Function, Human relations, Labour relations

MATHEMATICS I (MATH101)
Determinants, Logarithms, Formulae, Trigonometry (Radian measure), Complex Numbers (Forms + ; - ; x ; roots), Statistics (Descriptive, Central Tendency and Dispersion), Calculus (Differentiation and Elementary Integration)

MATHEMATICS II (MATH201)
Differentiation and applications, Integration and applications, 1st order differential equations and applications, Matrices

MATHEMATICS III (MATH301)
The solution of ODE by: D-operators, Laplace transforms, Numerical technique, Eigen values and eigenvectors, Fourier series, Analytical, Numerical

MECHANICAL ENGINEERING DRAWING I (MCHD101)
Use of instruments, line work, printing and dimensioning, Pictorial drawing., Orthographic Engineering Drawing, Sectional Drawings, Assembly Drawings, NB: Sectional and Assembly Drawings are required in the first and third angle projection of various shaped blocks, castings and industrial apparatus.

MECHANICAL MANUFACTURING ENGINEERING I (MMFE101)
Occupational Health and Safety, Introduction and Overview of manufacturing, Sheet Metal Working, Theory of Metal Machining, Machining operations and machine tools, Fundamentals of Welding, Welding processes

MECHANICAL MANUFACTURING ENGINEERING II (MMFE201)
Fault diagnosis, failure analysis and advanced measuring equipment, Test methods, interpretation and action, Powder metallurgy, Metal forming, Erosion, Castings, Plastics and machining, Welding & joining, Obtaining finish and accuracy

MECHANICS I (MCHN101)
Statics, Dynamics

OPERATIONS RESEARCH III (OPRS303)
Introduction to quantitative Analysis, Fundamentals of decision theory models & decision trees, Linear programming models (graphical & simplex), Transportation & assignment models, Integer programming, Waiting lines & queuing theory, Simulation modelling, Markov analysis

PRODUCTION ENGINEERING I (PEIN101)
Introduction, Competitiveness, strategy and productivity, Forecasting techniques, Product and service design, reliability, Capacity planning and location planning, Facilities Layout, Learning curves, Quality Management

PRODUCTION ENGINEERING II (PEIN201)

Supply chain management, Inventory Management, Aggregate planning, Materials requirements planning, Just-in-time systems, Maintenance, Scheduling, Theory of Constraints, Project Management

QUALITATIVE TECHNIQUES I (QTES101)

Introduction, Descriptive Techniques, Probability and Probability Distributions, Sample selection and sampling theory, Operational sample design, Hypothesis testing, Regression analysis, Decision theory and Bayesian probability

QUALITY ASSURANCE II (QASS201)

Introduction, Different philosophies, Quality improvement techniques, Quality control techniques, Product acceptance, Acceptance sampling, Measurement, Reliability, Quality assurance, Computer applications

(ii) B.TECH: ENGINEERING: INDUSTRIAL [SAQA NO. 72130]

ENTREPRENEURSHIP IV (ENTR401)

Introduction to strategies management, Strategic Management Model for business, Situation Analysis of a business
Strategy formulation, implementation and control, Continuous improvement approaches, Case studies and projects

INFORMATION SYSTEMS IV (INSY401)

Structure and strategies organizational role, Computer systems resources, Decision support systems and executive information systems, Development and implementation of information systems

LOGISTICS ENGINEERING IV (LENG401)

Introduction to logistics, Measure of logistics, System Operational Requirements, Logistics in System Design, System Operation and Support, Logistic support management, Projects

PRODUCTION TECHNOLOGY IV (PETH401)

Computer Aided Process Planning, Automation of Flow lines, Automated Assembly Systems, Automated Inspection and Testing, Automatic Identification Systems, Flexible Manufacturing Systems, Enterprise Integration and Computer Integrated Manufacturing, Projects and Computer Applications

PROJECT ENGINEERING IV (PJEN401)

Need and advantages of project management, Definition of the project, Modern project planning methods, Communication and presentation of information, Feasibility studies [Economic justification], Project Implementation
Support of the operational systems, Case studies, projects and computer applications

PROJECT RESEARCH IV (PJRE401)

Problem Identification, Choice and use of measuring instruments, Literature studying, Experimental Design, Analysis and interpretation of data, Composition of the project report, Case studies and projects

QUALITY ASSURANCE IV (QASS401)

Introduction: Quality Assurance in perspective, Philosophies of Crosby, Deming, Juran, etc., Advanced Quality techniques, Quality Audit (SABS 0157/ISO 9000), Total Quality management, Case study and projects

