Faculty of Engineering
& Technology
Prospectus

First published 2009
Second edition 2010
Third edition 2012
Fourth edition 2013
Fifth edition 2014
Sixth edition 2015
Seventh edition 2016
Eighth edition 2018
Ninth Edition 2019
Tenth Edition 2020

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NB:
Although the information contained in this Faculty Prospectus has been compiled as accurately as possible, the Council and the Senate of the Vaal University of Technology accept no responsibility for any errors or omissions.
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ICT Skills 1
Describe computers and computer systems; Explain the organization and operation of computers; Apply the concept of operating systems, including the features of MS DOS and Windows Operating Systems; Use the features of the modern word processing software, spreadsheet, PowerPoint presentation; Use the internet efficiently in information gathering and e-mailing; Explain the concept of computer viruses, their needs and control.

Engineering Chemistry 1
Recognize and explain the fundamental observations, models and experiments in Chemistry; Explain the atomic and molecular structures; Explain the principles and techniques of analytical chemistry; Discuss the applications of analytical and physical chemistry; Carry out experimental qualitative analysis in physical and analytical chemistry; Understand and explain the principles of chemical thermodynamics.

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1. Welcome by the Executive Dean

Welcome to the Faculty of Engineering & Technology at the Vaal University of Technology (VUT), where you will build an exciting future career in engineering. At VUT, you will empower yourself by choosing one of our eight programmes leading to a rewarding career in engineering.

Our programmes are fully accredited by the relevant Engineering professional body in South Africa (Engineering Council of South Africa). Thus, our graduates are
internationally recognised once they register with Engineering Council of South Africa (ECSA).

Unlike scientists who study the world as it is engineers create the world that has never been. In this faculty, you will not only learn how to make things but also, through creativity and innovation, how to improve, adapt and make them suitable for the demands of sustainable living and economic growth. As wealth creators, engineers play a pivotal role in the economy of any nation. Let nobody frighten you that engineering is difficult; all you need is to consistently work hard and smartly leverage the support of modern technology and remain focused.

The staff and course details are covered under each programme in the prospectus.

The members of staff of the Faculty of Engineering and Technology are looking forward to guiding you and form part of your education as you build your future career in engineering.

The one thing you all should not forget is that, this is a university, a totally different ball game from your previous schools. This place is for studies, so students get on with it.

You may assume time is on your side, but read my lips, your colleagues in other institutions are working very hard in nation building, please, do not be left behind.

Prof M Ndege
Executive Dean
2. Faculty: Department Structure and Qualifications

- **Faculty of Engineering & Technology**
  - Chemical Engineering: Dip; Advanced Diploma, MEng & PhD
  - Civil Engineering: Dip; Advanced Diploma; MEng & DEng
  - Electrical Engineering (Electronics): Dip; Advanced Diploma; MEng & DEng
  - Electrical Engineering (Power): Dip; Advanced Diploma; MEng & DEng
  - Electrical Engineering: Dip; Advanced Diploma; MEng & DEng
  - Industrial Engineering: Dip; Advanced Diploma, MEng
  - Industrial Engineering: Dip; Advanced Diploma
  - Operations Management: Dip & Advanced Diploma
  - Mechanical Engineering: Dip; Advanced Diploma; MEng & DEng
  - Metallurgical Engineering: Dip; Advanced Diploma; MEng
3. Professional Body, Program Accreditation and Professional Registration

The Engineering Council of South Africa (ECSA) audit all the engineering programmes offered at the Vaal University of Technology every four years. ECSA awards an accreditation status to each program that meets the standard for the award of the qualification. The standards are designed to meet the educational requirement towards registration as a Candidate or Professional Engineering Technician with the Engineering Council of South Africa and acceptance as a candidate to write the examinations for Certificated Engineers (for Diploma in Engineering Programmes) and the educational base required for registration as a Professional Engineering Technologist and/or Certificated Engineer with ECSA (for the Advanced Diploma in Engineering Programmes).

The Engineering Council of South Africa (ECSA) is a statutory body established in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000). ECSA’s predecessor was established by the Engineering Profession of South Africa Act, 1990 (Act No. 114 of 1990).

ECSA sees itself in partnership with the State and the engineering profession to promote a high level of education and training of practitioners in the engineering profession so as to facilitate full recognition of professionalism in the engineering profession, both locally and abroad. It enjoys full autonomy although it is accountable to the State, the profession and the public for the fair and transparent administration of its business in the pursuit of its goals.

However, in pursuing its goal, ECSA has an implied responsibility to ensure that the interests of the profession (the practitioners) are also promoted. The interest of the public and the country can only be served properly if a profession is healthy and strong. For this reason, ECSA promotes the well-being of the voluntary societies which are active in engineering. Since the societies are the instruments through which the interests of the practitioners are served, a good balance between “public interests” (ECSA) and “own interests” (Societies) should be maintained.

3.1 Statutory Functions of ECSA

In order to achieve the Act’s main focus, ECSA is empowered to perform a variety of functions, such as:
• Setting and auditing of academic standards for purposes of registration through a process of accreditation of engineering programmes at universities and universities of technology;
• Setting and auditing of professional development standards through the provision of guidelines which set out ECSA’s post-qualification requirements for registration in the four professional categories of registration, namely Professional Engineer, Professional Engineering Technologist, Professional Certificated Engineer and Professional Engineering Technician as well as for Specified Categories, such as Registered Lift Inspectors;
• Prescribing requirements for Continuing Professional Development and determining the period within which registered persons must apply for renewal of their registrations;
• Prescribing a Code of Conduct and Codes of Practice, and enforcing such conduct through an Investigating Committee and a Disciplinary Tribunal;
• Identification of work of an engineering nature that should be reserved for registered persons by the Council for the Built Environment (CBE), after consultation with the Competition Board;
• Advising the Council for the Built Environment (CBE) and Minister of Public Works on matters relating to the engineering profession and cognate matters;
• Recognition of professional associations, such as engineering associations, institutes / ions and societies;
• Publication of a guideline tariff of fees for consulting work, in consultation with government, the profession and industry; and
• Doing such other things as may be necessary for the proper performance of its functions in terms of the Act.

3.2 HEQSF Alignment and Professional Registration with the Engineering Council of South Africa
Programmes offered in the Faculty of Engineering and Technology of Vaal University of Technology, Vanderbijlpark Campus are Higher Education Qualification Sub Framework (HEQSF) aligned qualifications i.e. Diploma in Engineering and Advanced Diploma in Engineering. These Programmes are a replacement of the old NATED 151 qualifications; the National Diploma: Engineering and the Baccalaureus Technologiae: Engineering that are not aligned to the HEQSF

3.2.1 Why the need to be HEQSF Aligned?
ECSA pegs the accreditation of the current and upcoming Engineering Programmes on the HEQSF educational requirements as shown in Figure 1. In terms of a graduate’s need to register professionally, his/her education must also be aligned to the HEQSF requirements as well as ECSA’s requirements. Figure 2 depicts a
Professional Registration Pathway as a Technologist; the route that is to be followed by a graduate from this programme.

Figure 1: The HEQSF and ECSA educational requirements and progression (after ECSA) (2015)
Figure 2: Professional Technologist registration (after ECSA) (2015)

The Candidacy Phase (CP) is a post-qualification practical experience period required for one to transcend from a candidate to a full Professional status of registration in the respective category. More information and application forms can be obtained from the Faculty of Engineering & Technology or directly from:

Engineering Council of South Africa (ECSA) Tel: +27 11 607 9500  
Private Bag X691 Fax: +27 11 622 9295  
BRUMA, 2026 Website: www.ecsa.co.za

4. Purpose of Qualifications

4.1 Diploma in Engineering
The primary purpose of this vocationally oriented diploma is to develop focused knowledge and skills as well as experience in a work-related context. The Diploma equips graduates with the knowledge base, theory, skills and methodology of one or more engineering disciplines as a foundation for further training and experience towards becoming a competent engineering technician.
Specifically, the qualification provides:

- A thorough grounding in mathematics and natural sciences specific to the field, engineering sciences, engineering design and the ability to apply established methods. Engineering knowledge is complemented by methods for understanding of the impacts of engineering solutions on people and the environment;
- Preparation for a career in engineering itself and areas that potentially benefit from engineering skills, for achieving technical proficiency and to make a contribution to the economy and national development;
- The educational requirement towards registration as a Candidate or Professional Engineering Technician with the Engineering Council of South Africa and acceptance as a candidate to write the examinations for Certificated Engineers; and
- For graduates with an appropriate level of achievement, the ability to enter the upcoming Advanced Diploma in Engineering programme.

The candidate engineering technician (the graduate) completing this qualification will be able to demonstrate competence in the following eleven (11) graduate attributes (GAs) as stipulated in the ECSA Qualification Standard for Diploma in Engineering: NQF Level 6 (ECSA Document E-02-PN or ECSA Document E-01-P)

**Graduate Attribute 1: Problem solving**

Apply engineering principles to systematically diagnose and solve *well-defined* engineering problems;

**Graduate Attribute 2: Application of scientific and engineering knowledge**

Apply knowledge of mathematics, natural science and engineering sciences to applied engineering procedures, processes, systems and methodologies to solve *well-defined* engineering problems;

**Graduate Attribute 3: Engineering Design**

Perform procedural design of components, systems, works, products or processes to meet requirements, normally within applicable standards, codes of practice and legislation;

**Graduate Attribute 4: Investigations, experiments and data analysis**

Conduct investigations of *well-defined* problems through locating and searching relevant codes and catalogues, conducting standard tests, experiments and measurements;
Graduate Attribute 5: Engineering methods, skills and tools, including Information Technology
Use appropriate techniques, resources, and modern engineering tools including information technology for the solution of well-defined engineering problems, with an awareness of the limitations, restrictions, premises, assumptions and constraints;

Graduate Attribute 6: Professional and technical communication
Communicate effectively, both orally and in writing within an engineering context;

Graduate Attribute 7: Sustainability and 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 defined procedures;

Graduate Attribute 8: Individual, Team and Multidisciplinary Working
Demonstrate knowledge and understanding of engineering management principles and apply these to one’s own work, as a member and leader in a technical team and to manage projects;

Graduate Attribute 9: Independent Learning Ability
Engage in independent and life-long learning through well-developed learning skills;

Graduate Attribute 10: Engineering Professionalism
Understand and commit to professional ethics, responsibilities and norms of engineering technical practice;

Graduate Attribute 11: Workplace practices
Demonstrate an understanding of workplace practices to solve engineering problems consistent with academic learning achieved.

4.1.1 Progression and Pathway
- As shown in Figures 1 & 2, completion of this 360-credit Diploma meets the minimum entry requirement for admission to an Advanced Diploma designed to support articulation to satisfy an engineering technologist education benchmark. This Diploma provides the base for the graduate to enter training and experience toward independent practice as an engineering technician and registration as a Professional Engineering Technician.
- This qualification lies on a HEQSF Vocational Pathway.
4.2 Baccalaureus Technologiae: Engineering

This qualification is offered at the Vanderbijlpark campus only. NO more new intakes for this qualification as it is in the phasing out process. National Diploma students will be allowed into the Advanced Diploma after a bridging course has been completed for the students to comply with the admission requirements into the Advance Diploma.

The purpose of the programme is to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing engineering technologist.

Specifically, the qualification provides:

- 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;
- The educational base required for registration as a Professional Engineering Technologist; and
- For graduates with an appropriate level of achievement, the ability to enter the MTech*: Engineering programme (* This programme is not HEQSF aligned hence is phasing out)

The engineering learner completing this qualification has as entrance into this programme completed the NDip: Engineering and thus comply with the learning outcomes as required in that qualifications plus the outcomes specified below:

- The engineering learner completing this qualification will be competent and able to demonstrate the following learning outcomes:
  - Solving broadly defined engineering problems;
  - Applying of scientific and engineering knowledge;
  - Performing engineering designs;
  - Conduct investigations, experiments and collate data analysis;
  - Using appropriate engineering methods, skills and tools, including the use of information technology;
  - Communicating technical information in a professional manner;
  - Demonstrating critical awareness of the impact of the engineering activity;
  - Effectively working as an individual and in teams;
  - Engaging in independent learning;
  - Acting professionally and ethically at all times; and
  - Engage in engineering practice.
4.3 **Advanced Diploma: Engineering**

This qualification is primarily industry oriented. The knowledge emphasises general principles and application or technology transfer. The qualification provides students with a sound knowledge base in a particular field or discipline 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. Programmes leading to this qualification tend to have a strong professional or career focus and holders of this qualification are normally prepared to enter a specific niche in the labour market.

Specifically, the purpose of educational programmes designed to meet this qualification are to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing engineering technologist or certificated engineer.

This qualification provides:

- 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;
- The educational base required for registration as a Professional Engineering Technologist and/or Certificated Engineer with ECSA;
- Entry to NQF level 8 programmes e.g. Honours, Post Graduate Diploma and B Eng Programmes and then to proceed to master’s Programmes;
- For certificated engineers, this provides the education base for achieving proficiency in mining / factory plant and marine operations and occupational health and safety.

**Differentiation of Professional Engineering Technologist and Professional Certificated Engineer**

**Professional Engineering Technologist**

- Professional Engineering Technologists are characterised by the ability to apply established and newly developed engineering technology to solve *broadly-defined* problems, develop components, systems, services and processes;
- Professional Engineering Technologists provide leadership in the application of technology in safety, health, engineering and commercially effective operations and have *well-developed* interpersonal skills;
Professional Engineering Technologists work independently and responsibly, applying judgement to decisions arising in the application of technology and health and safety considerations to problems and associated risks;

Professional Engineering Technologists have a specialized understanding of engineering sciences underlying a deep knowledge of specific technologies together with financial, commercial, legal, social and economic, health, safety and environmental matters.

**Professional Certificated Engineer**

- Professional Certificated Engineers are characterised by the ability to apply established and newly developed engineering technology to solve *broadly-defined* problems, develop components, systems, services and processes in specific areas where a legal appointment is required in terms of either the Occupational Health and Safety Act, the Mines Health and Safety Act, or the Merchant Shipping Act, e.g. factories, mines and marine environments;
- Professional Certificated Engineers provide leadership in safety, health, engineering and commercially effective operations and have *well-developed* managerial skills;
- They work independently and responsibly, applying judgement to decisions arising in the application of technology and health and safety considerations to problems and associated risks;
- Professional Certificated Engineers have a specialised understanding of engineering sciences underlying manufacturing, marine, mining, plant and operations, together with financial, commercial, legal, socio-economic, health, safety and environmental methodologies, procedures and best practices.

Engineering students completing this qualification will demonstrate competence in all the ten (10) Graduate Attributes (GAs) contained in the Qualification Standard for Advanced Diploma in Engineering: NQF Level 7 (ECSA Document E-05-PT or ECSA Document E-01-P). The GAs is stipulated below.

**Graduate Attribute 1: Problem solving**
Apply engineering principles to systematically diagnose and solve \textit{broadly defined} engineering problems;

**Graduate Attribute 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 \textit{broadly defined} engineering problems;

**Graduate Attribute 3: Engineering Design**

Perform procedural and non-procedural design of \textit{broadly defined} components, systems, works, products or processes to meet desired needs normally within applicable standards, codes of practice and legislation;

**Graduate Attribute 4: Investigations, experiments and data analysis**

Conduct investigations of \textit{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;

**Graduate Attribute 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 \textit{broadly defined} engineering problems, with an understanding of the limitations, restrictions, premises, assumptions and constraints;

**Graduate Attribute 6: Professional and Technical Communication**

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

**Graduate Attribute 7: Sustainability and 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;

**Graduate Attribute 8: Individual, Team and Multidisciplinary Working**
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;

**Graduate Attribute 9: Independent Learning**

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

**Graduate Attribute 10: Engineering Professionalism**

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

### 4.3.1 Progression and Pathway

- As shown in Figures 1 & 2, completion of this 140-credit Advanced Diploma is the minimum entry requirement for admission to a Bachelor Honours Degree or Postgraduate Diploma. Entry into these qualifications is usually in the area of specialisation or in the discipline taken as a major in the Advanced Diploma, after completion of the Diploma in Engineering or equivalent. In addition, the graduate attributes are such that a graduate may also meet requirements for entry to a number of programmes including:
  - A candidacy programme toward registration as a Professional Engineering Technologist;
  - In certain disciplines, progression toward the Government Certificate of Competency;
  - With appropriate work experience, a Master of Business Administration or similar programme.
- This qualification lies on a HEQSF Professional Pathway

### 4.4 Master of Engineering

The purpose of the qualification Master of Engineering is to develop a researcher with advanced abilities in applying fundamental technological and engineering design, synthesis and related principles to solve problems of society at large. One of the main objectives of this process is to develop an advanced capability to do research independently. It also promotes a lifelong learning approach. The qualified student will be able to:
• Identify, assess, formulate, interpret, analyse and solve engineering research and development problems creatively and innovatively by applying relevant knowledge of i.e. Mathematics, Basic Science and Engineering Sciences in the chosen field of research;

• Plan and manage engineering research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) engineering research / development in the chosen field of research practice;

• Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of research;

• Organise and manage him / herself and his / her activities responsibly, effectively, professionally and ethically, accept responsibility within his / her limits of competence, and exercise judgment based on knowledge and expertise pertaining to the field of research;

• Plan and conduct applicable levels of investigation, research and / or experiments by applying appropriate theories and methodologies, and perform data analysis and interpretation;

• Communicate effectively, both orally and in writing, with engineering and specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support;

• Use and assess appropriate research methods, skills, tools and information technology effectively and critically in engineering research / development practice, and show an understanding and a willingness to accept responsibility for the impact of engineering research / development activities on society and the environment;

• Perform procedural and non-procedural design and synthesis of components, systems, works, products or processes as a set of related systems, and assess their social, legal, health, safety and environmental impact and benefits, where applicable, in the chosen field of research;

• Employ various learning strategies and skills to master outcomes required for preparing him / herself to engage in continuous learning, to keep abreast of knowledge and skills required in the engineering field;

• Participate as a responsible citizen in the life of local, national and global communities by acting professionally and ethically in the chosen field of research;

• Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research and development activities;
Explore, where applicable, education and career opportunities through engineering problem-solving, design, technical research and managerial skills; 
Organise and develop entrepreneurial opportunities through engineering, technical research development and/or managerial skills.

4.5 **Doctor of Engineering / PhD in Engineering**

The purpose of the qualification Doctor of Engineering/PhD in Engineering is to develop a researcher with advanced abilities in applying fundamental engineering and technological sciences, design, synthesis and related principles independently to specific problems of society at large. One of the main objectives of this process is to develop an advanced capability to conduct fundamental engineering research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields.

The qualified student will be able to:

- Identify, assess, formulate, interpret, analyse and solve original engineering research / development problems creatively and innovatively by applying relevant advanced fundamental knowledge of i.e. Mathematics, Basic Science and Engineering Sciences in the chosen field of research;
- Plan and manage advanced engineering research projects, demonstrating fundamental knowledge, understanding and insight into the principles, methodologies and concepts that constitute socially responsible (to local and other communities) engineering research / development in the chosen field of research practice;
- Work effectively, individually or with others, as a member of a team, group, organisation and the community or in multi-disciplinary environments in the chosen field of research;
- Organise and manage him / herself activities responsibly, effectively, professionally and ethically, accept responsibility within his / her limits of competence, and exercise original judgment based on knowledge and expertise, pertaining to the field of research;
- Plan and conduct advanced investigations, research and / or experiments of an original nature by applying or developing appropriate theories and methodologies, and perform data analysis and interpretation;
- Communicate effectively, both orally and in writing, with specifically research audiences and the community at large, in so far as they are affected by the research, using appropriate structure, style and graphical support;
- Use and assess appropriate advanced engineering research methods, skills, tools and information technology effectively and critically in research / development practice, and show an understanding and a willingness to accept responsibility...
for the impact of engineering research / development activities on society and the environment;

- Perform procedural and non-procedural design and synthesis of components, systems, works, products or processes as a set of related systems and assess their social, legal, health, safety and environmental impact and benefits, where applicable, in the chosen field of research;
- Employ various learning strategies and skills to master outcomes required for preparing him / herself to engage in continuous learning, to keep abreast of knowledge and skills required in the engineering research / development field;
- Participate as a responsible citizen in the life of local, national and global communities by acting professionally and ethically in the chosen field of research;
- Demonstrate, where applicable, cultural and aesthetic sensitivity across a range of social contexts in the execution of engineering research / development activities;
- Explore, where applicable, education and career opportunities in advanced engineering research / development;
- Organise and develop, where applicable, entrepreneurial opportunities through engineering, technical research, development and / or managerial skills.

5. **Department of Chemical Engineering**

5.1 **Departmental Staff Details**

<table>
<thead>
<tr>
<th>Surname, Initials &amp; Title</th>
<th>Designation</th>
<th>Highest Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osifo, P (Prof)</td>
<td>Acting HoD</td>
<td>PhD</td>
</tr>
<tr>
<td>Visagie AM (Ms)</td>
<td>Administrator</td>
<td>Senior Certificate</td>
</tr>
<tr>
<td>Rutto, HL (Prof)</td>
<td>Associate Professor</td>
<td>PhD</td>
</tr>
<tr>
<td>Shoko, L (Dr)</td>
<td>Senior Technologist</td>
<td>PhD</td>
</tr>
<tr>
<td>Tshilenge, KJ (Dr)</td>
<td>Senior Lecturer</td>
<td>DTech</td>
</tr>
<tr>
<td>Seodigeng TG (Dr)</td>
<td>Senior Lecturer</td>
<td>PhD</td>
</tr>
<tr>
<td>Brink, CJ (Mrs)</td>
<td>Lecturer</td>
<td>BEng</td>
</tr>
<tr>
<td>Dube, G (Mr)</td>
<td>Lecturer</td>
<td>MTech</td>
</tr>
<tr>
<td>Lerotholi, L (Mrs)</td>
<td>Lecturer</td>
<td>MEng</td>
</tr>
<tr>
<td>Modiba, E (Mr)</td>
<td>Lecturer</td>
<td>MTech</td>
</tr>
<tr>
<td>Muthubi, SS (Ms)</td>
<td>Laboratory Technician</td>
<td>BTech</td>
</tr>
<tr>
<td>Nyembe N (Mr)</td>
<td>Laboratory Technician</td>
<td>BTech</td>
</tr>
</tbody>
</table>
5.2 Diploma: Engineering: Chemical

5.2.1 Program Structure
Three (3) year full time qualification:
- Two years and half years (Five semesters S1 to S5) at the Vaal University of Technology
- One semester (6 months) Workplace Based Learning (WBL)

6.2.2 Purpose of the Diploma: Engineering: Chemical

The generic purpose of the qualification is spelled out in paragraph 4.1 and must be read in conjunction with the following.

The purpose of the qualification Diploma: Engineering: Chemical is to develop the necessary knowledge, understanding and skills required for the student’s further learning towards becoming a competent practicing Chemical Engineering Technician. It is intended to subsequently empower candidate Engineering Technicians to demonstrate that they are capable of applying their acquired knowledge, understanding, skills, attitudes and values in the work environments in South Africa. It is designed also to add value to the qualifying student in terms of enrichment of the person, status and recognition.

The qualified technician may find himself / herself as a member of an engineering team which may consist of engineers, scientists, artisans, process personnel, technologists and technicians from other disciplines. Functions may include the commissioning and maintenance of chemical plants, process control, design and development, optimising of chemical processes, quality control over the products of the manufacturing processes, feasibility studies and a variety of tasks related to the chemical process industry.

5.2.3 Admission Requirements

<table>
<thead>
<tr>
<th>NSC National Senior Certificate</th>
<th>Compulsory Subjects</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3 = 40 – 49</td>
</tr>
<tr>
<td></td>
<td>English</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Mathematics</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Physical Science</td>
<td>4 x 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 = 50 – 59</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 = 60 – 69</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 = 70 – 79</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7 = 80 – 89</td>
</tr>
</tbody>
</table>
Any other four subjects (Excluding Life Orientation) 24 

Total 8 = 90 – 100

All other grade 12 or equivalent certificates will be treated on ad hoc basis.

5.2.4 Career Opportunities

A profession in the field of Chemical Engineering offers a challenging and exciting career in both the private and public sectors. There is a continuous demand for trained manpower in the field of Chemical Engineering. Job designations may vary from production foremen, area superintendents, line managers and various others within several branches of heavy, light and general types of industries where the services and expertise of such persons are required.

The qualified technician may find himself / herself as a member of an engineering team which may consist of engineers, scientists, artisans, process personnel, technologists and technicians from other disciplines. Functions may include the commissioning and maintenance of chemical plants, process control, design and development, optimising of chemical processes, quality control over the products of the manufacturing processes, feasibility studies and a variety of tasks related to the chemical process industry.

5.2.5 Curriculum

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject Name</th>
<th>Pre/Co-requisite</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>HKCOX1A</td>
<td>Applied Communication Skills 1.1</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>AAECH1A</td>
<td>Engineering Chemistry 1</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>EEESK1A</td>
<td>Engineering Skills 1</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>ASICT1A</td>
<td>ICT Skills 1</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>AMMAT1A</td>
<td>Mathematics 1</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>APHYS1A</td>
<td>Physics 1</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>EESIN1A</td>
<td>Social Intelligence 1</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
### Semester 2

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Pre-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>HKCOY1A</td>
<td>Applied Communication Skills 1.2</td>
<td>None</td>
</tr>
<tr>
<td>EHC2OA</td>
<td>Computing Applications 2</td>
<td>None</td>
</tr>
<tr>
<td>AAEC2A</td>
<td>Engineering Chemistry 2</td>
<td>None</td>
</tr>
<tr>
<td>EMEDR1A</td>
<td>Engineering Drawing 1</td>
<td>None</td>
</tr>
<tr>
<td>EHH1TC1A</td>
<td>Introduction to Chemical Engineering 1</td>
<td>None</td>
</tr>
<tr>
<td>AMMAT2A</td>
<td>Mathematics 2</td>
<td>None</td>
</tr>
<tr>
<td>APHYS1A</td>
<td>Physics 2</td>
<td>None</td>
</tr>
<tr>
<td>EHSPA1A</td>
<td>Safety Principles and Law 1</td>
<td>None</td>
</tr>
</tbody>
</table>

### Semester 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Pre-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>HKCOX2A</td>
<td>Applied Communication Skills 2.1</td>
<td>None</td>
</tr>
<tr>
<td>BHMAN1A</td>
<td>Management 1</td>
<td>None</td>
</tr>
<tr>
<td>EHC1PIA</td>
<td>Chemical Process Industries 1</td>
<td>None</td>
</tr>
<tr>
<td>AAEC2A</td>
<td>Engineering Chemistry 3</td>
<td>None</td>
</tr>
<tr>
<td>EMM2EB1A</td>
<td>Material and Energy Balance 2</td>
<td>None</td>
</tr>
<tr>
<td>AMMAT2A</td>
<td>Mathematics 3</td>
<td>None</td>
</tr>
<tr>
<td>EHHMPO2A</td>
<td>Mechanical Operation 1</td>
<td>None</td>
</tr>
</tbody>
</table>

### Semester 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Pre-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>HKCOY2A</td>
<td>Applied Communication Skills 2.2</td>
<td>None</td>
</tr>
<tr>
<td>EHC1EL1A</td>
<td>Chemical Engineering Laboratory 1</td>
<td>None</td>
</tr>
<tr>
<td>EHCET2A</td>
<td>Chemical Eng. Thermodynamics 1</td>
<td>None</td>
</tr>
<tr>
<td>EHHMT2A</td>
<td>Heat and Mass Transfer 1</td>
<td>None</td>
</tr>
<tr>
<td>EHP2CO1A</td>
<td>Process Control 1</td>
<td>None</td>
</tr>
<tr>
<td>EHPFD2A</td>
<td>Applied Comm Skills 2.1</td>
<td>None</td>
</tr>
<tr>
<td>Co-reg: AMMAT2A</td>
<td>Co-reg: Mathematics 2</td>
<td>None</td>
</tr>
<tr>
<td>EHHMT2A</td>
<td>Co-reg: Mat &amp; Energy Bal 2</td>
<td>None</td>
</tr>
<tr>
<td>EHHMPO2A</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

---

Faculty Prospectus
### Semester 5

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EHATH3A</td>
<td>Applied Thermodynamics 2</td>
<td>None</td>
</tr>
<tr>
<td>EHCPR3A</td>
<td>Chemical Process Design</td>
<td>None</td>
</tr>
<tr>
<td>EHENE1A</td>
<td>Environmental Engineering 1</td>
<td>None</td>
</tr>
<tr>
<td>EHRTE3A</td>
<td>Reactor Technology 1</td>
<td>None</td>
</tr>
<tr>
<td>EHSEP3A</td>
<td>Separation Processes 1</td>
<td>None</td>
</tr>
<tr>
<td>EHCEL2A</td>
<td>Chemical Engineering Laboratory 1</td>
<td>None</td>
</tr>
</tbody>
</table>

### Semester 6

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EHEXL1A</td>
<td>Experiential Training 1</td>
</tr>
</tbody>
</table>

#### 5.3 Work Integrated Learning (WIL)

The National Diploma: Engineering: Chemical: This is for ND students still on the pipeline. A formal Work Integrated Learning component of twelve months is needed to obtain qualification. This takes place at a Vaal University of Technology accredited employer (company). The student has the responsibility of finding suitable placement after which the student will register for the two semesters of practical. In co-operation with a mentor, the learner will provide progress reports at regular intervals.

#### 5.4 Workplace Based Learning (WBL)

The Diploma in Chemical Engineering: In order to qualify for the Diploma in Chemical Engineering, a minimum six-month period of suitable work integrated learning (WIL) in addition to the prescribed theoretical University training must be successfully completed.
Work integrated learning refers to that component of co-operative education that can only be conducted by the employer in the workplace. This training provides the student with an opportunity to apply and develop the academic knowledge he/she received at the university to relevant problem situations in industry and exposure to typical organizational culture, human relations and working conditions.

With suitable guidance and supervision, the student is taught the responsibility to work independently and to develop an awareness of the ethics and requirements of industry.

Work integrated learning may be done after completion of the total theoretical part of the Diploma, after S5 of uninterrupted theoretical training at the University. This will give the student sufficient theoretical knowledge to benefit from the training, especially as they progress through the more advanced subject matter of S5 courses.

To ensure the effectiveness of the work integrated learning, employer and University must co-operate as partners. The student will enrol for the subject Chemical Engineering Practice at the University. The employer will act as an examiner and must award a mark for the work integrated learning. To pass the student must obtain 50%, and to pass with distinction 75%. The University acts as a moderator for the subject.

The student must have a mentor, who will certify that the student has completed the work required satisfactorily.

During work integrated learning, the student must submit three-monthly progress reports (10 pages minimum) that contain enough information so that the training received can be evaluated. This report must be approved by the student’s mentor before being submitted to the Department of Chemical Engineering, Vaal University of Technology.

On completion of the training period, the student must submit Semester report and Project (20 pages minimum). All reports should be ring-bounded otherwise it will not be accepted for marking

5.5. **Baccalaureus Technologiae: Engineering Chemical**

This qualification is in the phasing out process, and it is offered at the Vanderbijlpark and Secunda campuses. NO more new intakes for this qualification as the last intake was in 2019. National Diploma students will be allowed into the Advanced Diploma after a bridging course has been completed
in order for students to comply with the admission requirements into the Advance Diploma

5.6. **Advanced Diploma: Engineering Chemical**

This qualification is offered at Vanderbijlpark only.

5.6.1 **Programme Structure**

(One) 1 year, Full-Time or (Two) 2 years Part-Time Qualification.

5.7. **Purpose of the Advanced Diploma: Engineering Chemical**

5.7.1 **Purpose of the qualification**

The generic purpose of the qualification is spelled out in paragraph 4.2 and must be read in conjunction with the following.

The purpose of this qualification is to equip students with advanced technical skills and competencies to work in industry as a professional technologist or to progress to do higher academic qualifications. The knowledge emphasises general principles and application or technology transfer. The qualification provides students with a solid foundation in Chemical Engineering and the ability to apply their knowledge and skills in the area of Chemical Engineering, while equipping them to undertake more specialised and intensive learning. This programme leads to a qualification that has a strong professional and career focus and holders of this qualification are prepared to enter the chemical and process industry.

Specifically, the programme design is to meet the industry and community requirements, therefore the qualification’s purpose is to build the necessary knowledge, understanding, abilities and skills for further learning towards becoming a competent practicing engineering technologist. This qualification provides:
1. Preparation for careers in chemical engineering, for achieving technical 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 ECSA.
3. Entry to NQF level 8 programmes e.g. bachelor’s, Honours and Postgraduate Diploma Programmes and then to proceed to master’s Programmes (NQF level 9).

Engineering students completing this qualification will demonstrate competence in all the Exit Level Outcomes (ELO’s)/Graduate Attributes contained in this standard.

5.8. **Admission Requirements**

**Diploma: Engineering: Chemical and equivalent qualification**
All other equivalent qualifications will be considered on a case-by-case basis.

5.8.1 **Curriculum**

<table>
<thead>
<tr>
<th>Semester 1 &amp; 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject name</td>
<td>Prerequisite/code</td>
</tr>
<tr>
<td>Advanced</td>
<td>None</td>
</tr>
<tr>
<td>Mathematics</td>
<td>None</td>
</tr>
<tr>
<td>Advanced</td>
<td>None</td>
</tr>
<tr>
<td>Engineering</td>
<td>None</td>
</tr>
<tr>
<td>Laboratory</td>
<td>None</td>
</tr>
<tr>
<td>Advanced</td>
<td>None</td>
</tr>
<tr>
<td>Fluid Mechanics</td>
<td>None</td>
</tr>
<tr>
<td>Advanced</td>
<td>None</td>
</tr>
<tr>
<td>Process Design</td>
<td>None</td>
</tr>
<tr>
<td>Advanced</td>
<td>None</td>
</tr>
<tr>
<td>Heat, Mass</td>
<td>None</td>
</tr>
<tr>
<td>Transfer and</td>
<td>None</td>
</tr>
<tr>
<td>Separation</td>
<td>None</td>
</tr>
<tr>
<td>Research</td>
<td>None</td>
</tr>
<tr>
<td>Methods and</td>
<td>None</td>
</tr>
<tr>
<td>Project</td>
<td>None</td>
</tr>
<tr>
<td>Engineering</td>
<td>None</td>
</tr>
<tr>
<td>Management</td>
<td>None</td>
</tr>
<tr>
<td>Advanced</td>
<td>None</td>
</tr>
<tr>
<td>Reaction</td>
<td>None</td>
</tr>
<tr>
<td>Engineering</td>
<td>None</td>
</tr>
<tr>
<td>Advanced</td>
<td>None</td>
</tr>
<tr>
<td>Process Control</td>
<td>None</td>
</tr>
</tbody>
</table>
5.9 **Magister Technologiae: Engineering: Chemical**

This qualification is offered at the Vanderbijlpark campus only.

5.10. **Programme Structure**

At least 1 year full time research, concluded with a Master Dissertation.

5.10.1 **Purpose of the Magister Technologiae: Engineering: Chemical**

The purpose of this qualification is to develop a student into a researcher, able to conduct independent research with minimum guidance in a chosen field of Chemical Engineering. The outcomes of the research will contribute to knowledge production in the specialisation field. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields. (Also see paragraph 4.3)

5.10.2 **Admission Requirements**

Baccalaureus Technologiae in Chemical Engineering with a minimum average of 60% required. Proof of successful completion of a Vaal University of Technology approved course in Research Methodology is required.

Ad hoc cases will be treated on merit.

5.10.3 **Assessment**

The department follows the assessment strategy of formal written examination. The year mark is compiled from a series of not less than three tests and / or a practical mark. The year mark for admittance to the formal examination is 50%. Weights for calculating the year mark as well as the final mark will be reflected in the Learning Guide. All tests, assignments and practical work done during a particular semester, will help learners learn and understand the work.

Some subjects follow the assessment strategies of Continuous Assessment (CASS). All marks obtained during the semester will make up the learner’s final mark. Each Learning Guide will indicate which tests and activities will contribute according to a pre-determined weight, to the final mark

5.11 **Enquiries**
Enquiries may be addressed to:
HoD: Chemical Engineering
Faculty of Engineering & Technology
Vaal University of Technology
Private Bag X021
VANDERBIJLPARK, 1900
or
Postgraduate Office

Enquiries may be addressed to:
HoD: Chemical Engineering
Faculty of Engineering & Technology
Vaal University of Technology
Private Bag X021
VANDERBIJLPARK, 1900
or
Postgraduate Office

6. **Department of Civil Engineering**

6.1. **Departmental Staff Details**

<table>
<thead>
<tr>
<th>Surname, Initials &amp; Title</th>
<th>Designation</th>
<th>Highest Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ochieng’, GM (Prof)</td>
<td>HoD</td>
<td>DTech: Eng: Civil PGDHE</td>
</tr>
<tr>
<td>Tlakeli, RN (Ms)</td>
<td>Administrator</td>
<td>BEng (Hons) (PrEng &amp; PMP)</td>
</tr>
<tr>
<td>Barnard, APA (Mr)</td>
<td>Senior Lecturer</td>
<td>PhD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MSc (Bldng &amp; Const)</td>
</tr>
<tr>
<td>Orando, M (Dr)</td>
<td>Senior Lecturer</td>
<td>MSc (Civil Eng)</td>
</tr>
<tr>
<td>Acheampong, E (Mr)</td>
<td>Lecturer</td>
<td>PhD</td>
</tr>
<tr>
<td>Beer, M (Mrs)</td>
<td>Lecturer</td>
<td>DTech:Eng:Civil</td>
</tr>
<tr>
<td>Ikotun, J (Dr)</td>
<td>Lecturer</td>
<td>MTech:Eng:Civil</td>
</tr>
<tr>
<td>Rwanga, S (Dr)</td>
<td>Lecturer</td>
<td>BSc (Hons) Eng</td>
</tr>
<tr>
<td>Onyango, FO (Mr)</td>
<td>Lecturer</td>
<td>BTech:Eng:Civil</td>
</tr>
<tr>
<td>Gaborone, K (Mr)</td>
<td>Lecturer</td>
<td>BEng (Civil)</td>
</tr>
<tr>
<td>Lamola, M (Mr)</td>
<td>Lecturer</td>
<td>BTech: Eng: Civil</td>
</tr>
<tr>
<td>Mukalay, J (Ms)</td>
<td>Lecturer</td>
<td>BTech: Eng: Civil</td>
</tr>
<tr>
<td>Smit M (Mr)</td>
<td>Laboratory Technician</td>
<td>BTech: Eng: Civil</td>
</tr>
<tr>
<td>Chapinduka, M (Ms)</td>
<td>Laboratory Technician</td>
<td>BTech: Eng: Civil</td>
</tr>
<tr>
<td>Doda, TJ (Mr)</td>
<td>Laboratory Technician</td>
<td>BTech: Eng: Civil</td>
</tr>
<tr>
<td>Modise, GS (Mrs)</td>
<td>Laboratory Technician</td>
<td>BTech: Eng: Civil</td>
</tr>
<tr>
<td>Phakathi, S (Mr)</td>
<td>Laboratory Technician</td>
<td>BTech: Eng: Civil</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BTech: ICT</td>
</tr>
</tbody>
</table>
6.2 **Diploma in Engineering: Civil Engineering (DI0810)**

6.2.1 **Programme Structure**

**HEQSF Specification**

The qualification Diploma in Engineering: Civil Engineering is HEQSF aligned and bears the following HEQSF specifications:

<table>
<thead>
<tr>
<th>HEQSF Qualification Type</th>
<th>Diploma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variant</td>
<td>Vocationally oriented</td>
</tr>
<tr>
<td>NQF Exit Level</td>
<td>6</td>
</tr>
<tr>
<td>Minimum Total Credits</td>
<td>360</td>
</tr>
<tr>
<td>Minimum Credits at Exit Level</td>
<td>120</td>
</tr>
</tbody>
</table>

**Qualification title**

Diploma in Engineering: Civil Engineering

**Duration**

This is a three-year course and consists of five semesters university attendance (39 modules) and one semester Workplace Based Learning in industry which should be done after completion of the total theoretical part of the Diploma i.e. after the fifth semester (S5) of uninterrupted theoretical training at the University.