SYSTEMS DYNAMICS IV (SDYS402)

Introduction to simulation and systems modelling, Simulation and flow charting of algorithms, Probability and Statistics used in simulation, steps in building a simulation model, Simulation Modelling using Simul8, Introduction to Systems Thinking

(iii) Bachelor of Engineering Technology in Industrial Engineering (SAQA NO: 99639)

Year 1:

Subject: ELOs being developed: Indicative Content:	**Engineering Physics 1A (EPHA101)** Application of scientific and engineering knowledge Units, Physical Quantities, Vectors, Equilibrium of a particle, Newton's Second Law, Gravitation, Work and Energy, Impulse and Momentum, Torque, Elasticity, Periodic Motion, Mechanical Waves, Acoustic Phenomena, Vibrating Bodies
Subject: ELOs being developed: Indicative Content:	**Engineering Mathematics 1A (EMTA101)** Problem Solving, Application of scientific and engineering Knowledge Numbers and Algebra, Areas and Volumes, Trigonometry, Graphs, Complex Numbers, Calculus – Differentiation, Calculus – Integration
Subject: ELOs being developed: Indicative Content:	**Statistics for Engineers (STST101)** Application of scientific and engineering knowledge, Investigation Discrete Random Variables And Probability, Continuous Random Variables And Probability Distributions, Joint Probability Distributions And Random Samples, Point Estimation, Statistical Intervals Based On A Single Sample, Tests Of Hypotheses Based On A Single Sample, Inferences Based On Two Samples, The Analysis Of Variance, Multifactor Analysis Of Variance, Simple Linear Regression and Correlation, Nonlinear and Multiple Regression.
Subject: ELOs being developed: Indicative Content:	**Industrial Drawing & CAD (ICAD101)** Engineering Design, Engineering Methods, Skills, Tools and IT, Professional and Technical communication, Independent Learning Freehand drawing & sketching, SABS drawing standards and conventions, Orthographic and isometric drawings, Developments and assemblies, Conceptualise and generate 3D drawings on appropriate design software

Subject:	**Cornerstone 101 (CSTN101)**
ELOs being developed:	Engineering Methods, Skills, Tools and IT, Professional and Technical communication, Individual and Teamwork, Engineering Professionalism
Indicative Content:	The module content is 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. Sections will draw on issues of ethics, diversity and critical citizenry.
Subject:	**Technical Literacy (TCLT101)**
ELOs being developed:	Professional and Technical Communication, Independent Learning
Indicative Content:	The differences between language usage in academic, technical and common environments, Experimental methods and the scientific method, Planning and documenting experiments, Technical Report writing, Referencing practice, Utilising spreadsheets for graphical presentation of information Standards (ISO, SABS, etc.)
Subject:	**Electrical Principles I (ELEP101)**
ELOs being developed:	Problem Solving, Investigation
Indicative Content:	Established electrical principles and laws, Network theorems, conversions and applications, Passive components in DC circuits.
Subject:	**Engineering Mathematics 1B (EMTB101)**
ELOs being developed:	Problem solving, Application of scientific and engineering knowledge
Indicative Content:	Linear Algebra, Trigonometry, Series, Advanced Calculus - Differentiation Advances Calculus - Integration, Differential Equations, Statistics and Probability
Subject:	**Engineering Physics 1B (EPHB101)**
ELOs being developed:	Application of scientific and engineering knowledge
Indicative Content:	Atomic and Molecular Structure, Coulomb's Law, Current, Resistance and Capacitance, The Magnetic Field, Inductance, Maxwell's Equations, Electromagnetic Waves, The Nature and Propagation of Light, Thermodynamics
Subject:	**Sociology of Work (SCWK101)**
ELOs being developed:	Professional and Technical Communication, Impact of Engineering Activity
Indicative Content:	Themes: What is Work, Industrialisation and post industrialisation, The capitalist workplace, Trade unionism, Women and Work, Precarious Labour
Subject:	**Financial Accounting for Engineers (FAEN101)**
ELOs being developed:	Professional and Technical Communication, Engineering professionalism
Indicative Content:	The conceptual overview of financial accounting, The accounting process, The elements and analysis of financial statements, Entity formations in business, Sundry topics

Subject:	**Computing & IT (CPIT101)**
ELOs being developed:	Engineering Methods, Skills, Tools and IT
Indicative Content:	Introduction to programming, Overview of the .net platform, Problem solving and programming, Program Development cycle, Structured Programming Techniques, Application areas: Variables; Data Types; Operators

Year 2:

Subject:	**Strengths of Materials I (STMT102)**
ELOs being developed:	Problem solving, Application of scientific and engineering knowledge, Independent Learning
Indicative Content:	Introduction to Strength of Materials, Equilibrium of deformable body, Stress, Axially loaded members, Average shear stress, Allowable stress, Thin-walled pressure vessels (cylindrical and spherical), Design of simple connections, Deformation (strain), The tension and compression test, The stress-strain diagram, Stress-strain behaviour of ductile and brittle materials, Hooke's law, Poisson's ratio, The shear stress-strain diagram, Principle of superposition, Torsional deformation of a circular shaft.
Subject:	**Engineering Mathematics 2A (EMTA201)**
ELOs being developed: Indicative Content:	Problem solving, Application of scientific and engineering knowledge Partial Differential Equations: Statistics and Probability, Differential Equations, Laplace Transforms, Fourier Series.
Subject:	**Mechanics of Machines I (MCHM102)**
ELOs being developed:	Note: ECSA Exit Level Outcomes (ELO) as per E-02-PT are used in place of DUTs graduate attributes and thus ECSA ELOs are referred to here. Problem Solving, Application of scientific and engineering knowledge, Investigation, Professional and Technical Communication,
Indicative Content:	Individual and Teamwork. Statistics – Bodies in Equilibrium, Dynamics – Bodies in Motion.
Subject:	**Computer Programming & IT (CPRI101)**
ELOs being developed:	Problem Solving, Engineering methods, skills, tools, including Information technology.
Indicative Content:	Know the key concepts of Top Down design to design a simple application, understand key programming concepts, use an IDE to create and debug a working application, demonstrate proficiency in the use of a programming language used in engineering to solve an engineering problem, have an understanding of visual programming, design a User Interface using contemporary methods.
Subject:	**Industrial Engineering Design I (IDES101)**
ELOs being developed:	Scientific and Engineering knowledge, Engineering Design, Professional and Technical Communication, Individual and Teamwork, Independent Learning, Engineering Professionalism
Indicative Content:	Introduction to Engineering Design, Purpose of design for Engineers, Tools used for design, Working in design teams, Dealing with design constraints, Documentation of design and report
Subject:	**Management Accounting for Engineers (MACE101)**
ELOs being developed:	Professional and Technical Communication, Impact of Engineering Activity
Indicative Content:	Statement of Cash Flows and Financial Statement Analysis, Job Order

	and Process Cost Systems, Cost Behaviour and Cost-Volume Profit Analysis. Profit Reporting for Management Analysis (Variable and Absorption Costing). Budgeting and Standard Costs, Product Pricing, Capital Investment Analysis, Cost Allocation, Activity Based Costing and Cost Management for Just-in-Time Environments, Business Ethics.
Subject: ELOs being developed: Indicative Content:	**Manufacturing Engineering 1 (MNFE101)** Engineering Methods, Skills, Tools & IT, Impact of engineering activity Overview of manufacturing, Theory of metal machining, Hand tools, Machine tools, Fasteners & joining of components, Welding & Fabrication – Fundamentals & Processes.
Subject: ELOs being developed: Indicative Content:	**Engineering Mathematics 2B (EMTB201)** Problem Solving, Application of scientific and engineering knowledge Analysis and Calculus, Linear Algebra, Complex Analysis, Partial Differential Equations, Transforms.
Subject: ELOs being developed: Indicative Content:	**Engineering Work Systems 1 (EWSY101)** Engineering methods, skills, tools, including Information technology, Individual and Teamwork, Engineering professionalism Productivity, work study and the human factor, Method Study, Work Measurement.
Subject: ELOs being developed: Indicative Content:	**Production Engineering 1 (PENG101)** Engineering methods, skills, tools, including Information technology, Individual and Teamwork, Engineering professionalism. Field of operations management, Operations strategy and competitiveness Process analysis, Product design and process selection, Waiting line management, Electronic commerce and E-operations, Supply chain strategy, Strategic capacity management.
Subject: ELOs being developed: Indicative Content:	**Information System Design (ISYD101)** Problem Solving, Engineering Methods, Skills, Tools & IT Introductory concepts – information and the organisation, Developing information systems in an object orientated environment, System analysis and design, Database concepts and structures, Object orientation paradigms and teams, Database administration, Object orientated databases, Knowledge based expert systems.
Subject: ELOs being developed: Indicative Content:	**Industrial Engineering Design 2 (IDES201)** Problem solving, Scientific and Engineering Knowledge, Engineering Design, Professional and Technical Communication, Individual and Teamwork, Independent Learning. Detailed Engineering Design, Application of design Tools and practices, Design prototyping and testing, Align process to ISO standards, Documenting and reporting.