Each semester consists of approximately sixteen weeks of theoretical studies; each week consisting of lectures, tutorials and in some subject’s practical work done in laboratories or on site.

6.3 **Purpose of the Qualification**

The generic purpose of the qualification is spelled out in paragraph 4.1 and must be read in conjunction with the following:
The purpose of the qualification Diploma in Engineering: Civil Engineering is to develop focused knowledge and skills as well as experience in a work-related context. The Diploma in Engineering: Civil Engineering equips graduates with the knowledge base, theory, skills and methodology of Civil Engineering as a foundation for further training and experience towards becoming a competent Civil engineering technician.

This foundation is achieved through a thorough grounding in mathematics and natural sciences specific to the field of Civil Engineering, engineering sciences, engineering design and the ability to apply established methods. Engineering knowledge is complemented by methods for understanding of the impacts of engineering solutions on people and the environment.

6.3.1 Fields of Study
Fields of study includes but is not limited to transportation, water, structural, geotechnical, construction management and urban engineering

6.3.2 Career Opportunities
Civil Engineering Technicians could be involved with construction projects such as reinforced concrete, structural steel, timber and masonry structures, roads, bridges, dams, canals, pipelines, water purification, sewage treatment, airports, railways, harbours, housing and services.

There is ample opportunity to attain job satisfaction and attractive financial rewards. Some past students from this department have senior positions at consulting engineering firms, construction companies, government bodies, local authorities and industry.

The following selections of careers are available:
Design Draughtsman, Project Official, Site Agent, Municipal Technician, Engineering Surveyor, Quantity Technician, Designer, Laboratory Technician, Contract Manager, Project Planner, Estimator, Quality Controller or a Geotechnician.

6.4 Entry / Admission Requirements
### 6.5 Assessment

In the five-semester duration that the student undertakes the theoretical component of the qualification, the student’s progress is evaluated by means of tests and the presentation of projects and practical reports. At the end of each semester, final examinations are written over a two-week period on all the work done during the semester.

**NB: It is critical for the learner’s success to note that:**

The exit level subjects are evaluated by means of a learner having to show competence in the graduate attribute(s) (GAs) associated with the relevant exit level subjects. The exit level subjects associated with particular GAs shall be made known to the learner in advance by the Lecturer concerned and the respective rules governing the measure of achievement or none achievement of competence and the consequences thereof shall also be communicated to the learner with further instructions also included in the learner guides and the assessment documents.

#### 6.5.1 Standard for the award of the qualification

The purpose and level of the qualification will have been achieved when the student has demonstrated:

- The knowledge defined in the Table below (knowledge area characteristics and credits – Diploma in Engineering: Civil Engineering); and
- The skills and applied competence defined in section 4.1 (GAs for Diploma: Engineering).
Table: Knowledge area characteristics and credits (Diploma in Engineering: Civil Engineering)

<table>
<thead>
<tr>
<th>Knowledge area</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Sciences</td>
<td>36</td>
</tr>
<tr>
<td>Natural Sciences</td>
<td>52</td>
</tr>
<tr>
<td>Engineering Sciences</td>
<td>127</td>
</tr>
<tr>
<td>Design and Synthesis</td>
<td>28</td>
</tr>
<tr>
<td>Computing and Information Technology</td>
<td>29</td>
</tr>
<tr>
<td>Complementary Studies</td>
<td>65</td>
</tr>
<tr>
<td>Work Integrated Learning</td>
<td>60</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>397</strong></td>
</tr>
</tbody>
</table>

6.5.2 **Achievement of Competence in Assessed Graduate Attributes**

The Department of Civil Engineering at VUT applies a 4-point Likert scale to assess the achievement level of a given Graduate Attribute. The 4-point Likert scale is defined in bands/range of percentage score in the assessed graduate attribute as shown in Table below

Table: 4-point Likert scale Levels of Graduate Attribute (GA) Acquisition

<table>
<thead>
<tr>
<th>Level</th>
<th>Intuitive Label</th>
<th>Band/Range % Score</th>
<th>Achievement statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emergent</td>
<td>0% - 24%</td>
<td>Not Achieved (Does not meet GA)</td>
</tr>
<tr>
<td>2</td>
<td>Basic</td>
<td>25% - 49%</td>
<td>Partially Achieved (Does not meet GA)</td>
</tr>
<tr>
<td>3</td>
<td>Adequate</td>
<td>50% - 74%</td>
<td>Achieved (Meet GA)</td>
</tr>
<tr>
<td>4</td>
<td>Superior</td>
<td>75% - 100%</td>
<td>Fully Achieved (Meet GA)</td>
</tr>
</tbody>
</table>
Levels 1-2 correspond to levels of pre-acquisition. *At level 3, mastery and/or acquisition of an attribute is deemed acceptable in a university setting.* Level 4 designate a level of excellence that may go beyond what is expected in a university setting and may not be reached by all students (Ipperciel & ElAtia, 2014).

### 6.5.3 Presentation of Evidence of Assessment of Graduate Attributes

For transparency and clarity in assessment outcomes, the evidence of assessment of GAs is presented as per the following template prescribed by ECSA

<table>
<thead>
<tr>
<th>ECSA Graduate Attribute</th>
<th>Assessment Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g. GA1: Problem Solving</td>
<td>Apply engineering principles to systematically diagnose and solve well-defined engineering problems</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Where is the attribute assessed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>How is this attribute assessed?</td>
</tr>
<tr>
<td>What is satisfactory performance/achievement?</td>
</tr>
<tr>
<td>What is the consequence of unsatisfactory performance/non-achievement?</td>
</tr>
</tbody>
</table>

### 6.6 Curriculum (New Diploma)

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Applied Communication Skills 1.1</td>
<td>• Applied Communication Skills 1.2</td>
</tr>
<tr>
<td></td>
<td>• Applied Mechanics 1</td>
</tr>
<tr>
<td>Semester 3</td>
<td>Semester 4</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>• ICT Skills</td>
<td>• Computing Applications 2</td>
</tr>
<tr>
<td>• Engineering Chemistry 1</td>
<td>• Engineering Chemistry 2</td>
</tr>
<tr>
<td>• Engineering Skills 1</td>
<td>• Engineering Drawing 1</td>
</tr>
<tr>
<td>• Engineering Mathematics 1</td>
<td>• Engineering Mathematics 2</td>
</tr>
<tr>
<td>• Engineering Physics 1</td>
<td>• Engineering Physics 2 – Practical</td>
</tr>
<tr>
<td>• Social Intelligence 1</td>
<td>• Engineering Physics 2 - Theory</td>
</tr>
<tr>
<td>• Computing Applications 2</td>
<td>• Safety Principles and Law 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester 3</th>
<th>Semester 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Applied Communication Skills 2.1</td>
<td>• Applied Communication Skills 2.2</td>
</tr>
<tr>
<td>• Construction Methods 1</td>
<td>• Civil Engineering Management 1</td>
</tr>
<tr>
<td>• Construction Materials 1</td>
<td>• Construction Materials 2</td>
</tr>
<tr>
<td>• Engineering Drawing 2</td>
<td>• Elements of Structural Steel and Timber Design 2</td>
</tr>
<tr>
<td>• Engineering Geology 1</td>
<td>• Engineering Surveying 2</td>
</tr>
<tr>
<td>• Engineering Surveying 1</td>
<td>• Structural Analysis 3</td>
</tr>
<tr>
<td>• Soil Mechanics 1</td>
<td>• Transportation Engineering 1</td>
</tr>
<tr>
<td>• Theory of Structures 2</td>
<td>• Water Engineering 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester 5</th>
<th>Semester 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Civil Engineering Management 2</td>
<td>• <strong>Workplace Based Learning</strong></td>
</tr>
<tr>
<td>• Documentation 1</td>
<td></td>
</tr>
<tr>
<td>• Elements of Reinforced Concrete Masonry Design 3</td>
<td></td>
</tr>
<tr>
<td>• Fluid Mechanics 2 (Civil)</td>
<td></td>
</tr>
<tr>
<td>• Soil Mechanics 2</td>
<td></td>
</tr>
<tr>
<td>• Structural Analysis 4</td>
<td></td>
</tr>
<tr>
<td>• Transportation Engineering 2</td>
<td></td>
</tr>
</tbody>
</table>

6.7. **Work Integrated Learning (WIL)**

Students enrolled in the phasing-out National Diploma: Engineering: Civil still need to complete WIL. This constitutes a formal Work Integrated Learning component of
twelve months divided into two periods P1 and P2 each for a period of 6 months. Completion of P1 and P2 is mandatory in addition to the mandatory theoretical subjects to obtain the qualification.

P1 and P2 takes place at a Vaal University of Technology accredited employer (company). The student has the responsibility of finding suitable placement after which the student will register for the two semesters of practical. In co-operation with a mentor, the learner will provide progress reports at regular intervals.

6.8. **Workplace Based Learning (WBL)**

The qualification Diploma in Engineering: Civil Engineering: In order to qualify for the Diploma in Engineering: Civil Engineering, a minimum six-month period of suitable work integrated learning (WIL) in addition to the prescribed theoretical University training must be successfully completed.

Work integrated learning refers to that component of co-operative education that can only be conducted by the employer in the workplace. This training provides the student with an opportunity to apply and develop the academic knowledge he/she received at the university to relevant problem situations in industry and exposure to typical organizational culture, human relations and working conditions.

With suitable guidance and supervision, the student is taught the responsibility to work independently and to develop an awareness of the ethics and requirements of industry.

Work integrated learning may be done after completion of the total theoretical part of the Diploma, after S5 of uninterrupted theoretical training at the University. This will give the student enough theoretical knowledge to benefit from the training, especially as they progress through the more advanced subject matter of S5 courses.

To ensure the effectiveness of the work integrated learning, employer and University must co-operate as partners. The student will enrol for the subject Civil Engineering Practice at the University. The employer will act as an examiner and must indicate the level of achievement of competence of the student in line with Graduate Attribute number 11 (Workplace Practice) for the qualification Diploma in Engineering. The assessment of the level of GA acquisition shall be in line with the following typifying exemplified associated competency indicators:
i. Orientation to the working environment is described in terms of company structure and conventions, rules, policies, working hours, dress codes and reporting lines.

ii. Labour practices used in the workplace are described in accordance with relevant legislation.

iii. Workplace safety is described in terms of the application of relevant safety, health and environmental legislation.

iv. General administration procedures are described in terms of how they operate and the key purpose.

v. Work activities are conducted in a manner suited to the work context.

**Range**: Work activities include assisting, contributing, observing and applying *at least four of the specific practices below*:

- Engineering processes, skills and tools, including measurement;
- Investigations, experiments and data analysis;
- Problem solving techniques;
- Application of scientific and engineering knowledge;
- Engineering planning and design;
- Professional and technical communication;
- Individual and teamwork; or
- The impact of engineering activity on health, safety and the environment.

vi. Knowledge and understanding gained from the work-integrated learning period is reported in a prescribed format, using appropriate language and style.

To pass the student must obtain a minimum of Level 3 (adequate achievement: 50% - 74% Range Score as stipulated in the 4-Point Likert Scale in the previous Table provided in the section under Assessment), and to pass with distinction ≥75% (Level 4). The University acts as a moderator for the subject.

The student must have a mentor, who will certify that the student has completed the work required satisfactorily.
During work integrated learning, the student must submit three-monthly progress reports (10 pages minimum) that contain sufficient information so that the training received can be evaluated. This report must be approved by the student’s mentor before being submitted to the Department of Civil Engineering, Vaal University of Technology.

On completion of the training period, the student must submit Semester report and Project (20 pages minimum). All reports should be ring-bounded otherwise it will not be accepted for marking.

6.9 **Baccalaureus Technologiae: Engineering: Civil**

This qualification is offered at the Vanderbijlpark campus only.

NO more new intakes for this qualification as it is in the phasing out process. National Diploma students will be allowed into the Advanced Diploma after a bridging course has been completed in order for students to comply with the admission requirements into the Advance Diploma.

6.9.1 **Program Structure**

This is a 2year part time qualification which consists of 8 discipline specific modules. Two modules will be offered per semester.

6.9.2 **Purpose of the Baccalaureus Technologiae: Engineering: Civil**

The generic purpose of the qualification is spelled out in paragraph 4.2 and must be read in conjunction with the following:

The purpose of the qualification Baccalaureus Technologiae: Engineering: Civil is to develop the necessary knowledge, understanding and skills required for the student’s further learning towards becoming a competent practicing Civil Engineering Technologist. It is intended to subsequently empower candidate Engineering Technologist to demonstrate that they can apply their acquired knowledge, understanding, skills, attitudes and values in the work environments in South Africa. It is designed also to add value to the qualifying student in terms of enrichment of the person, status and recognition.
6.9.3 **Curriculum**

<table>
<thead>
<tr>
<th>Transportation (308224)</th>
<th>Water (308424)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Traffic Engineering 4*</td>
<td>• Hydraulics 4*</td>
</tr>
<tr>
<td>• Pavement Technology 4*</td>
<td>• Construction Materials Technology 4*</td>
</tr>
<tr>
<td>• Transportation Planning 4*</td>
<td>• Reticulation Design and Management 4*</td>
</tr>
<tr>
<td>• Earthwork Design 4*</td>
<td>• Project Management 4*</td>
</tr>
<tr>
<td>• Construction Materials Technology 4*</td>
<td>• Waste-Water Treatment Technology 4*</td>
</tr>
<tr>
<td>• Geometric Design 4*</td>
<td>• Water Treatment Technology 4*</td>
</tr>
<tr>
<td>• Transportation Technology 4*</td>
<td>• Hydrology 4*</td>
</tr>
<tr>
<td>• Project Management 4*</td>
<td>• Earthwork Design 4*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Structural (308124)</th>
<th>Urban Engineering (308324)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Structural Analysis 4*</td>
<td>• Solid Waste Management 4*</td>
</tr>
<tr>
<td>• Construction Materials Technology 4*</td>
<td>• Pavement Technology 4*</td>
</tr>
<tr>
<td>• Theory of Structures 4*</td>
<td>• Reticulation Design and Management 4*</td>
</tr>
<tr>
<td>• Project Management 4*</td>
<td>• Earthwork Design 4*</td>
</tr>
<tr>
<td>• Reinforced Concrete Design 4*</td>
<td>• Construction Materials Technology 4*</td>
</tr>
<tr>
<td>• Structural Steel Design 4*</td>
<td>• Geometric Design 4*</td>
</tr>
<tr>
<td>• Pre-stressed Concrete Design 4*</td>
<td>• Urban Planning and Design 4*</td>
</tr>
<tr>
<td>• Earthwork Design 4*</td>
<td>• Project Management 4*</td>
</tr>
</tbody>
</table>

* Compulsory subject for the qualification; + Requisite subject for the qualification

6.10 **Advanced Diploma in Engineering: Civil Engineering**

6.10.1 **Programme Structure**

**HEQSF Specification**
The qualification Advanced Diploma in Engineering: Civil Engineering is HEQSF aligned and bears the following HEQSF specifications:
HEQSF Qualification Type | Advanced Diploma
---|---
Variant | Professionally oriented
NQF Exit Level | 7
Minimum Total Credits | 140
Minimum Credits at Exit Level | 120

**Qualification title**
Advanced Diploma in Engineering: Civil Engineering

**Duration**
This is a one-year full-time course and consists of two semesters university attendance (13 modules) that includes two (2) modules on Civil Engineering Research Methods and Project.

Each semester consists of approximately sixteen weeks of theoretical studies; each week consisting of lectures, tutorials and in some subject’s practical work done in laboratories or on site.

**6.11 Purpose of the Qualification**

The generic purpose of the qualification is spelled out in paragraph 4.3 and must be read in conjunction with the following:

This qualification is primarily industry oriented. The knowledge emphasises general principles and application or technology transfer. The qualification provides students with a sound knowledge base in the field of Civil Engineering and it’s respective disciplines e.g. Structural, Water, Transportation, Environmental, and Urban Engineering and the ability to apply their knowledge and skills to becoming a competent Professional Civil Engineering Technologist, while equipping them to undertake more specialised and intensive learning. Programmes leading to this qualification tend to have a strong professional or career focus and holders of this qualification are normally prepared to enter a specific niche in the labour market.
Specifically, the purpose of educational programmes designed to meet this qualification are to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing civil engineering technologist. This qualification provides:

- Preparation for careers in civil engineering and areas that potentially benefit from engineering skills, for achieving technical proficiency and to contribute to the economy and national development;
- The educational base required for registration as a Professional Civil Engineering Technologist with ECSA.
- Entry to NQF level 8 programmes e.g. Honours, Post Graduate Diploma and B Eng Programmes and then to proceed to Masters Programmes.

Civil engineering students completing this qualification will demonstrate competence in all the Graduate Attributes (Exit Level Outcomes) contained in this standard.

6.11.1 **Fields of Study**

Fields of study includes but is not limited to transportation, water, structural, geotechnical, construction management and urban engineering.

6.11.2 **Career Opportunities**

Professional Civil Engineering Technologists could be involved with construction projects such as reinforced concrete, structural steel, timber and masonry structures, roads, bridges, dams, canals, pipelines, water purification, sewage treatment, airports, railways, harbours, housing and services.

There is ample opportunity to attain job satisfaction and attractive financial rewards. Some past students from this department have senior positions at consulting engineering firms, construction companies, government bodies, local authorities and industry.

The following selections of careers are available:

Design Draughtsperson, Project Official, Site Agent, Municipal Technologist, Engineering Surveyor, Designer, Senior Laboratory Technologist, Contract Manager, Project Planner, Estimator, Quality Controller or a Geo-technologist.
6.11.3 Entry / Admission Requirements
A student with relevant qualification on NQF level 6 (min 360 credits) can enter this
Advanced Diploma in Civil Engineering on NQF level 7 (minimum 120 credits, ECSA 140 credits) or a relevant qualification (e.g. Bachelors in Civil Engineering).
The relevant NQF level 6 qualification must be passed with an average of 65% of all the exit level subjects.

6.11.4 Assessment
In the two (2) semester duration that the student undertakes the theoretical component of the qualification, the student’s progress is evaluated by means of tests and the presentation of projects and practical reports. At the end of each semester, final examinations are written over a two-week period on all the work done during the semester. The Research Methodology and Research Project will be assessed by means of Continuous Assessment (CASS) strategy through project proposal writing and presentation, presentation of project work and portfolio of evidence for the project undertaken.

NB: It is critical for the learner’s success to note that:
All subjects/modules presented at this level are exit level subjects and shall be evaluated by means of a learner having to show competence in ALL the ten (10) graduate attribute(s) (GAs) associated with the relevant exit level subjects. The exit level subjects associated with particular GAs shall be made known to the learner in advance by the Lecturer concerned and the respective rules governing the measure of achievement or none achievement of competence and the consequences thereof shall also be communicated to the learner with further instructions also included in the learner guides and the assessment documents.

6.11.5 Standard for the award of the qualification
The purpose and level of the qualification will have been achieved when the student has demonstrated:
- The knowledge defined in the Table below (knowledge area characteristics and credits – Advanced Diploma in Engineering: Civil Engineering); and
- The skills and applied competence defined in section 4.3 (GAs for Advanced Diploma in Engineering: Civil Engineering).

Table: Knowledge area characteristics and credits (Advanced Diploma in Engineering: Civil Engineering)
<table>
<thead>
<tr>
<th>Knowledge area</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Sciences</td>
<td>18</td>
</tr>
<tr>
<td>Natural Sciences</td>
<td>15</td>
</tr>
<tr>
<td>Engineering Sciences</td>
<td>30</td>
</tr>
<tr>
<td>Engineering Design and Synthesis</td>
<td>26</td>
</tr>
<tr>
<td>Computing and Information Technology</td>
<td>18</td>
</tr>
<tr>
<td>Complementary Studies</td>
<td>33</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>140</strong></td>
</tr>
</tbody>
</table>

6.11.6 Achievement of Competence in Assessed Graduate Attributes

The Department of Civil Engineering at VUT applies a 4-point Likert scale to assess the achievement level of a given Graduate Attribute. The 4-point Likert scale is defined in bands/range of percentage score in the assessed graduate attribute as shown in Table below.

Table: 4-point Likert scale Levels of Graduate Attribute (GA) Acquisition

<table>
<thead>
<tr>
<th>Level</th>
<th>Intuitive Label</th>
<th>Band/Range % Score</th>
<th>Achievement statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Emergent</td>
<td>0% - 24%</td>
<td>Not Achieved (Does not meet GA)</td>
</tr>
<tr>
<td>2</td>
<td>Basic</td>
<td>25% - 49%</td>
<td>Partially Achieved (Does not meet GA)</td>
</tr>
<tr>
<td>3</td>
<td>Adequate</td>
<td>50% - 74%</td>
<td>Achieved (Meet GA)</td>
</tr>
<tr>
<td>4</td>
<td>Superior</td>
<td>75% - 100%</td>
<td>Fully Achieved (Meet GA)</td>
</tr>
</tbody>
</table>

Levels 1-2 correspond to levels of pre-acquisition. At level 3, mastery and/or acquisition of an attribute is deemed acceptable in a university setting. Level 4 designate a level of excellence that may go beyond what is expected in a university setting and may not be reached by all students (Ipperciel & ElAtia, 2014).

6.11.7 Presentation of Evidence of Assessment of Graduate Attributes
For transparency and clarity in assessment outcomes, the evidence of assessment of GAs is presented as per the following template prescribed by ECSA

Table: Presenting Evidence of Assessment of GAs

<table>
<thead>
<tr>
<th>ECSA Graduate Attribute</th>
<th>Assessment Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g. GA1: Problem Solving</td>
<td>Apply engineering principles to systematically diagnose and solve <em>broadly defined</em> engineering problems</td>
</tr>
</tbody>
</table>

| | Where is the attribute assessed? |
| | How is this attribute assessed? |
| | What is satisfactory performance/achievement? |
| | What is the consequence of unsatisfactory performance/non-achievement? |

6.11.8 Curriculum: Advanced Diploma in Engineering: Civil Engineering

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Civil Engineering Materials</td>
<td>• Earthworks Design</td>
</tr>
</tbody>
</table>
6.12 Master of Engineering in Civil Engineering (MEng Civil)

6.12.1 Purpose of the Master of Engineering in Civil Engineering (MEng: Civil Engineering)

The purpose of this qualification is to develop a student into a researcher, able to conduct independent research with minimum guidance in a chosen field of Civil Engineering. The outcomes of the research will contribute to knowledge production in the specialisation field. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields. (also see paragraph 4.3)

6.12.2 Admission requirements:

A BEng Degree or Equivalent level 8 qualification including the Postgraduate Diploma in Civil Engineering with an average pass mark of 60% and above

Proof of successful completion of a Vaal University of Technology approved course in Research Methodology.

Ad hoc cases will be treated on merit.

6.12.3 Duration of Programme:

The equivalent of 1 year, full-time study.
6.12.4. **Programme Structure:**

This instructional programme comprises of a thesis only.

6.12.5 **Assessment:**

The Masters Dissertation/thesis is assessed both internally and externally. An average mark is calculated from the allocations made by both the internal and external examiners. A pass mark of 50% is required for the qualification to be awarded.

6.13 **Doctor of Engineering in Civil Engineering: (DEng: Civil Engineering)**

6.13.1 **Purpose of the Doctor of Engineering in Civil Engineering**

The purpose of the qualification is to develop a researcher who will make a significant and original contribution to knowledge in a specialised area of civil engineering and technology. To develop a researcher in civil engineering with advanced abilities, to independently apply civil engineering design, synthesis, and related principles, to specific problems of society at large.

One of the main objectives in this process is to develop an advanced capability to conduct engineering research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields. (also see paragraph 4.4)

6.13.2 **Admission requirements:**

Master of Engineering in Civil Engineering or Equivalent level 9 qualification. Ad hoc cases will be treated on merit.

6.13.3 **Duration of the programme:**

At least two years full time research, concluded with a Doctoral Thesis.
**6.13.4 Assessment:**

The Doctoral Thesis is assessed both internally and externally. No marks awarded. The thesis is assessed as either a Pass or Fail. The Doctorate is awarded when all examiners prescribe a Pass for the thesis.

**6.14 Enquiries**

Enquiries may be addressed to:

<table>
<thead>
<tr>
<th>HoD: Civil Engineering &amp; Building</th>
<th>Tel :</th>
<th>+27 16 950 9241</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty of Engineering &amp; Technology</td>
<td>Fax :</td>
<td>+27 16 950 9241</td>
</tr>
<tr>
<td>Vaal University of Technology</td>
<td>E-Mail :</td>
<td><a href="mailto:georgeo@vut.ac.za">georgeo@vut.ac.za</a></td>
</tr>
<tr>
<td>Private Bag X021, 1900</td>
<td>Website :</td>
<td><a href="http://www.vut.ac.za">www.vut.ac.za</a></td>
</tr>
<tr>
<td>VANDERBIJLPARK, 1900</td>
<td>:</td>
<td><a href="mailto:rosaliat@vut.ac.za">rosaliat@vut.ac.za</a></td>
</tr>
</tbody>
</table>

or

<table>
<thead>
<tr>
<th>Postgraduate Office</th>
<th>Tel :</th>
<th>+27 16 950 9536</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms B Phume</td>
<td>E-Mail:</td>
<td><a href="mailto:beatricet@vut.ac.za">beatricet@vut.ac.za</a></td>
</tr>
</tbody>
</table>

---

7. **Department of Electronic Engineering**

7.1 **Departmental Staff Details**

<table>
<thead>
<tr>
<th>Surname, Initials &amp; Title</th>
<th>Designation</th>
<th>Highest Qualification</th>
</tr>
</thead>
</table>

---
7.2 **Diploma in Electrical Engineering (Electronics)**

7.2.1 **Program Structure**

Three years full time qualification, 360 credits. Sixty credits are allocated to *workplace Based learning (WBL)*. WBL can take various forms including simulated learning, work-directed theoretical learning, problem-based learning, project-based learning and Work Based Learning. The Workplace Based Learning will take place in Industry!

7.2.2 **Purpose of the Diploma in Electrical Engineering (Electronics)**

The generic purpose of the qualification is spelled out in paragraph 4.1 and must be read in conjunction with the following.
The purpose of the qualification Diploma in Electrical Engineering (Electronics) is to develop the necessary knowledge, understanding and skills required for the student’s further learning towards becoming a competent practicing Electronic Engineering Technician. It is intended to subsequently empower candidate Engineering Technicians to demonstrate that they are capable of applying their acquired knowledge, understanding, skills, attitudes and values in the work environment in South Africa. It is designed also to add value to the qualifying student in terms of enrichment of the person, status and recognition.

### 7.2.3 Admission Requirements

<table>
<thead>
<tr>
<th>NSC National Senior Certificate</th>
<th>Compulsory Subjects</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>4</td>
<td>4 = 50 – 59</td>
</tr>
<tr>
<td>Mathematics</td>
<td>4</td>
<td>5 = 60 – 69</td>
</tr>
<tr>
<td>Physical Science</td>
<td>4</td>
<td>6 = 70 – 79</td>
</tr>
<tr>
<td>Any other four subjects (excluding life orientation)</td>
<td>4 x 3</td>
<td>7 = 80 – 89</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>8 = 90 – 100</td>
</tr>
</tbody>
</table>

All other grade 12 or equivalent certificates will be treated on ad hoc basis.

### 7.2.4 Career Opportunities

A successful candidate can pursue a career as a technician in one of the following specialisation fields: Electronic design and development; Electronic maintenance; Electronic communication design and development or Electronic communication maintenance.

### 7.2.5 Curriculum

<table>
<thead>
<tr>
<th>Semester 1 (* subjects are compulsory)</th>
<th>Semester 2 (* subjects are compulsory)</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Applied Communication Skills 1.1</td>
<td>*Applied Communication Skills 1.2</td>
</tr>
<tr>
<td>*Engineering Skills 1</td>
<td>*Computing Applications 2</td>
</tr>
<tr>
<td>*ICT Skills 1</td>
<td>*Electrical Engineering 1</td>
</tr>
<tr>
<td>Semester 3 (* subjects are compulsory)</td>
<td>Semester 4 (* subjects are compulsory)</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>*Mathematics 1</td>
<td>*Mathematics 2</td>
</tr>
<tr>
<td>*Social Intelligence 1</td>
<td>*Safety Principles and Law 1</td>
</tr>
<tr>
<td>Engineering Chemistry 1</td>
<td>Digital Systems 1</td>
</tr>
<tr>
<td>Physics 1</td>
<td>Physics 2</td>
</tr>
<tr>
<td>*Applied Communication Skills 2.1,</td>
<td>*Applied Communication Skills 2.2</td>
</tr>
<tr>
<td>*Electronics 1</td>
<td>*Electronics 2</td>
</tr>
<tr>
<td>*Electrical Engineering 2</td>
<td>*Projects 2 (WBL Electrical)</td>
</tr>
<tr>
<td>*Projects 1 (WIL Electrical)</td>
<td>Digital Systems 3</td>
</tr>
<tr>
<td>*Mathematics 3</td>
<td>Electrical Computer Aided Design 2</td>
</tr>
<tr>
<td>Computer Aided Design 1</td>
<td>Electronic Communication 2</td>
</tr>
<tr>
<td>Digital Systems 2</td>
<td>Engineering Programming 2</td>
</tr>
<tr>
<td>Engineering Programming 1</td>
<td>Power Electronics 3</td>
</tr>
<tr>
<td>Management 1</td>
<td>Alternative Energy 2</td>
</tr>
<tr>
<td>Networks 1</td>
<td>Control Systems 2</td>
</tr>
<tr>
<td>Process Instrumentation 1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester 5 (* subjects are compulsory)</th>
<th>Semester 6 (* subjects are compulsory)</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Projects 3</td>
<td>Workplace Based Learning</td>
</tr>
<tr>
<td>Microwave Communication 3</td>
<td></td>
</tr>
<tr>
<td>Radio Engineering 3</td>
<td></td>
</tr>
<tr>
<td>Measurement Technology 3</td>
<td></td>
</tr>
<tr>
<td>Digital Communication 2</td>
<td></td>
</tr>
<tr>
<td>Electronics 3</td>
<td></td>
</tr>
<tr>
<td>Engineering Project 4</td>
<td></td>
</tr>
</tbody>
</table>
7.3  **Baccalaureus Technologiae: Engineering (Electronics)**

This qualification is offered at the Vanderbijlpark campus only. NO more new intakes for this qualification as it is in the phasing out process. National Diploma students will be allowed into the Advanced Diploma after a bridging course has been completed in order for students to comply with the admission requirements into the Advance Diploma.

This qualification is offered at the Vanderbijlpark campus only.

7.3.1  **Program Structure**

1 year, full time or two years part time qualification.

7.3.2  **Purpose of the Baccalaureus Technologiae: Engineering (Electronics)**

The generic purpose of the qualification is spelled out in paragraph 4.2 and must be read in conjunction with the following.

The purpose of the qualification Baccalaureus Technologiae: Engineering (Electronics) is to develop the necessary knowledge, understanding and skills required for the student’s further learning towards becoming a competent practicing Electronic Engineering Technologist. It is intended to subsequently empower candidate Engineering Technologist to demonstrate that they are capable of applying their acquired knowledge, understanding, skills, attitudes and values in the work environments in South Africa. It is designed also to add value to the qualifying student in terms of enrichment of the person, status and recognition.

7.3.3  **Career Opportunities**

A successful candidate can pursue a career as a technologist in one of the following specialisation fields: Electronic design and development; Electronic maintenance; Electronic communication design and development or Electronic communication maintenance.
8.3.4 **Curriculum**

<table>
<thead>
<tr>
<th>Compulsory Subjects</th>
<th>Choice Subjects (Choose 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Industrial Project 4</td>
<td>• Mathematics 4</td>
</tr>
<tr>
<td>• Radio Engineering 4</td>
<td>• Management 4</td>
</tr>
<tr>
<td>• Microwave Engineering 4</td>
<td>• Measurement Technology 4</td>
</tr>
<tr>
<td></td>
<td>• Opto-Electronics 4</td>
</tr>
<tr>
<td></td>
<td>• Electronics 4</td>
</tr>
<tr>
<td></td>
<td>• Circuit Analysis 4</td>
</tr>
<tr>
<td></td>
<td>• Digital Process Control 4</td>
</tr>
<tr>
<td></td>
<td>• Digital Signal Processing 4</td>
</tr>
<tr>
<td></td>
<td>• Signal Processing 4</td>
</tr>
</tbody>
</table>

7.4 **Magister Technologiae: Engineering: Electrical (Electronics)**

This qualification is offered at the Vanderbijlpark campus only.

7.4.1 **Program Structure**

At least 1 year, full time research, concluded with a master’s Dissertation.

7.4.2 **Purpose of the Magister Technologiae: Engineering (Electronics)**

The purpose of this qualification is to develop a student into a researcher, able to conduct independent research with minimum guidance in a chosen field of Electrical Engineering. The outcomes of the research will contribute to knowledge production in the specialisation field. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields. (also see paragraph 4.3)

7.4.3 **Admission Requirements**

Baccalaureus Technologiae: Engineering (Electronics) (with an average of at least 65%).

Proof of successful completion of a Vaal University of Technology approved course in Research Methodology.

Ad hoc cases will be treated on merit.

7.5 **Doctor Technologiae: Engineering: Electrical (Electronics)**
This qualification is offered at the Vanderbijlpark campus only.

7.5.1  **Program Structure**
At least two years full time research, concluded with a Doctoral Thesis.

7.5.2  **Purpose of the Doctor Technologiae: Engineering (Electronics)**
The purpose of the qualification is to develop a researcher who will make a significant and original contribution to knowledge in a specialised area of electrical engineering and technology. To develop a researcher in electrical engineering with advanced abilities, to independently apply electrical engineering design, synthesis, and related principles, to specific problems of society at large. One of the main objectives in this process is to develop an advanced capability to conduct engineering research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields. (also see paragraph 4.4)

7.5.3  **Admission Requirements**
Magister Technologiae: Engineering (Electronics).
Ad hoc cases will be treated on merit.

7.6  **Assessment**
The department follows the assessment strategy of formal written exams. The year mark is compiled from a series of not less than three tests and / or a practical mark. The year mark for admittance to the formal examination is 50%. Weights for calculating the year mark as well as the final mark will be reflected in the Learning Guide. All tests, assignments and practical work done during a particular semester, will help learners learn and understand the work.

Some subjects follow the assessment strategies of Continuous Assessment (CASS). All marks obtained during the semester will make up the learner’s final mark. Each subject’s Learning Guide will indicate which tests and activities will contribute according to a pre-determined weight, to the final mark.

7.7  **Enquiries**
Enquiries may be addressed to:
HoD: Electronic Engineering          Tel : +27 16 950 9416
Faculty of Engineering & Technology   Fax : +27 16 950 9796
8. **Department of Power Engineering**

8.1 **Departmental Staff Details**

<table>
<thead>
<tr>
<th>Surname, Initials &amp; Title</th>
<th>Designation</th>
<th>Highest Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joubert, T (Ms)</td>
<td>HoD</td>
<td>MTech</td>
</tr>
<tr>
<td>Kloppers, R (Ms)</td>
<td>Administrator</td>
<td></td>
</tr>
<tr>
<td>Martins, J (Mr)</td>
<td>Principal Lecturer</td>
<td>MDip Tech</td>
</tr>
<tr>
<td>Le Roux, BJ (Mr)</td>
<td>Senior Lecturer</td>
<td>MDip Tech</td>
</tr>
<tr>
<td>Oosthuysen, NJ (Mr)</td>
<td>Senior Lecturer (C)</td>
<td>MDip Tech</td>
</tr>
<tr>
<td>Momubaghan, PU (Mr)</td>
<td>Lecturer</td>
<td>BSc</td>
</tr>
<tr>
<td>Pulutsoane, MGE (Mr)</td>
<td>Lecturer</td>
<td>BTech</td>
</tr>
<tr>
<td>Thekiso, MQ (Mr)</td>
<td>Lecturer</td>
<td>BTech</td>
</tr>
<tr>
<td>Langa, HM (Mr)</td>
<td>Lecturer</td>
<td>MPhil.Eng</td>
</tr>
<tr>
<td>Kaaiye, S (Mr)</td>
<td>Junior Lecturer</td>
<td>MScEng</td>
</tr>
<tr>
<td>Makhalima, AT (Mr)</td>
<td>Junior Lecturer</td>
<td>BTech</td>
</tr>
<tr>
<td>Motloung, DP (Mr)</td>
<td>Junior Lecturer</td>
<td>ND</td>
</tr>
<tr>
<td>Sebueng, S (Mr)</td>
<td>Junior Lecturer</td>
<td>BTech</td>
</tr>
<tr>
<td>Mtambo, BA (Mr)</td>
<td>Laboratory Assistant</td>
<td>Senior Certificate</td>
</tr>
<tr>
<td>Djeumen, JS (Mr)</td>
<td>Technician</td>
<td>MTech</td>
</tr>
<tr>
<td>Kyere, IK (Mr)</td>
<td>Technologist</td>
<td>M Tech</td>
</tr>
<tr>
<td>Ralebona, ER (Mr)</td>
<td>Technician</td>
<td>BTech</td>
</tr>
<tr>
<td>Shittu, AM (Mr)</td>
<td>Jnr Lecturer</td>
<td>BSc</td>
</tr>
<tr>
<td>Adeniyi AO</td>
<td>Lecturer</td>
<td>MTech</td>
</tr>
<tr>
<td>Adaourhere RE</td>
<td>Technician</td>
<td>BTech</td>
</tr>
</tbody>
</table>

8.2 **Diploma: Engineering: Electrical (Power)**
8.2.1. **Program Structure**

Three years full time qualification, 360 credits. Sixty credits are allocated to Workplace Based learning (WBL). WBL is the last section of the qualification to be completed in Industry. Students to be placed in Industry with approved companies, monitored and assessed by University staff.

8.2.2 **Purpose of the Diploma: Engineering: Electrical (Power)**

The generic purpose of the qualification is spelled out in paragraph 4.1 and must be read in conjunction with the following.

The purpose of the qualification Diploma: Engineering: Electrical (Power) is to develop the necessary knowledge, understanding and skills required for the student’s further learning towards becoming a competent practicing Power Engineering Technician. It is intended to subsequently empower candidate Engineering Technicians to demonstrate that they are capable of applying their acquired knowledge, understanding, skills, attitudes and values in the work environments in South Africa. It is designed also to add value to the qualifying student in terms of enrichment of the person, status and recognition.

8.2.3 **Admission Requirements**

<table>
<thead>
<tr>
<th>NSC National Senior Certificate</th>
<th>Compulsory Subjects</th>
<th>Minimum</th>
<th>3 = 40 – 49</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>English</td>
<td>4</td>
<td>4 = 50 – 59</td>
</tr>
<tr>
<td></td>
<td>Mathematics</td>
<td>4</td>
<td>5 = 60 – 69</td>
</tr>
<tr>
<td></td>
<td>Physical Science</td>
<td>4</td>
<td>6 = 70 – 79</td>
</tr>
<tr>
<td></td>
<td>Any other four subjects (excluding life orientation)</td>
<td>4 x 3</td>
<td>7 = 80 – 89</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>24</td>
<td>8 = 90 – 100</td>
</tr>
</tbody>
</table>

All other grade 12 or equivalent certificates will be treated on ad hoc basis.

8.2.4 **Career Opportunities**

A successful candidate can pursue a career as a technician in one of the following specialisation fields: Electrical Machines; Generation of Electricity; Electrical Transmission and Distribution, Electrical Protection, Alternative Energy and Energy Management.

The specialisation fields above each offer careers in Design and Development and Maintenance.
8.2.5 **Curriculum**

C represents **Compulsory units** and E represents **Elective units**.