Year 3

Subject:	**Facilities Planning (FCLP101)**
ELOs being developed:	Engineering methods, skills, tools, including Information technology, Impact of engineering activity, Individual and Teamwork
Indicative Content:	Introduction to facilities layout, Product design and schedule design, Flow space and activity relationships, Personnel requirements, Material handling equipment and systems, Layout planning models and design algorithms.
Subject:	**Engineering Work Systems 2 (EWSY201)**
ELOs being developed:	Scientific and engineering knowledge, Engineering methods, skills, tools, including Information technology, Impact of engineering activity.
Indicative Content:	Advanced Work Design, Manual work and worker-machine systems, Physical ergonomics, Work environment ergonomics, Advanced Work Measurement, Predetermined motion time systems, Standard data systems, Work sampling, Service operations and office work, Performance Measurement And Improvement, Compensation systems.
Subject:	**Production Engineering 2 (PENG201)**
ELOs being developed:	Scientific and Engineering Knowledge, Engineering methods, skills, tools, including Information technology, Impact of Engineering Activity.
Indicative Content:	Just-In-Time and Lean systems, Enterprise resource planning, Forecasting, Aggregate and sales operations planning, Inventory control, Material requirements planning, Operations scheduling, Synchronous manufacturing and theory of constraints.
Subject:	**Operations Research (OPRS101)**
ELOs being developed:	Problem Solving, Scientific and Engineering Knowledge, Individual and Teamwork, Independent Learning
Indicative Content:	Introduction to Quantitative Analysis, Decision Analysis, Linear Programming – Graphical method, Linear Programming – Simplex method, Transportation and Assignment modelling, Integer Programming, Network Modelling, Waiting lines and Queuing theory, Simulation Modelling, Total Productive Maintenance.
Subject:	**Project Management (PMAN102)**
ELOs being developed:	Professional and Technical communication, Individual and Team Work Project Management within Context
Indicative Content:	Modern Project planning methods, tool, analysis and computer applications Oral and written communication of project planning Project Implementation Support of the operational systems
Subject:	**Design Project Part 1 (DPJT111)**
ELOs being developed:	Problem Solving, Engineering Design, Investigation, Professional and Technical communication
Indicative Content:	Detailed Engineering Design, costing and documentation.
Subject:	**Industrial Engineering Project Part 2 (DPJT121)**
ELOs being develop:	Problem Solving, Engineering Design, Investigation
Indicative Content:	Design prototyping and testing and legal issues, Detail Standard Operating Procedures as per ISO, Documentation and Technical reporting.

Subject: ELOs being develop: Indicative Content:	**Production Engineering 3 (PENG301)** Scientific and Engineering Knowledge. Introduction to manufacturing systems, Additive manufacturing and rapid prototyping technologies, Single station manufacturing cells, Manual assembly lines, Automated production lines, Automated assembly systems, Cellular manufacturing systems, Flexible manufacturing systems.
Subject: ELOs being develop: Indicative Content:	**Principles of Management (PMGM102)** Impact of Engineering Activity, Engineering Professionalism. The Environment in which People Work, Key concepts of Management, Human Resource Management, The Labour Relations Act, Managing People and Teams.
Subject: ELOs being develop: Indicative Content:	**Engineering Work Systems 3 (EWSY301)** Impact of Engineering Activity. Systems thinking methodology, systems analysis / system interrogation, systems engineering. Ethics / Social responsibility, Green technologies / Carbon imprint / Respecting the environment / Sustainable designs, Performance improvement programs, Introduction to productivity measurement, change in real terms, contribution & calculation of price recovery and productivity to profit., data specification, productivity measurement in service functions, the creation and distribution of wealth formula, Partial productivity measurement, operator's performance, departmental performance, overall performance, Machine performance indices, Incentive schemes.
Subject: ELOs being develop: Indicative Content:	**Simulation Modelling (SMMD101)** Engineering methods, skills, tools, including Information technology. Introduction to simulation and systems modelling, Simulation and flowcharting algorithms, Probability and statistics in simulation, steps in building a simulation model, Simulation modelling using Simul8, Introduction to systems thinking.
Subject: ELOs being develop: Indicative Content:	**Quality Engineering (QLTE101)** Investigation, Individual and Teamwork Introduction to Quality, Importance of quality in the workplace, TQM tools and techniques, Control charts for variables, Control charts for attributes, Use of quality software.

E&OE