<table>
<thead>
<tr>
<th>Semester 1 (All subjects are compulsory)</th>
<th>Semester 2 (All subjects are compulsory)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Communication Skills 1.1, Engineering Skills 1, ICT Skills 1, Mathematics 1, Social Intelligence 1, Physics 1, Electrical Engineering 1.</td>
<td>Applied Communication Skills 1.2, Computing Applications 2, Electrical Engineering 2, Mathematics 2, Safety Principles and Law 1, Digital Systems 1, Electronics 1,</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester 3 (All * subjects are compulsory)</th>
<th>Semester 4 (All * subjects are compulsory)</th>
</tr>
</thead>
</table>

*Electives:*
Mechanics 1, Physics 2, Management 1, Digital Systems 2, Engineering drawing 1.

<table>
<thead>
<tr>
<th>Semester 5 (All * subjects are compulsory)</th>
<th>Semester 6</th>
</tr>
</thead>
</table>

*Electives:*
Electronics 3,
8.2.6 Government Certificate of Competency (GCC)
The Certificate of Competency as a Mechanical and / or Electrical Engineering Technician is issued by the Department of Labour (Factories) or the Department of Minerals and Energy Affairs (Mines) to a person with the necessary academic diploma / degree and practical experience and who has passed a qualifying examination. A person with such a certificate must take responsibility for the operation of a factory or mine where the consumption of electricity exceeds a certain limit.

This University is one of a few tertiary institutions accredited to offer Diplomas complying with the requirements for admission to the GCC examination. This is not a GCC qualification, only a subject package complying with the entry requirements to the GCC examination.

This is for the combination of subjects of the National Diploma and NOT for the Diploma in Engineering.

<table>
<thead>
<tr>
<th>Government Certificate of Competency (GCC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Computer &amp; Programming Skills I</td>
</tr>
<tr>
<td>• Mathematics I</td>
</tr>
<tr>
<td>• Mathematics II</td>
</tr>
<tr>
<td>• Industrial Electronics II</td>
</tr>
<tr>
<td>• Power Electronics III</td>
</tr>
<tr>
<td>• Electronics I</td>
</tr>
<tr>
<td>• Electronics II</td>
</tr>
<tr>
<td>• Mechanics I</td>
</tr>
<tr>
<td>• Mechanical Engineering Drawing I</td>
</tr>
<tr>
<td>• Mechanical Technology I</td>
</tr>
<tr>
<td>• Mechanical Technology II</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>• Electrical Engineering, I</td>
</tr>
<tr>
<td>• Electrical Engineering II</td>
</tr>
<tr>
<td>• Electrical Engineering III</td>
</tr>
<tr>
<td>• Electrical Machines II</td>
</tr>
<tr>
<td>• Electrical Machines III</td>
</tr>
<tr>
<td>• Electrical Protection III</td>
</tr>
<tr>
<td>• Digital Systems I</td>
</tr>
<tr>
<td>• Applied Communication Skills 1.1</td>
</tr>
<tr>
<td>• Applied Communication Skills 1.2</td>
</tr>
<tr>
<td>• Applied Communication Skills 2.1</td>
</tr>
<tr>
<td>• Applied Communication Skills 2.2</td>
</tr>
<tr>
<td>• EDL</td>
</tr>
</tbody>
</table>
Government Certificate of Competency Contact Information:
Written application for admission to the examination for the Certificate of Competency can be addressed to:

Mines & Industries : Department of Minerals & Energy Affairs
Private Bag X59
Pretoria, 0001

The written application must also include a letter stating that all the prescribed theoretical requirements have been met. This letter is obtainable from the Department of Power Engineering.

8.3 **Baccalaureus Technologiae: Engineering (Power)**

This qualification is offered at the Vanderbijlpark campus only. NO more new intakes for this qualification as it is in the phasing out process. National Diploma students will be allowed into the Advanced Diploma after a bridging course has been completed in order for students to comply with the admission requirements into the Advance Diploma.

8.3.1 **Program Structure**
1 year, full time or two years part time qualification.

8.3.2 **Purpose of the Baccalaureus Technologiae: Engineering (Power)**
The generic purpose of the qualification is spelled out in paragraph 4.2 and must be read in conjunction with the following.

The purpose of the qualification Baccalaureus Technologiae: Engineering Electrical (Power) is to develop the necessary knowledge, understanding and skills required for the student’s further learning towards becoming a competent practicing Electronic Engineering Technologist. It is intended to subsequently empower
candidate Engineering Technologist to demonstrate that they are capable of applying their acquired knowledge, understanding, skills, attitudes and values in the work environments in South Africa. It is designed also to add value to the qualifying student in terms of enrichment of the person, status and recognition.

8.3.3 **Career Opportunities**
A successful candidate can pursue a career as a technologist in one of the following specialisation fields: Electrical Machines; Generation of Electricity; Electrical Transmission and Distribution or Electrical Protection. The specialisation fields above each offer careers in Design and Development and Maintenance.

8.3.4 **Curriculum**

<table>
<thead>
<tr>
<th>Compulsory Subjects</th>
<th>Choice Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Project 4</td>
<td>Power Electronics 4</td>
</tr>
<tr>
<td>Electrical Protection 4</td>
<td>Mathematics 4</td>
</tr>
<tr>
<td>Protection Technology 4</td>
<td>Management 4</td>
</tr>
<tr>
<td>High Voltage Engineering 4</td>
<td></td>
</tr>
<tr>
<td>Electrical Machines 4</td>
<td></td>
</tr>
<tr>
<td>Power Systems 4</td>
<td></td>
</tr>
</tbody>
</table>

8.4 **Magister Technologiae: Engineering: Electrical (Power)**
This qualification is offered at the Vanderbijlpark campus only.

8.4.1 **Program Structure**
At least 1 year, full time research, concluded with a Master Dissertation.

8.4.2 **Purpose of the Magister Technologiae: Engineering (Power)**
The purpose of this qualification is to develop a student into a researcher, able to conduct independent research with minimum guidance in a chosen field of Electrical Engineering. The outcomes of the research will contribute to knowledge production in the specialisation field. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields. (also see paragraph 4.3)
8.4.3 **Admission Requirements**
Baccalaureus Technologiae: Engineering (Power) average of 65% minimum.
Proof of successful completion of a Vaal University of Technology approved course in Research Methodology.
Ad hoc cases will be treated on merit.

8.5 **Doctor Technologiae: Engineering: Electrical (Power)**
This qualification is offered at the Vanderbijlpark campus only.

8.5.1 **Program Structure**
At least two years full time research, concluded with a Doctoral Thesis.

8.5.2 **Purpose of the Doctor Technologiae: Engineering (Power)**
The purpose of the qualification is to develop a researcher who will make a significant and original contribution to knowledge in a specialised area of electrical engineering and technology. To develop a researcher in electrical engineering with advanced abilities, to independently apply electrical engineering design, synthesis, and related principles, to specific problems of society at large. One of the main objectives in this process is to develop an advanced capability to conduct engineering research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields. (also see paragraph 4.4)

8.5.3 **Admission Requirements**
Magister Technologiae: Engineering (Power).
Ad hoc cases will be treated on merit.

8.6 **Assessment**
The department follows the assessment strategy of formal written exams. The year mark is compiled from a series of not less than three tests and / or a practical mark. The year mark for admittance to the formal examination is 50%. Weights for calculating the year mark as well as the final mark will be reflected in the Learning Guide. All tests, assignments and practical work done during a particular semester, will help learners learn and understand the work.
Some subjects follow the assessment strategies of Continuous Assessment (CASS). All marks obtained during the semester will make up the learner’s final mark. Each subject’s Learning Guide will indicate which tests and activities will contribute according to a pre-determined weight, to the final mark.

8.7 **Enquiries**

Enquiries may be addressed to:

HoD: Power Engineering  
Tel : +27 16 950 9929

Faculty of Engineering & Technology  
Fax : +27 16 950 9795

Vaal University of Technology  
E-Mail : theresa@vut.ac.za

Private Bag X021  
VANDERBIJLPARK, 1900  
Website : www.vut.ac.za

Or

Postgraduate Office  
Tel : +27 16 950 9297

Ms B Phume  
E-Mail : beatricet@vut.ac.za

9. **Department of Process Control & Computer Systems**

9.1 **Departmental Staff Details**
<table>
<thead>
<tr>
<th>Surname, Initials &amp; Title</th>
<th>Designation</th>
<th>Highest Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohanga, M (Prof)</td>
<td>HoD</td>
<td>PhD</td>
</tr>
<tr>
<td>Mwale R, Z (Ms)</td>
<td>Administrator</td>
<td>PG Dip (HE)</td>
</tr>
<tr>
<td>Fouche, AP (Mr)</td>
<td>Principal Lecturer</td>
<td>MDip Tech</td>
</tr>
<tr>
<td>Joubert, AG (Mr)</td>
<td>Senior Lecturer</td>
<td>MDip Tech</td>
</tr>
<tr>
<td>Loubsier, JB (Mr)</td>
<td>Senior Lecturer</td>
<td>MTech</td>
</tr>
<tr>
<td>Mitton, PJ (Mr)</td>
<td>Senior Lecturer</td>
<td>MDip Tech</td>
</tr>
<tr>
<td>Joubert A (Dr)</td>
<td>Senior Lecturer</td>
<td>DTech</td>
</tr>
<tr>
<td>Mathaba TND (Dr)</td>
<td>Senior Lecturer</td>
<td>PhD</td>
</tr>
<tr>
<td>Otunniyi TO (Ms)</td>
<td>Lecturer</td>
<td>MTech</td>
</tr>
<tr>
<td>Bosman, C (Mr)</td>
<td>Lecturer</td>
<td>BCom</td>
</tr>
<tr>
<td>Claassen, CJ (Mr)</td>
<td>Lecturer</td>
<td>MTech</td>
</tr>
<tr>
<td>Maloka, TV (Mr)</td>
<td>Lecturer</td>
<td>BTEch</td>
</tr>
<tr>
<td>Nel, BCD (Mr)</td>
<td>Lecturer</td>
<td>BTEch</td>
</tr>
<tr>
<td>Smit, AC (Mr)</td>
<td>Lecturer</td>
<td>MDip Tech</td>
</tr>
<tr>
<td>Tukisi, TW (Mr)</td>
<td>Lecturer</td>
<td>BTEch</td>
</tr>
<tr>
<td>Van Aardt, CC (Mr)</td>
<td>Lecturer</td>
<td>MSc</td>
</tr>
<tr>
<td>Van der Merwe, PJ (Mr)</td>
<td>Lecturer</td>
<td>BTEch</td>
</tr>
<tr>
<td>Vosloo, AM (Ms)</td>
<td>Lecturer</td>
<td>BTEch</td>
</tr>
<tr>
<td>Benson, MJM (Mr)</td>
<td>Junior Lecturer</td>
<td>BTEch</td>
</tr>
<tr>
<td>Marie, TE (Mr)</td>
<td>Lecturer</td>
<td>MTech</td>
</tr>
<tr>
<td>Nshimba, KT (Mr)</td>
<td>Junior Lecturer</td>
<td>BTEch</td>
</tr>
<tr>
<td>Mohapi, MJ (Ms)</td>
<td>Junior Lecturer</td>
<td>MTech</td>
</tr>
<tr>
<td>Pretorius, PD (Mr)</td>
<td>Snr Research Technologist</td>
<td>MTech</td>
</tr>
<tr>
<td>Roos, L (Mr)</td>
<td>Technician</td>
<td>BTEch</td>
</tr>
<tr>
<td>Van Tonder, Z (Ms)</td>
<td>Technician</td>
<td>BTEch</td>
</tr>
<tr>
<td>Francois du Rand</td>
<td>Technician</td>
<td>MTech</td>
</tr>
<tr>
<td>Baxter, R (Mr)</td>
<td>Snr Laboratory Assistant</td>
<td></td>
</tr>
</tbody>
</table>

9.2 Diploma in Electrical Engineering: (Process Control and Instrumentation)

9.2.1 Program Structure
The Diploma in Electrical Engineering in Process Control and Instrumentation is recognised as a three-year qualification. This programme incorporates a workplace-based learning (WBL) component totalling 60 credits. WBL takes place in industry. Due to this component this programme is likely to take longer than 3 years to complete. This programme is presented at the Vanderbijlpark and Secunda campuses. The exit level of the qualification is NQF 6.

9.2.2 Purpose of the Diploma in Electrical Engineering: (Process Control and Instrumentation)

The generic purpose of the qualification is spelled out in paragraph 4.1 and must be read in conjunction with the following.

The purpose of the qualification Diploma in Electrical Engineering: (Process Control and Instrumentation) is to develop the necessary knowledge, understanding and skills required for the student’s further learning towards becoming a competent practicing Process Control and Instrumentation Engineering Technician. A qualifying learner at this level is competent in process control and instrumentation operations, maintenance and problem solving. It is intended to subsequently empower candidate Engineering Technicians to demonstrate that they are capable of applying their acquired knowledge, understanding, skills, attitudes and values in the process control and instrumentation work environments in South Africa. It is designed also to add value to the qualifying student in terms of enrichment of the person, status and recognition.

9.2.3 Admission Requirements

<table>
<thead>
<tr>
<th>NSC National Senior Certificate</th>
<th>Compulsory Subjects</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>English</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Mathematics</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Physical Science</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Any other four subjects (excluding life orientation)</td>
<td>4 x 3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 = 40 – 49</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 = 50 – 59</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 = 60 – 69</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 = 70 – 79</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7 = 80 – 89</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 = 90 – 100</td>
</tr>
</tbody>
</table>

All other grade 12 or equivalent certificates will be treated on ad hoc basis.
### 9.2.4 Career Opportunities

The following are some areas of career opportunities: Fundamental process control; Design and maintenance; PLC programming and control applications; Industrial networks // **Industrial Control Bus systems and SCADA systems**.

### 9.2.5 Curriculum

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Applied Communication Skills 1.1</td>
<td>• Applied Communication Skills 1.2</td>
</tr>
<tr>
<td>• Electrical Engineering 1</td>
<td>• Computing Applications 2</td>
</tr>
<tr>
<td>• Engineering Skills 1</td>
<td>• Digital Systems 1</td>
</tr>
<tr>
<td>• ICT Skills 1</td>
<td>• Mathematics 2</td>
</tr>
<tr>
<td>• Mathematics 1</td>
<td>• Physics 2</td>
</tr>
<tr>
<td>• Physics 1</td>
<td>• Process Instrumentation 1</td>
</tr>
<tr>
<td>• Social Intelligence 1</td>
<td>• Safety Principles and Law 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester 3</th>
<th>Semester 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Applied Communication Skills 2.1</td>
<td>• Applied Communication Skills 2.2</td>
</tr>
<tr>
<td>• Electrical Engineering 2</td>
<td>• Digital Control Systems 1</td>
</tr>
<tr>
<td>• Electronics 1</td>
<td>• Digital Systems 2</td>
</tr>
<tr>
<td>• Engineering Programming 1</td>
<td>• Electronics 2</td>
</tr>
<tr>
<td>• Mathematics 3</td>
<td>• Engineering Programming 2</td>
</tr>
<tr>
<td>• Networks 1</td>
<td>• Networks 2</td>
</tr>
<tr>
<td>• Process Instrumentation 2</td>
<td>• Process Instrumentation 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester 5</th>
<th>Semester 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Control Systems 2</td>
<td>Optional Additional:</td>
</tr>
<tr>
<td>• Digital Control Systems 2</td>
<td>• Digital Systems 4</td>
</tr>
<tr>
<td>• Digital Systems 3</td>
<td>• Networks 4</td>
</tr>
<tr>
<td>• Power Electronics 3</td>
<td>• Control Systems 3</td>
</tr>
<tr>
<td>• Networks 3</td>
<td>• Experiential Learning 1</td>
</tr>
<tr>
<td>• Engineering Programming 3</td>
<td>• Experiential Learning 2</td>
</tr>
<tr>
<td></td>
<td>• Engineering Project 4 (WBL)</td>
</tr>
</tbody>
</table>
9.2.6 **Workplace Based Learning**

The Diploma in Electrical Engineering: (Process Control and Instrumentation) has a formal Workplace Based Learning component of 60 credits. This takes place at an accredited employer (company). The student will be assisted to find suitable placement after which the student will register for the WBL modules. The student will provide progress reports at regular intervals, in co-operation with a work-based mentor, to confirm that the necessary outcomes are being achieved.

9.4 **Magister Technologiae: Engineering: Electrical (Process Control and Instrumentation)**

This qualification is offered at the Vanderbijlpark campus only.

9.4.1 **Program Structure**

At least 1 year full time research, concluded with a Master Dissertation.

9.4.2 **Purpose of the Magister Technologiae: Engineering (Process Control and Instrumentation)**

The purpose of this qualification is to develop a student into a researcher, able to conduct independent research with minimum guidance in a chosen field of Electrical Engineering. The outcomes of the research will contribute to knowledge production in the specialisation field. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields. (also see paragraph 4.3)

9.4.3 **Admission Requirements**

Baccalaureus Technologiae: Engineering (Process Control and Instrumentation).

Proof of successful completion of Vaal University of Technology approved course in Research Methodology.

Ad hoc cases will be treated on merit.

9.5 **Doctor Technologiae: Engineering: Electrical (Process Control and Instrumentation)**

This qualification is offered at the Vanderbijlpark campus only.

9.5.1 **Program Structure**
At least two years full time research, concluded with a Doctoral Thesis.

9.5.2 **Purpose of the Doctor Technologiae: Electrical (Process Control and Instrumentation)**

The purpose of the qualification is to develop a researcher who will make a significant and original contribution to knowledge in a specialised area of electrical engineering and technology. To develop a researcher in electrical engineering with advanced abilities, to independently apply electrical engineering design, synthesis, and related principles, to specific problems of society at large.

One of the main objectives in this process is to develop an advanced capability to conduct engineering research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields. (See also paragraph 4.4)

9.5.3 **Admission Requirements**

Magister Technologiae: Engineering (Process Control and Instrumentation).

Ad hoc cases will be treated on merit.

9.6 **Diploma in Electrical Engineering (Computer Systems)**

9.6.1 **Program Structure**

The Diploma in Electrical Engineering in Computer Systems is recognised as a 3 year qualification. This programme incorporates a workplace based learning (WBL) component totalling 60 credits. WBL takes place in industry. Due to this component this programme is likely to take longer than 3 years to complete. This programme is presented at the Vanderbijlpark campus. The exit level of the qualification is NQF 6.

9.6.2 **Purpose of the Diploma in Electrical Engineering: Computer Systems**

The generic purpose of the qualification is spelled out in paragraph 4.1 and must be read in conjunction with the following.

The purpose of the qualification Diploma in Electrical Engineering: Computer Systems is to develop the necessary knowledge, understanding and skills required for the student’s further learning towards becoming a competent practicing Computer Systems Technician. A qualifying learner at this level is competent in
computer systems operations, **systems support** and problem solving. It is intended to subsequently empower candidate Engineering Technicians to demonstrate that they are capable of applying their acquired knowledge, understanding, skills, attitudes and values in the work environments in South Africa. It is designed also to add value to the qualifying student in terms of enrichment of the person, status and recognition.

**9.6.3 Admission Requirements**

<table>
<thead>
<tr>
<th>NSC National Senior Certificate</th>
<th>Compulsory Subjects</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>4</td>
<td>4 = 50 – 59</td>
</tr>
<tr>
<td>Mathematics</td>
<td>4</td>
<td>5 = 60 – 69</td>
</tr>
<tr>
<td>Physical Science</td>
<td>4</td>
<td>6 = 70 – 79</td>
</tr>
<tr>
<td>Any other four subjects (excluding life orientation)</td>
<td>4 x 3</td>
<td>7 = 80 – 89</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24</strong></td>
<td>8 = 90 – 100</td>
</tr>
</tbody>
</table>

All other grade 12 or equivalent certificates will be treated on ad hoc basis.

**9.6.4 Career Opportunities**

The computerization of most facets of modern business and industry, together with the great demand for technical manpower creates a multitude of possibilities. The following are some areas of career opportunities: Fundamental computer systems design and maintenance, Micro controller/Microprocessor development, Embedded design, Network systems, Database systems, Software Engineering and Programming applications.

**9.6.5 Curriculum**

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Applied Communication Skills 1.1</td>
<td>• Applied Communication Skills 1.2</td>
</tr>
<tr>
<td>• Electrical Engineering 1</td>
<td>• Computing Applications 2</td>
</tr>
<tr>
<td>• Engineering Skills 1</td>
<td>• Digital Systems 1</td>
</tr>
<tr>
<td>• ICT Skills 1</td>
<td>• Mathematics 2</td>
</tr>
</tbody>
</table>
- Mathematics 1
- Physics 1
- Social Intelligence 1

- Physics 2
- Safety Principles and Law 1

<table>
<thead>
<tr>
<th>Semester 3</th>
<th>Semester 4</th>
</tr>
</thead>
</table>
| - Applied Communication Skills 2.1
- Digital Systems 2
- Electrical Engineering 2
- Electronics 1
- Engineering Programming 1
- Networks 1
- Software Engineering 1 | - Applied Communication Skills 2.2
- Electronics 2
- Engineering Programming 2
- Networks 2
- Software Engineering 2
- Operating Systems 1 |

<table>
<thead>
<tr>
<th>Semester 5</th>
<th>Semester 6</th>
</tr>
</thead>
</table>
| - Digital Systems 3
- Engineering Programming 3
- Mathematics 3
- Networks 3
- Software Engineering 3
- Operating Systems 2 | - Operating Systems 3
- Choose (At least 2)
- Digital Systems 4
- Engineering Programming 4
- Networks 4
- Experiential Learning 1
- Experiential Learning 2
- Engineering Project 4 (WBL) |

9.6.6 **Workplace Based Learning**

The Diploma in Electrical Engineering: (Computer Systems) has a formal Workplace Based Learning component of 60 credits. This takes place at an accredited employer (company). The student will be assisted to find suitable placement after which the student will register for the WBL modules. The student will provide progress reports at regular intervals, in co-operation with a work-based mentor, to confirm that the necessary outcomes are being achieved.

9.7. **Enquiries**
Enquiries may be addressed to:
HoD: Process Control & Computer Systems Tel : +27 16 950 9254
Faculty of Engineering & Technology Fax : +27 16 950 9727
Vaal University of Technology E-Mail : refilewem1@vut.ac.za
Private Bag X021 marcelo@vut.ac.za
Vanderbijlpark, 1900 Website : www.vut.ac.za
or
Postgraduate Office Tel : +27 16 950 9536
Ms B Phume E-Mail : beatricet@vutr.ac.za

10. **Department of Industrial Engineering and Operations Management**

10.1 **Departmental Staff Details**

<table>
<thead>
<tr>
<th>Surname, Initials &amp; Title</th>
<th>Designation</th>
<th>Highest Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tengen, TB (Prof)</td>
<td>HOD</td>
<td>PhD</td>
</tr>
<tr>
<td>Van Wyk, T (Ms)</td>
<td>Senior Lecturer</td>
<td>MBL, Pr Tech Eng</td>
</tr>
<tr>
<td>Henning H (Ms)</td>
<td>Administrator</td>
<td>-</td>
</tr>
<tr>
<td>Sukraj, R (Mr)</td>
<td>Senior Lecturer</td>
<td>BTech</td>
</tr>
<tr>
<td>Adeyemi, OS (Mr)</td>
<td>Senior Lecturer</td>
<td>MSc</td>
</tr>
<tr>
<td>Nhlabathi, GS (Mr)</td>
<td>Lecturer</td>
<td>MTech</td>
</tr>
<tr>
<td>Ikome, JM, (Mr)</td>
<td>Lecturer</td>
<td>MSc</td>
</tr>
<tr>
<td>Khumalo, I (Mr)</td>
<td>Lecturer</td>
<td>-</td>
</tr>
<tr>
<td>Mallane, TM (Ms)</td>
<td>Junior Lecturer</td>
<td>BTech</td>
</tr>
<tr>
<td>Sivambu, JC (Mr)</td>
<td>Technician</td>
<td>BTech</td>
</tr>
</tbody>
</table>

10.2 **Diploma in Industrial Engineering**

A diploma will be issued on the completion of 36 subjects, made up of five semesters of theoretical learning, and one semester **Workplace Based Learning (WBL)** at an accredited employer. The six-month period of Workplace Based Learning is registered at the University. The WBL training is undertaken upon completion of S5 or at least 90% of all the theoretical component of the training. The University
will look for placement for students who complete ALL the theoretical components of the qualification, while students who only complete around 90% of the theoretical components will have the responsibilities to look for THEIR OWN placements.

10.2.1 Program Structure
Three-year full-time qualification:

- Five semesters (S1 to S5) of theoretical learning at the Vaal University of Technology
- One semester (at least) of Workplace Based Learning (Industry)

10.2.2 Purpose of the Diploma in Industrial Engineering
The generic purpose of the qualification is spelled out in paragraph 4.2 and must be read in conjunction with the following:

The purpose of the qualification Diploma in Industrial Engineering is to develop the necessary knowledge, understanding and skills required for the student’s further learning towards becoming a competent practicing Industrial Engineering Technician. It is intended to subsequently empower candidate Engineering Technicians to demonstrate that they can apply their acquired knowledge, understanding, skills, attitudes and values in the work environments in South Africa and the world at large. It is designed also to add value to the qualifying student in terms of enrichment of the person, status and recognition.

The main objective of this disciple is to constantly improve methods, procedures and practice within an organisation in order to increase productivity and profits. More value is added if inputs like manpower, materials, machinery and money are converted more effectively with sound management principle into products and services. Such a person is continually engaged in core aspects such as communication, co-operation, quality, planning, scheduling, cycle time, capacity, utilisation, economic analysis, problem solving, materials handling, facility layout, etc.

Industrial Engineering therefore requires persons who like working with people, who enjoy analysing and solving problems, developing solutions, gaining cooperation, motivating people and always seek better, quicker and cheaper ways of doing things.

10.2.3 Admission Requirements

<table>
<thead>
<tr>
<th>NSC</th>
<th>Compulsory Subjects</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3 = 40 – 49</td>
</tr>
<tr>
<td>National Senior Certificate</td>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>-----------------------------</td>
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<td>--------</td>
</tr>
<tr>
<td>English</td>
<td>4</td>
<td>4 = 50 – 59</td>
</tr>
<tr>
<td>Mathematics</td>
<td>4</td>
<td>5 = 60 – 69</td>
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<tr>
<td>Physical Science</td>
<td>4</td>
<td>6 = 70 – 79</td>
</tr>
<tr>
<td>Any other four subjects</td>
<td>4 x 3</td>
<td>7 = 80 – 89</td>
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<td>(excluding life orientation)</td>
<td></td>
<td>8 = 90 – 100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>24</td>
<td>—</td>
</tr>
</tbody>
</table>

All other grade 12 or equivalent certificates will be treated on ad hoc basis.

10.2.4 **Career Opportunities**

There is a great need for persons who are well trained in Industrial Engineering. Job opportunities abound in all types of manufacturing companies as well as service organisations as advisors, industrial analysts, production personnel, planning personnel and line managers. Experience has shown that people with a qualification in Industrial Engineering and a dynamic personality quickly progress to management level or start their own business.

10.2.5 **Curriculum**

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Applied Communication Skills 1.1</td>
<td>• Applied Communication Skills 1.2</td>
</tr>
<tr>
<td>• Engineering Chemistry 1</td>
<td>• Computing Application 2</td>
</tr>
<tr>
<td>• Engineering Skills 1</td>
<td>• Engineering Chemistry 2</td>
</tr>
<tr>
<td>• ICT Skills 1</td>
<td>• Engineering Drawing 1</td>
</tr>
<tr>
<td>• Mathematics 1</td>
<td>• Mathematics 2</td>
</tr>
<tr>
<td>• Physics 1</td>
<td>• Manufacturing Relations 2</td>
</tr>
<tr>
<td>• Social Intelligence 1</td>
<td>• Physics 1</td>
</tr>
<tr>
<td></td>
<td>• Safety Principles and Law 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester 3</th>
<th>Semester 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Applied Communication Skills 2.1</td>
<td>• Applied Communication Skills 2.2</td>
</tr>
<tr>
<td>• Electrical Engineering 1</td>
<td>• Costing 2</td>
</tr>
<tr>
<td></td>
<td>• Engineering Work Study 2</td>
</tr>
</tbody>
</table>
- Engineering Work Study 1
- Manufacturing Engineering 1
- Mechanics 1
- Production Engineering 1
- Qualitative Techniques 1

- Facility Layout and Material Handling 2
- Mechanical Manufacturing Engineering 2
- Production Engineering 2
- Quality Assurance 2
- 1 Elective from the following:
  - Electrical Engineering 2
  - Maintenance 1
  - Mechanical Engineering Design 2
  - Mechanics of Machines 2
  - Strength of Materials 2

<table>
<thead>
<tr>
<th>Semester 5</th>
<th>Semester 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automation 3</td>
<td>Workplace Based Learning (WBL)</td>
</tr>
<tr>
<td>Engineering Work Study 3</td>
<td></td>
</tr>
<tr>
<td>Industrial Accounting 3</td>
<td></td>
</tr>
<tr>
<td>Industrial Leadership 3</td>
<td></td>
</tr>
<tr>
<td>Mathematics 3</td>
<td></td>
</tr>
<tr>
<td>Operations Research 3</td>
<td></td>
</tr>
</tbody>
</table>

Note: Basic principles and theories are continuously supported by assignments, practical projects and computer applications. All classes and study material are available in English.

10.3 **Baccalaureus Technologiae: Engineering: Industrial**

This qualification is offered at the Vanderbijlpark campus only. NO more new intakes for this qualification as it is in the phasing out process. National Diploma students will be allowed into the Advanced Diploma after a bridging course has been completed for students to comply with the admission requirements into the Advance Diploma.

10.3.1 **Program Structure**
1 year, full time or two years part time qualification.

10.3.2 **Purpose of the Baccalaureus Technologiae: Engineering: Industrial**
The generic purpose of the qualification is spelled out in paragraph 4.2 and must be read in conjunction with the following.
The purpose of the qualification Baccalaureus Technologiae: Engineering: Industrial is to develop the necessary knowledge, understanding and skills required for the student’s further learning towards becoming a competent practicing Industrial Engineering Technologist. It is intended to subsequently empower candidate Engineering Technologist to demonstrate that they are capable of applying their acquired knowledge, understanding, skills, attitudes and values in the work environments in South Africa and the world at large. It is designed also to add value to the qualifying student in terms of enrichment of the person, status and recognition.

10.3.3 **Career Opportunities**
There is a great need for persons who are well trained in Industrial Engineering. Job opportunities abound in all types of manufacturing companies as well as service organisations as advisors, industrial analysts, production personnel, planning personnel and line managers. Experience has shown that people with a qualification in Industrial Engineering and having a dynamic personality quickly progress to management level or start their own business.

10.3.4 **Curriculum**

<table>
<thead>
<tr>
<th>Compulsory Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Entrepreneurship 4</td>
</tr>
<tr>
<td>• Production Technology 4</td>
</tr>
<tr>
<td>• Quality Assurance 4</td>
</tr>
<tr>
<td>• Systems Dynamics 4</td>
</tr>
<tr>
<td>• Information Systems 4</td>
</tr>
<tr>
<td>• Project Research 4</td>
</tr>
<tr>
<td>• Project Engineering 4</td>
</tr>
<tr>
<td>• Logistics Engineering 4</td>
</tr>
</tbody>
</table>
10.4 Magister Technologiae: Engineering: Industrial
This qualification is offered at the Vanderbijlpark campus only.

10.4.1 Program Structure
At least eighteen months of Fulltime research, concluded with a Master Dissertation.

10.4.2 Purpose of the Magister Technologiae: Engineering Industrial
The purpose of this qualification is to develop a student’s research ability by being able to conduct independent research with minimum guidance in a chosen field of Industrial Engineering. The outcomes of the research will contribute to knowledge creation in the specialisation field. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields. (also see paragraph 4.3)

10.4.3 Admission Requirements
Baccalaureus Technologiae: Engineering: Industrial with at least 60% average score.
Ad hoc cases will be treated on merit.

10.5 Diploma in Operations Management
A diploma will be issued on the completion of 31 subjects, made up of five semesters of theoretical learning, and one semester Operations Management Practice (Project based).

10.5.1 Program Structure
Three-year full time, qualification:

- Five semesters (S1 to S5) of theoretical learning at the Vaal University of Technology
- One semester of Operations Management Practice (Project based) done in Industry or simulated workplace in the form of simulated learning work-directed theoretical learning, problem-based learning, project-based learning or workplace-based learning

10.5.2 Purpose of the Diploma in Operations Management
If you are a person who likes working with people, who enjoys analysing and solving problems, developing solutions, gaining co-operation, motivating people and who always seeks better, quicker and cheaper ways of doing things – then this is the course for you!

Qualified persons in Operations Management are employed by manufacturing companies because this qualification is most suitable for careers in production and operations management.

In Operations Management, you will specialise in production scheduling, material movement, inventory control, quality management, work simplification, productivity improvement and will contribute to the design and implementation of integrated systems comprising capital, plant, manpower and raw materials. Your objective will be to constantly improve methods, procedures and practices within an organisation in order to increase productivity and profits.

### 10.5.3 Admission Requirements

<table>
<thead>
<tr>
<th>NSC National Senior Certificate</th>
<th>Compulsory Subjects</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>English</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Mathematics</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Physical Science</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Any other four subjects (excluding life orientation)</td>
<td>4 x 3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>23</td>
</tr>
</tbody>
</table>

|                                | 3 = 40 – 49         |
|                                | 4 = 50 – 59         |
|                                | 5 = 60 – 69         |
|                                | 6 = 70 – 79         |
|                                | 7 = 80 – 89         |
|                                | 8 = 90 – 100        |

All other grade 12 or equivalent certificates will be treated on ad hoc basis.

### 10.5.4 Career Opportunities

Operations Management offers a challenging and exciting career in the private sector. The expertise and skills that you will achieve find their optimum application and growth in the manufacturing industry, progressively, as Production Assistant /
Production Planner, Production Scheduler / Head Planner, Production Superintendent, Production Manager and Operations Management. People with Operations Management qualifications and experience are also well equipped to start their own business.

11.5.5 Curriculum

<table>
<thead>
<tr>
<th>Year 1 – Semester</th>
<th>Year 1 – Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Operations Management 1.1 (Industrial)</td>
<td>• Operations Management 1.2 (Industrial)</td>
</tr>
<tr>
<td>• Organisational Effectiveness 1.1</td>
<td>• Organisational Effectiveness 1.2</td>
</tr>
<tr>
<td>• Manufacturing Technology 1.1</td>
<td>• Manufacturing Technology 1.2</td>
</tr>
<tr>
<td>• Workplace Dynamics 1.1</td>
<td>• Workplace Dynamics 1.2</td>
</tr>
<tr>
<td>• ICT Skills 1</td>
<td>• Mathematics 1</td>
</tr>
<tr>
<td>• Applied Communication Skills 1.1</td>
<td>• Quality Management 1</td>
</tr>
<tr>
<td>• Applied Communication Skills 1.1</td>
<td>• Applied Communication Skills 1.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2 – Semester 3</th>
<th>Year 2 – Semester 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Operations Management 2.1</td>
<td>• Operations Management 2.2</td>
</tr>
<tr>
<td>• Organisational Effectiveness 2.1</td>
<td>• Organisational Effectiveness 2.2</td>
</tr>
<tr>
<td>• Cost &amp; Estimating 1.1</td>
<td>• Operations Management Techniques 2</td>
</tr>
<tr>
<td>• Quality Assurance 2</td>
<td>• Cost &amp; Estimating 1.2</td>
</tr>
<tr>
<td>• Statistics 1.1</td>
<td>• Applied Communication Skills 2.2</td>
</tr>
<tr>
<td>• Applied Communication Skills 2.1</td>
<td>• One Elective from the following:</td>
</tr>
<tr>
<td>• One Elective from the following</td>
<td>• Maintenance Engineering 2</td>
</tr>
<tr>
<td>• Engineering Chemistry 1</td>
<td>• Manufacturing Engineering 2</td>
</tr>
<tr>
<td>• Labour Law 1.1</td>
<td>• Physics 2</td>
</tr>
<tr>
<td>• Physics 1</td>
<td>• Programming 2</td>
</tr>
<tr>
<td>• Programming 1</td>
<td>• Engineering Chemistry 2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 3 – Semester 5</th>
<th>Year 3 – Semester 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Industrial Leadership 3</td>
<td>• Operation Management Practice (Project based)</td>
</tr>
</tbody>
</table>
- Operations Management 3.1
- Organisational Effectiveness 3
- Operations Management Techniques 3
- Operations Management Technology 3
- 1 Elective from the following:
  - Maintenance Engineering 2
  - Manufacturing Engineering 2
  - Physics 2
  - Programming 2
  - Engineering Chemistry 2

Note: Basic principles and theories are continuously supported by assignments, practical projects and computer applications. All classes and study material are available in English.

10.6 **Baccalaureus Technologiae: Operations Management**

This qualification is offered at the Vanderbijlpark campus only. NO more new intakes for this qualification as it is in the phasing out process. National Diploma students will be allowed into the Advanced Diploma after a bridging course has been completed in order for students to comply with the admission requirements into the Advance Diploma.

10.6.1 **Program Structure**
At least one-year full time or two-year part-time qualification.

10.6.2 **Purpose of the Baccalaureus Technologiae: Operations Management**
The generic purpose of the qualification is spelled out in paragraph 4.2 and must be read in conjunction with the following.
The purpose of the qualification Baccalaureus Technologiae: Operations Management is to develop the necessary knowledge, understanding and skills required for the student’s further learning towards becoming a competent practicing operations manager.
It is intended to subsequently empower candidate operations managers to demonstrate that they are capable of applying their acquired knowledge, understanding, skills, attitudes and values in the work environments in South Africa. It is designed also to add value to the qualifying student in terms of enrichment of the person, status and recognition.

10.6.3 Curriculum

<table>
<thead>
<tr>
<th>Compulsory Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Introduction to Marketing Management 1.1 and 1.2</td>
</tr>
<tr>
<td>• Research Methodology 1.1 and 1.2</td>
</tr>
<tr>
<td>• Financial Planning &amp; Control 3.1 and 3.2</td>
</tr>
<tr>
<td>• Operations Management Techniques 4.1 and 4.2</td>
</tr>
<tr>
<td>• Operations Management 4.1 and 4.2</td>
</tr>
</tbody>
</table>

Note: All the subjects consist of two modules; each will be offered on a semester basis.

10.7 Workplace Based Learning (WBL)

The Diploma in Industrial Engineering have a formal Workplace Based Learning component of six months. This takes place at a Vaal University of Technology accredited employer (company).

The student will be placed in Industry by VUT. Registration of this WBL is the responsibility of the student and continuous progress will be monitored by VUT staff. In co-operation with an Industry mentor, the learner will be assessed by the mentor and VUT staff.
10.8 **Assessment**
The department follows the assessment strategy of formal written exams. The year mark is compiled from a series of no less than three assessments (tests, practical’s, assignments, presentations, case studies, etc.). The year mark for admittance to the formal examination is 50%. Weights for calculating the year mark as well as the final mark will be reflected in the Learning Guide.

All assessment done during a particular semester, will help learners learn and understand the work.
Some subjects follow the assessment strategies of Continuous Assessment (CASS). All marks obtained during the semester will make up the learner’s final mark. Each subject’s Learning Guide will indicate which tests and activities will contribute according to a pre-determined weight, to the final mark.

10.9 **Enquiries**

Enquiries may be addressed to:
HoD: Industrial Engineering & Operations Management  
Tel : +27 16 950 9287 / 9087  
Fax : +27 16 950 9797  
Faculty of Engineering & Technology  
E-Mail : thomas@vut.ac.za  
Vaal University of Technology  
madeleine@vut.ac.za  
Private Bag X021  
Website : www.vut.ac.za  
VANDERBIJLPARK, 1900  
or  
Postgraduate Office  
Tel : +27 16 950 9297  
Ms B Phume  
E-Mail : beatricet@vut.ac.za

11. **Department of Mechanical Engineering**

11.1 **Departmental Staff Details**

<table>
<thead>
<tr>
<th>Surname, Initials &amp; Title</th>
<th>Designation</th>
<th>Highest Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Position</td>
<td>Qualification</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Alugongo, AA (Prof)</td>
<td>HoD</td>
<td>PhD</td>
</tr>
<tr>
<td>Masu, LM (Prof)</td>
<td>Professor</td>
<td>PhD</td>
</tr>
<tr>
<td>Henning, M (Ms)</td>
<td>Administrator</td>
<td>BTech</td>
</tr>
<tr>
<td>Teku, GN (Mr)</td>
<td>Lecturer</td>
<td>MSc Eng</td>
</tr>
<tr>
<td>Aniki, AO (Mr)</td>
<td>Lecturer</td>
<td>M Eng</td>
</tr>
<tr>
<td>Nturanabo, F (Mr)</td>
<td>Lecturer</td>
<td>MSc Eng</td>
</tr>
<tr>
<td>Olivier, AA (Mr)</td>
<td>Lecturer</td>
<td>M Tech</td>
</tr>
<tr>
<td>Tchomeni Kouejou, BX (Mr)</td>
<td>Lecturer</td>
<td>M Tech</td>
</tr>
<tr>
<td>Inyang, EE (Mr)</td>
<td>Lecturer</td>
<td>M Tech</td>
</tr>
<tr>
<td>Pieterse, DP (Mr)</td>
<td>Lecturer</td>
<td>B Tech</td>
</tr>
<tr>
<td>Postma, AS (Mr)</td>
<td>Lecturer</td>
<td>MSc</td>
</tr>
<tr>
<td>Rowe, CC (Mr)</td>
<td>Lecturer</td>
<td>B Tech</td>
</tr>
<tr>
<td>Theron, H (Mr)</td>
<td>Lecturer</td>
<td>B Tech</td>
</tr>
<tr>
<td>Tshitshonu, EK (Mr)</td>
<td>Lecturer</td>
<td>BSc Hons</td>
</tr>
<tr>
<td>Spiret, DW (Mr)</td>
<td>Lecturer</td>
<td>B Tech</td>
</tr>
<tr>
<td>Koza, V (Mr)</td>
<td>Technician</td>
<td>M Eng</td>
</tr>
<tr>
<td>Van Tonder, R (Mr)</td>
<td>Technician</td>
<td>B Tech</td>
</tr>
<tr>
<td>Vilakazi, LN (Ms)</td>
<td>Technician</td>
<td>B Tech</td>
</tr>
<tr>
<td>Altaki, K (Mr)</td>
<td>Technician</td>
<td>B Tech</td>
</tr>
<tr>
<td>Mhlongo, O (Ms)</td>
<td>Technician</td>
<td>B Tech</td>
</tr>
<tr>
<td>De Wet, GCO (Mr)</td>
<td>Workshop Manager</td>
<td>Trade Cert.</td>
</tr>
<tr>
<td>Greyling, M (Mr)</td>
<td>Workshop Assistant</td>
<td>Grade 12</td>
</tr>
<tr>
<td>Ntshala, I (Mr)</td>
<td>Artisan</td>
<td>N3 Technical</td>
</tr>
</tbody>
</table>

11.2 **Diploma in Mechanical Engineering**

11.2.1 **Program Structure**
Three-year full time, qualification:
Three years (six semesters S1 to S6) at the Vaal University of Technology.

**The department is making provision to gradually release S6 completely of coursework to allow space for Workplace Based-Learning.**
11.2.2 **Purpose of the Diploma in Mechanical Engineering**

The generic purpose of the qualification is spelled out in paragraph 4.1 and must be read in conjunction with the following:

The purpose of the qualification Diploma in Mechanical Engineering is to develop the necessary knowledge, understanding and skills required for the student’s further learning towards becoming a competent practicing Mechanical Engineering Technician. It is intended to subsequently empower candidate Engineering Technicians to demonstrate that they are capable of applying their acquired knowledge, understanding, skills, attitudes and values in the work environments in South Africa. It is designed also to add value to the qualifying student in terms of enrichment of the person, status and recognition.

11.2.3 **Admission Requirements**

<table>
<thead>
<tr>
<th>NSC National Senior Certificate</th>
<th>Compulsory Subjects</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>4</td>
<td>4 = 50 – 59</td>
</tr>
<tr>
<td>Mathematics</td>
<td>4</td>
<td>5 = 60 – 69</td>
</tr>
<tr>
<td>Physical Science</td>
<td>4</td>
<td>6 = 70 – 79</td>
</tr>
<tr>
<td>Any four other subjects</td>
<td>4 x 3</td>
<td>7 = 80 – 89</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>8 = 90 – 100</td>
</tr>
</tbody>
</table>

All other grade 12 or equivalent certificates will be treated on ad hoc basis.

11.2.4 **Career Opportunities**

A Mechanical Technician is a person in possession of at least a Diploma in Mechanical Engineering. The task of the Technician in the design field is to assist the Engineer / Technologist with the design of new products or equipment for use in industry or society.

A Technician in the maintenance field must see to it that preventive or scheduled maintenance is done on all machines in order to prevent interruptions in production.

The activities in Mechanical Engineering can therefore be grouped into design, maintenance, electromechanical and project work where the latter includes aspects such as planning of projects, cost control, evaluation of tenders, negotiations with contractors, control over the progress of the project, co-ordination of all the interested departments and commissioning of the completed project.
In any heavy or light manufacturing industry, e.g. the chemical industry, iron and steel manufacturing industry, mining industry, power stations, transport services, provisional and government services, etc. Technicians are much sought after and a career in this field is lucrative and rewarding.

### 11.2.5 Curriculum

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Applied Communication Skills 1.1</td>
<td>• Applied Communication Skills 1.2</td>
</tr>
<tr>
<td>• Engineering Chemistry 1</td>
<td>• Computing Applications 2</td>
</tr>
<tr>
<td>• Engineering Skills 1</td>
<td>• Engineering Chemistry 2</td>
</tr>
<tr>
<td>• ICT Skills 1</td>
<td>• Engineering Drawing 1</td>
</tr>
<tr>
<td>• Mathematics 1</td>
<td>• Mathematics 2</td>
</tr>
<tr>
<td>• Physics 1</td>
<td>• Physics 2</td>
</tr>
<tr>
<td>• Social Intelligence 1</td>
<td>• Safety Principles and Law 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester 3</th>
<th>Semester 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Mechanics 1</td>
<td>• Mechanical Engineering Design 2</td>
</tr>
<tr>
<td>• Project 1 (WIL Mechanical)</td>
<td>• Mechanics of Machines 2</td>
</tr>
<tr>
<td>• Mathematics 3</td>
<td>• Strength of Materials 2</td>
</tr>
<tr>
<td>• Applied Communication Skills 2.1</td>
<td>• Fluid Mechanics 2</td>
</tr>
<tr>
<td>• Manufacturing Engineering 1</td>
<td>• Thermodynamics 2</td>
</tr>
<tr>
<td>• Engineering Drawing 2</td>
<td>• Project 2 (WIL Mechanical)</td>
</tr>
<tr>
<td>• Electrical Engineering 1</td>
<td>• Applied Communication Skills 2.2</td>
</tr>
<tr>
<td>• Computer Aided Draughting 1</td>
<td>• Computer Aided Draughting 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester 5</th>
<th>Semester 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Mechanics of Machines 3</td>
<td>• Theory of Machines 3</td>
</tr>
<tr>
<td>• Strength of Materials 3</td>
<td>• Applied Strength of Materials 3</td>
</tr>
<tr>
<td>• Fluid Mechanics 3</td>
<td>• Hydraulic Machines 3</td>
</tr>
<tr>
<td>• Thermodynamics 3</td>
<td>• Steam Plant 3</td>
</tr>
<tr>
<td>• Mechanical Engineering Design 3</td>
<td>• Machine Design 3</td>
</tr>
<tr>
<td>• Manufacturing Engineering 2</td>
<td>• Maintenance Engineering 2</td>
</tr>
<tr>
<td>• Maintenance Engineering 1</td>
<td>• Modelling and Engineering Computation 2</td>
</tr>
<tr>
<td>• Project 3 (WIL Mechanical)</td>
<td></td>
</tr>
</tbody>
</table>
11.3 **Advanced Diploma in Mechanical Engineering**

This qualification is in preparation as a replacement of the B.Tech, in line of the HEQSF (Higher Education Qualification Sub-framework) and will be offered at the Vanderbijlpark campus only.

11.3.1 **Program Structure**
One-year full time or two-year part time qualification.

11.3.2 **Purpose of the Advanced Diploma in Mechanical**

The main purpose of this educational programme design is to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing engineering technologist. This qualification provides:

1. Preparation for careers in Mechanical Engineering at NQF level 7 (Technologist status), for achieving technical 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 ECSA.
3. Entry to NQF level 8 programmes e.g. bachelor’s Honours and Postgraduate Diploma programmes and then to proceed to master’s and Doctorate programmes.

11.3.3 **Admission Requirements**

Diploma or National Diploma: Engineering: Mechanical with an average of at least 60% in the following subjects: Hydraulic Machines 3, Steam Plant 3, Theory of Machines 3, Applied Strength of Materials 3 and Mathematics 3.

All other equivalent qualifications will be treated ad hoc.
11.3.4 Curriculum

Option 1: Technology

- Engineering Design Project 4 (Two semesters – enrolment in January)
- Strength of Materials 4
- Stress Analysis 4
- Mechanics of Machines 4
- Automatic Control 4
- Fluid Mechanics 4
- Turbo Machines 4 or Thermodynamics IV

Option 2: Management

- Engineering Design Project 4 (Two semesters – enrolment in January)
- Project Engineering IV and Entrepreneurship IV,
- Two of the following combinations:
  - Strength of Materials 4 and Stress Analysis 4
  - Mechanics of Machines 4 and Automatic Control 4
  - Fluid Mechanics 4 and Turbo Machines 4 or Thermodynamics IV

11.4 Magister Technologiae: Engineering: Mechanical

This qualification is offered at the Vanderbijlpark campus only.

11.4.1 Program Structure

At least one-year full time research, concluded with a master’s Dissertation.

11.4.2 Purpose of the Magister Technologiae: Engineering: Mechanical

The purpose of this qualification is to develop a student into a researcher, able to conduct independent research with minimum guidance in a chosen field of Mechanical Engineering. The outcomes of the research will contribute to knowledge production in the specialisation field. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields. (also see paragraph 4.3)
11.4.3 Admission Requirements

Baccalaureus Technologiae: Engineering: Mechanical with an average of 65%. Ad hoc cases will be treated on merit.

11.5 Doctor Technologiae: Engineering: Mechanical

This qualification is offered at the Vanderbijlpark campus only.

11.5.1 Program Structure

At least two years full time research, concluded with a Doctoral Thesis.

11.5.2 Purpose of the Doctor Technologiae: Engineering: Mechanical

The purpose of the qualification is to develop a researcher who will make a significant and original contribution to knowledge in a specialised area of mechanical engineering and technology.

To develop a researcher in mechanical engineering with advanced abilities, to independently apply mechanical engineering design, synthesis, and related principles, to specific problems of society at large. One of the main objectives in this process is to develop an advanced capability to conduct engineering research of an original nature. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields. (also see paragraph 4.4)

11.5.3 Admission Requirements

Magister Technologiae: Mechanical.

Proof of successful completion of a Vaal University of Technology approved course in Research Methodology. Ad hoc cases will be treated on merit.

11.6 Assessment

The department follows the assessment strategy of formal written exams. The year mark is compiled from a series of not less than three tests and/or a practical mark. The year mark for admittance to the formal examination is 50%. Weights for calculating the year mark as well as the final mark will be reflected in the Learning Guide. All tests, assignments and practical work done during a particular semester, will help learners learn and understand the work.
Some subjects follow the assessment strategies of Continuous Assessment (CASS). All marks obtained during the semester will make up the learner’s final mark. Each subject’s Learning Guide will indicate which tests and activities will contribute according to a pre-determined weight, to the final mark.

11.7 **Workplace Based Learning (WBL)**

The old *National Diploma: Engineering: Mechanical* has a formal Work Integrated Learning component of twelve months. This takes place at a Vaal University of Technology accredited employer (company). The student has the responsibility of finding suitable placement after which the student will register for the two semesters of practical. In co-operation with a mentor, the learner will provide progress reports at regular intervals.

The *Diploma in Mechanical Engineering* has a formal six months Work Integrated Learning Component that is coordinated by the Department of Mechanical Engineering. Initially designed to be conducted on campus in three components (Project I, Project II and Project III), the WIL is currently under review to be conducted as a Work-Placed-based-Learning in industry.

11.8 **Enquiries**

Enquiries may be addressed to:

- **HoD: Mechanical Engineering**
  - Tel : +27 16 950 9302
- **Faculty of Engineering & Technology**
  - Fax : +27 16 950 9797
- **Vaal University of Technology**
  - E-Mail : alfayoa@vut.ac.za
- **Private Bag X021**
  - VANDERBIJLPARK, 1900
  - Website : [www.vut.ac.za](http://www.vut.ac.za)

or

- **Postgraduate Office**
  - Tel : +27 16 950 9297
- **Ms B Phume**
  - E-Mail : beatricet@vut.ac.za

12. **Department of Metallurgical Engineering**

12.1 **Departmental Staff Details**
### 12.2 **Diploma: Engineering: Metallurgical**

#### 12.2.1 **Program Structure**
Three-year full time, qualification:
Five semesters, S1 to S5 at the Vaal University of Technology
One semester **Workplace Based Learning (WBL)**

#### 12.2.2 **Purpose of the Diploma: Engineering: Metallurgical**
The generic purpose of the qualification is spelled out in paragraph 4.1 and must be read in conjunction with the following.
The purpose of the qualification **Diploma: Engineering: Metallurgical** is to develop the necessary knowledge, understanding and skills required for the student’s further learning towards becoming a competent practicing Metallurgical Engineering Technician.

It is intended to subsequently empower candidate Engineering Technicians to demonstrate that they are capable of applying their acquired knowledge, understanding, skills, attitudes and values in the work environments in South Africa.
It is designed also to add value to the qualifying student in terms of enrichment of the person, status and recognition.

12.2.3 **Admission Requirements**

<table>
<thead>
<tr>
<th>NSC National Senior Certificate</th>
<th>Compulsory Subjects</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>English</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Mathematics</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Physical Science</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Any other four subjects (excluding life orientation)</td>
<td>4 x 3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>24</td>
</tr>
</tbody>
</table>

All other grade 12 or equivalent certificates will be treated on ad hoc basis.

12.2.4 **Career Opportunities**

Many opportunities exist at primary producers of both ferrous and non-ferrous metals as well as in the manufacturing industry. Metallurgical Engineering Technicians may be involved in developing new processes / procedures in the extraction / manufacturing industry as well as optimising / improving existing processes; ensuring the quality of products during the different stages of the process and testing and inspection of the final material / product.

13.2.5 **Curriculum**

<table>
<thead>
<tr>
<th>Year 1 –</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester 1</td>
</tr>
<tr>
<td>AMMAT1A</td>
</tr>
<tr>
<td>AAECH1A</td>
</tr>
<tr>
<td>APHYS1A</td>
</tr>
<tr>
<td>EESIN1A</td>
</tr>
<tr>
<td>EEESK1A</td>
</tr>
<tr>
<td>AMMAT2A</td>
</tr>
<tr>
<td>EMEDR1A</td>
</tr>
<tr>
<td>APHYS2A</td>
</tr>
<tr>
<td>AAECH2A</td>
</tr>
<tr>
<td>HLSPA1A</td>
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</table>
### Year 2

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EYPTH1A</strong></td>
<td>EYHYD2A</td>
</tr>
<tr>
<td>Process Thermodynamics 1</td>
<td>Hydrometallurgy 2</td>
</tr>
<tr>
<td><strong>EYEME1A</strong></td>
<td>EYPYR2A</td>
</tr>
<tr>
<td>Extractive Metallurgy 1</td>
<td>Pyrometallurgy 2</td>
</tr>
<tr>
<td><strong>EYPME1A</strong></td>
<td>EYPME2A</td>
</tr>
<tr>
<td>Physical Metallurgy 1</td>
<td>Physical Metallurgy 2</td>
</tr>
<tr>
<td><strong>EYMOR1A</strong></td>
<td>EYMPR2A</td>
</tr>
<tr>
<td>Mineral Processing 1</td>
<td>Mineral Processing 2</td>
</tr>
<tr>
<td><strong>EYMAM1A</strong></td>
<td>EYMAM2A</td>
</tr>
<tr>
<td>Manufacturing Metallurgy 1</td>
<td>Manufacturing Metallurgy 2</td>
</tr>
<tr>
<td><strong>EYECE1A</strong></td>
<td>EBQCO2A</td>
</tr>
<tr>
<td>Engineering Geology 1</td>
<td>Quality Control 2</td>
</tr>
<tr>
<td><strong>HKCOX2A</strong></td>
<td><strong>HKCOY2A</strong></td>
</tr>
<tr>
<td>Applied Communication Skills 2.1</td>
<td>Applied Communication Skills 2.2</td>
</tr>
</tbody>
</table>

### Year 2

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EYHYD3A</strong></td>
<td>EYWIL1A</td>
</tr>
<tr>
<td>Hydrometallurgy 3</td>
<td>Workplace Based Learning 1</td>
</tr>
<tr>
<td><strong>EYPYR3A</strong></td>
<td>EYMPR3A</td>
</tr>
<tr>
<td>Pyrometallurgy 3</td>
<td>Mineral Processing 3</td>
</tr>
<tr>
<td><strong>EYPME3A</strong></td>
<td>EYMAM3A</td>
</tr>
<tr>
<td>Physical Metallurgy 3</td>
<td>Manufacturing Metallurgy 3</td>
</tr>
<tr>
<td><strong>BHMAN1A</strong></td>
<td><strong>EYENC1A</strong></td>
</tr>
<tr>
<td>Engineering Management 1</td>
<td>Environmental Chemistry 1</td>
</tr>
</tbody>
</table>

12.3.3 **Baccalaureus Technologiae: Metallurgical**

This qualification is offered at the Vanderbijlpark campus only. NO more new intakes for this qualification as it is in the phasing out process. National Diploma students will be allowed into the Advanced Diploma after a bridging course has been completed in order for students to comply with the admission requirements into the Advance Diploma.
12.3.1 **Program Structure**
One-year full time or two years part time qualification.

12.3.2 **Purpose of the Baccalaureus Technologiae: Metallurgical**
The generic purpose of the qualification is spelled out in paragraph 4.2 and must be read in conjunction with the following. The purpose of the qualification Baccalaureus Technologiae: Engineering: Metallurgical is to develop the necessary knowledge, understanding and skills required for the student’s further learning towards becoming a competent practicing Metallurgical Engineering Technologist.

It is intended to subsequently empower candidate Engineering Technologist to demonstrate that they are capable of applying their acquired knowledge, understanding, skills, attitudes and values in the work environments in South Africa. It is designed also to add value to the qualifying student in terms of enrichment of the person, status and recognition.

12.3.3 **Career Opportunities**
A successful candidate can pursue a career as a technologist in one of the following specialisation fields: Physical Metallurgy or Extractive Metallurgy.

12.3.4 **Curriculum**

<table>
<thead>
<tr>
<th>SEMESTER</th>
<th>PHYSICAL</th>
<th>HYDRO</th>
<th>PYRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&amp;2</td>
<td>EYMPR4A (Project)</td>
<td>EYMPR4A (Project)</td>
<td>EYMPR4A (Project)</td>
</tr>
<tr>
<td>1</td>
<td>AMISS3C (Mathematics 3)</td>
<td>AMISS3C (Mathematics 3)</td>
<td>AMISS3C (Mathematics 3)</td>
</tr>
<tr>
<td>1</td>
<td>EYMMW3A (Metallurgical Thermodynamics)</td>
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<tr>
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<td>EYMF4D4A (Physical Metallurgy)</td>
<td>EYMN4A (Applied Mineral Processing 4)</td>
<td>EYMN4A (Applied Mineral Processing 4)</td>
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<tr>
<td>2</td>
<td>EYMM4A (Materials Deformation Technology 4)</td>
<td>EYMEC4A (Extraction of Non-ferrous Metals 4)</td>
<td>EYM4A (Production of Iron and Steel 4)</td>
</tr>
<tr>
<td>2</td>
<td>EYMKR4A (Corrosion 4)</td>
<td>EYMKN3A (Mineralogy 3)</td>
<td>EYMKR4A (Corrosion 4)</td>
</tr>
</tbody>
</table>
12.4  **Magister Technologiae: Engineering: Metallurgical**
This qualification is offered at the Vanderbijlpark campus only.

12.4.1  **Program Structure**
At least one-year full time research, concluded with a Master Dissertation.

12.4.2  **Purpose of the Magister Technologiae: Engineering: Metallurgical**
The purpose of this qualification is to develop a student into a researcher, able to conduct independent research with minimum guidance in a chosen field of Metallurgical Engineering. The outcomes of the research will contribute to knowledge production in the specialisation field. It also promotes a lifelong learning approach and an aptitude for training other students in similar fields. (also see paragraph 4.3)

12.4.3  **Admission Requirements**
Baccalaureus Technologiae: Engineering: Metallurgical.
Proof of successful completion of a Vaal University of Technology approved course in Research Methodology.
Ad hoc cases will be treated on merit.

12.5  **Assessment**
The department follows the assessment strategy of formal written exams. The year mark is compiled from a series of not less than three tests and / or a practical mark. The year mark for admittance to the formal examination is 50%. Weights for calculating the year mark as well as the final mark will be reflected in the Learning Guide. All tests, assignments and practical work done during a particular semester, will help learners learn and understand the work.

Some subjects follow the assessment strategies of Continuous Assessment (CASS). All marks obtained during the semester will make up the learner’s final mark. Each subject’s Learning Guide will indicate which tests and activities will contribute according to a pre-determined weight, to the final mark.

12.6  **Workplace Based Learning**
The new Diploma in Metallurgical Engineering has a formal six months Workplace Based Learning Component that is coordinated by the Department of Metallurgical Engineering.
12.7 **Enquiries**

Enquiries may be addressed to:

HoD: Metallurgical Engineering                  Tel         : +27 16 950 9243
Faculty of Engineering & Technology            Fax         : +27 16 950 9796
Vaal University of Technology                   E-Mail      : rethav@vut.ac.za
Private Bag X021                                Website     : www.vut.ac.za
VANDERBIJLPARK, 1900                            

or

Postgraduate Office                             Tel         : +27 16 950 9297
Ms B Phume                                      E-Mail      : beatricet@vut.ac.za
13. Syllabi

<table>
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<tr>
<th>Department</th>
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<tbody>
<tr>
<td><strong>Syllabi</strong></td>
<td><strong>NDip: Engineering: Chemical – Course Codes 208086</strong></td>
</tr>
</tbody>
</table>

**Applied Communication 1.1 HKCOX1A**
Social Intelligence and Communication Theory; Critical Thinking; Globalisation; Communication theory and its application in the workplace; Listening to improve your input at work; Reading and comprehending in a professional environment; Reading skills; Comprehension skills; Professional writing and correspondence; Good writing style and what to avoid; Dictionary Skills and Introduction to research; Dictionary Skills; Helping with Research

**Applied Communication 1.2 HKCOY1A**
Communication theory; Oral presentation; Technical writing skills; Group communication skills

**Applied Communication 2.1 HKCOX2A**
Communication theory; Oral presentation; Technical writing skills; Group communication skills

**Applied Communication Skills 2.2 HKCOX2A**
Speaking and listening intensive, speaking and presentation skills, pronunciation, voice projection, pronunciation, vocabulary, intonation, inflection, accent neutralisation and PowerPoint presentation skills. Practical and functional application of Business Communication skills: meeting procedures, e-business, argumentative orals and interviews, persuasion, problem solving and negotiation skills, conflict resolution, netiquette, project management, business plans, networking and report writing.

**Applied Thermodynamics**
Steam and vapour principles; Steam condenser; Boilers; Turbines and steam cycles; Refrigeration and heat pumps; Steam and gas nozzles.

**Chemistry 1**
Matter and energy; Atomic structure; Chemical bonding; Periodic table and nomenclature of inorganic compounds; Chemical equations and stoichiometry;
Solutions; Acids, bases and salts; Chemical reactions; Chemical equilibrium; Electrochemistry and redox theory; Introduction to inorganic chemistry and Introduction to organic chemistry.

**Communication Skills**
Communication theory; Oral presentation; Technical writing skills and Group communication skills.

**Communication Skills (EDL)**
Life Skills; Basic English Language; Comprehension; Writing Skills and Reading Skills.

**Communication Skills (Module 1)**
Basic English Language; Comprehension; Writing Skills and Reading Skills.

**Communication Skills (Module 2)**
Basic English Language; Comprehension; Writing Skills and Reading Skills.

**Computer & Programming Skills 1**
MS-DOS principles and applications, integrated software packages such as work processors and spreadsheets and the Windows environment.

**Computer Skills 1**

**Chemical Engineering Laboratory 1**
Batch distillation; Gas absorption with determination off mass transfer coefficient; Thin film evaporator; Vapour liquid equilibrium; Filtration; Cooling tower; Boiling/condensation; Refrigeration/heat pump; Leaching.
**Chemical Engineering Thermodynamics**
Introduction to thermodynamics; First Law of Thermodynamics and other basic concepts; Second Law of Thermodynamics; Volumetric behaviour of pure fluids; Heat Effect; Thermodynamics properties of fluids.

**Chemical Process Design Principles**
Computer simulation and financial assessment; Basic Cost Estimation and Economic Assessment; A simple flash calculation by hand and simulator; Material Streams: energy balances and flow sheeting on computer; Physical property data bases and predictive methods; Degrees of freedom in problem solution; Complex unit operations design; Design with recycles and application to improved design; Emphasis on operability & controllability of processes.

**Chemical Process Industries**
Industrial gases and heavy chemicals; Inorganic chemicals; Agricultural chemicals; Coal processing; Petroleum refining; Industrial polymers; Iron and steel; Pulp and paper and Sugar refining.

**Engineering Chemistry 1 AAECH1A**
Matter and energy; Atomic structure; Chemical bonding; Periodic table and nomenclature of inorganic compounds; Chemical equations and stoichiometry; Solutions; Acids, bases and salts; Chemical reactions; Chemical equilibrium; Electrochemistry and redox theory; Introduction to inorganic chemistry; Introduction to organic chemistry.

**Engineering Chemistry 2 AAECH2A**
Introduction to chemical bonding; Ionic bonds; Covalent bonding and molecular structure; Hydrogen; The Group IA and IIA metals; Boron and Aluminium; Chemical reactions in aqueous solutions; Carbon, Silicon, Germanium, Tin, and Lead; Acids, bases, and non-aqueous solvents; Nitrogen Phosphorus, Arsenic; Oxygen, Sulphur, Selenium, and Tellurium; Halogens.

**Engineering Drawing 1 EMEDR1A**
Letter and number notation; Line notation; Handling of apparatus; Measurement notation; Geometrical Construction; Orthographic Projections; Arcs of penetration and Developments; Detailed works drawing; Composite drawings.

**Engineering Mathematics 1 AMMAT1A**
Basic mathematics; Differentiation 1; Integration 1; Statistics A1.
**Engineering Mathematics 2 AMMAT2A**  
Differentiation II; Integration II; Matrix algebra; Differential equations (first order).

**Engineering Physics 1 APHYS1A**  
Introduction to vectors; Movement in a straight line; Projectile movement, Newton’s laws; Work and energy; impulse and momentum; Equilibrium statistics; Rotational movement; Elasticity; Statistical fluids; Dynamic fluids; Heat, temperature and expansion; Heat Transfer; First and second laws of thermodynamics; Electrostatics; Electricity; Magnetism; Electromagnetic induction; Basic electronics; Nature and propagation of light; Mirrors; Lenses; Prisms; Illumination; Interference, diffraction and polarisation; Introduction to nuclear physics; Practical physics.

**Engineering Physics 2 APHYS2A**  
Projectile motion; rotational motion; simple harmonic motion and elasticity; fluids; gas behaviour; thermodynamics; current and capacitors; magnetism; nuclear physics, radioactivity and ionising radiation; Calculus.

**ICT Skills 1 ASICT1A**  
Recognizing Computers; Using Microsoft Windows; Common Elements; Using Microsoft Word; Using Microsoft Excel; Using Microsoft PowerPoint; Getting Connected; Using the Internet.

**Mathematics 1**  
Basic mathematics: Algebra; Logarithms; Graphs; Trigonometry; Radian measure; Sine function; Cramer’s rule; determinations and simultaneously linear equations. Differentiation: Increments; Limits (Binomial theorem); Function of a function; Products; Quotients and Logarithmic differentiation. Integration: The definite integral and numerical integration. Statistics: Frequency distributions; Measures of locality and dispersion; x; s; Regression and correlation; Elementary probability theory; Probability distributions, Binomial and Poisson.

**Mathematics 2**  
Differentiation: Hyperbolic functions; Parametric equations; Practical applications of maxima and minima and Partial differentiation. Integration: Standard integrals; Integration by parts; Partial fractions; Powers; Products of trigonometric functions and Integration tables. Statistics: Elementary sampling theory; Sampling distributions of means; Statistical estimation theory; Population parameters; Statistical decision theory; Statistical hypotheses; Theory for small
samples; Learner’s t-distribution and Analysis of variance. Linear programming: Graphical representation; Matrices; Transpose; Inverse matrix; Gauss-elimination method for solving systems of equations; The simplex method and Maximising and minimising.

**Physics 1**
Introduction to vectors; Movement in a straight line; Projectile movement; Newton’s Laws; Work and energy; Impulse and momentum; Equilibrium statistics; Rotational movement; Elasticity; Statistical fluids; Dynamic fluids; Heat, temperature and expansion; Heat transfer; First and second laws of thermodynamics; Electrostatics; Electricity; Magnetism; Electromagnetic induction; Basic electronics; Nature and propagation of light; Mirrors; Lenses; Prisms; Illumination; Interference, diffraction and polarisation; Introduction to nuclear physics and Practical physics.

**Process Control**
Control of chemical processes: Incentive of chemical process control, Design aspects of a process control system, Control modes (P, PI, PD, PID). Analysis and Design of advanced control systems: Introduction to feedback control, Control systems with multiple loops, Split range control, Feed forward control, Ration control, Adaptive control, Inferential control, Design of control systems for Multivariable processes.

**Professional Skills (Module 1)**
Job searching; Interviews; CV compilation; Report writing and Oral presentation.

**Professional Skills (Module 2)**
Job searching; Interviews; CV compilation; Report writing and Oral presentation.

**Chemical Technology**
Material balances; Chemical reaction equation and stoichiometry; Recycle; Purge; Bypass and Energy balances.

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<tr>
<th>Department</th>
<th>Chemical Engineering</th>
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<tr>
<td>Syllabi</td>
<td>Diploma: Engineering: Chemical – Course Codes DI0800/DE0800</td>
</tr>
</tbody>
</table>

**YEAR 1: SEMESTER 1**
Applied Communication Skills 1.1: HKCOX1A
Listening skill; reading skills; comprehension skills; dictionary skills; constructing sentences; applying the correct writing style and paragraph development.

Engineering Chemistry I: AAEC1A
Matter and Measurement; Atoms; Molecules and Ions; Formulas, Equations, and Moles; Chemical reactions in aqueous solution; Periodicity and Atomic Structure; Ionic Bonds; Covalent Bonds and Molecular Structure; Chemical Equilibrium; Acids and Bases; Organic Chemistry.

Engineering Skills 1: EEESK1A
Explain the role of the engineer in society; Describe the tasks of the engineer; Explain the processes and related documents in engineering. Engineering Ethics

Mathematics 1: AMMAT1A
Standard functions and techniques; Differentiation; Integration; Vectors; Complex numbers

Physics 1: APHYS1A
Units waves and sound; The Principle of linear Superposition; Electromagnetic waves; Interference and the wave nature of light; The Reflection of Light; Lenses and optical instruments; Introduction and Mathematical Concept components; Kinematics in One Dimension; Forces and Newton’s Law of Motion; Work and Energy; Impulse and Momentum; Electric Forces and Electric Fields; Electric Potential Energy and the Electric Potential; Electric circuits; Fluids; Temperature and Heat; The transfer of heat; Nuclear Physics and Radioactivity

Social Intelligence 1: EESIN1A
Evaluate the importance of social intelligence in the engineering context; Demonstrate knowledge and understanding of self-identity and diversity; Apply critical, creative and conceptual and writing skills; Draw the parallels between global and local perspectives.

YEAR 1: SEMESTER 2
Applied Communication Skills 1.2: HKCOY1A
Power Point presentations; Communication Theory and Pronunciation.
Engineering Chemistry 2: AAECH2A
Inorganic chemistry: An introduction to chemical bonding; Covalent bonding and molecular structure; Chemical reactions in aqueous solutions; Acids, bases, and non-aqueous solvents; Groups; Reaction kinetics, titrations, pH studies

Introduction to Chemical Engineering 1: EHITC1A
Dimensions, Units and their Conversion; Moles density and concentration; Pressure and barometric measurements; Introduction to material balances; Closed and open systems; Batch and continuous processes; Solving material balance problems for single and multiple units without reactions; Chemical reaction equation and stoichiometry.

Computing Applications 1: EHCOA2A
Basic Microsoft Excel spreadsheet commands and functions; Advanced Microsoft Excel for Algebraic and Numerical computations; Data representation using tables and graphs; Introduction statistical analysis. Introduction to Computer Programming using Visual Basic for Applications in Microsoft Excel.

Mathematics 2: AMMAT2A
Differentiation: Hyperbolic functions; Parametric equations; Practical applications of maxima and minima and Partial differentiation. Integration: Standard integrals; Integration by parts; Partial fractions; Powers; Products of trigonometric functions and Integration tables. Statistics: Elementary sampling theory; Sampling distributions of means; Statistical estimation theory; Population parameters; Statistical decision theory; Statistical hypotheses; Theory for small samples; Learner’s t-distribution and Analysis of variance. Linear programming: Graphical representation; Matrices; Transpose; Inverse matrix; Gauss-elimination method for solving systems of equations; The simplex method and Maximizing and minimizing.

Physics 2: APHYS2A
Electric circuits; Magnetic forces and magnetic fields; Electromagnetic induction; Alternating current circuits; Fluids; The ideal gas law and kinetic theory; Thermodynamics; The nature of the atom; Ionizing radiation; nuclear energy; elementary particles; Kinematics in two dimensions; Dynamics of uniform circular motion; Rotational kinematics; Rotational dynamics; Simple harmonic motion and elasticity

Safety Principles and Law: HLSPA1A
Importance of health and safety; Fundamental safety concepts; Hazard control; Electrical safety; Tools and machines; Transportation; Materials handling; Visual environment; Noise and vibration; Ergonomics; Risk assessment and
management; Safety management; Safety systems; Safety analyses and management information

**Engineering Drawing 1: EMEDR1A**
Drawing instruments; Drawing skills; Object visualization and drawing; sketch and drawing of chemical engineering process equipment’s using computer software.

**YEAR 2: SEMESTER 1**

**Applied Communication 2.1: HKCOX2A**
Communication theory; Oral presentation; Technical writing skills; Group communication skills

**Chemical Process Industries: EHCP11A**
Industrial gases and heavy chemicals, Cryogenic air separation, Ammonia manufacture, Chlori-alkali industries; Inorganic acids, Sulphuric acid, Phosphoric acid, Nitric acid, Hydrochloric acid; Coal processing, Combustion, Destructive Distillation – By product coking, Gasification and Synthol processes; Petroleum refining, Petrol and its properties, Pre-treatment of crude oil, Separation of crude oil, Conversion processes; Industrial polymers, Synthetic Rubber, Plastics; Iron and steel making processes, Iron making, Steel making

**Engineering Chemistry: AAECHE3A**
Introduction to chemical bonding; Covalent bonding and molecular structure; Chemical reactions in aqueous solutions; Acids, bases, and non-aqueous solvents; Groups; Reaction kinetics, titrations, pH studies

**Mechanical Operations 1: EHMPO1A**
Particulate solids; Screening; Transportation and storage of solids; Comminution (Size Reduction); Size reduction equipment; Separation based on properties; Mixing; Froth Flotation.

**Material and Energy Balance 2: EHMEB2A**
Basic material balances on single units and on multiple systems; Chemical reaction equation and stoichiometry; Material balances for processes involving chemical reactions; Recycle; Bypass and Purge; Recycle and purge for processes involving chemical reactions; Heat balances without chemical reactions and heat balances involving chemical reactions.
### Management 1: BHMAN1A
Organizational structure and design, Organizational change and learning, Motivating for performance, The dynamics of leadership, Groups and teams in organizations; Operating strategies; Forecasting; Process planning and designing; Trade-off analysis; Automated processes; Allocating resources with LP; Decision trees; Facility location; Aggregate planning; Master production schedules; Inventory systems; Material requirements planning and Lot-sizing for MRP and CRP.

### Mathematics 3: AMMAT3A
Integration; Simpson's rule; first and second-order differential equations; Laplace transforms and their applications; Introduction to Numerical Methods; use mathematical software such as Matlab.

### YEAR 2: SEMESTER 2
#### Applied Communication Skills 2.2: HKCOY2A
The Business Plan; Corporate Identity and Intellectual Property, Corporate Communication, The Job Advertisement, Curriculum Vitae, Letter of Application, Interviews, Conflict Resolution, Problem Solving and Negotiation, Persuasion and Mediation, Meeting Procedures, Good Writing Etiquette, Business Etiquette and Electronic Media / Social Media Applications and Netiquette

#### Chemical Engineering Laboratory 1: EHCEL1A
Projects such as: Batch distillation; gas absorption with determination of mass transfer coefficient; thin film evaporator; vapour liquid equilibrium; filtration; cooling tower; boiling/condensation; refrigeration/heat pump; leaching.

#### Chemical Engineering Thermodynamics 1: EHCET2A
Introduction to thermodynamics, the first law and other basic concepts; Second Law of Thermodynamics, Volumetric behaviour of pure fluids; Heat Effect; Thermodynamics properties of fluids

#### Heat and Mass Transfer 1: EHHMT2A
Different modes of heat transfer: conduction, convection radiation. Heat transfer by conduction- Fourier’s law; Resistance of heat flow; derivation and application of equation for resistance in series and parallel. Heat transfer by convection- concept of the film; evaluation of individual film coefficients, derivation and application of the convection equation; definition and application of the overall heat transfer coefficient using mean area and mean temperature difference. Heat
transfer by radiation-definition of the term blackbody absorptivity and emissivity; definition and application of the Stefan-Boltzmann law. Basic principle of mass transfer, molecular diffusion (mass diffusion in gas phase, mass diffusion in liquid phase, mass diffusion through solid).

**Process Control 1: EHCP02A**

**Process Fluid Dynamics 1: EHPFD2A**
Units and Dimensions, System of units, Dimensional analysis, Scale-up methods; Fluid Statics, Hydrostatics, Pressure and pressure measurement devices; General Conservation Laws, Mass, momentum and energy relationships; Fluid Dynamics (general principles in fluid flow), Laminar & turbulence flow, Newtonian & non-Newtonian fluids and viscosity, Friction in pipes, Piping and pumping, piping auxiliaries, valves and 3D sigma, Non-circular conduits, Flow measuring devices

**YEAR 3: SEMESTER 1**

**Applied Thermodynamics 2: EHATH3A**
Steam/Vapour; Steam Condensers; Boiler; Turbines and Steam Cycles; Refrigeration

**Chemical Engineering Laboratory 2: EHCEL2A**
Projects such as: Continuous distillation; gas absorption with determination off mass transfer coefficient; thin film evaporator; vapour liquid equilibrium; filtration; cooling tower; boiling/condensation; refrigeration/heat pump; leaching.
**Chemical Process Design: EHCPR3A**
Computer simulation and financial assessment; Basic Cost Estimation and Economic Assessment; A simple flash calculation by hand and simulator; Material Streams: energy balances and flow sheeting on computer; Physical property data bases and predictive methods, Degrees of freedom in problem solution; Complex unit operations design; Design with recycles and application to improved design; Emphasis on operability & controllability of processes

**Environmental Engineering 1: EHENE1A**
Material & Energy balances and Separations; Reactors and Reactions; Water Quality & Water Treatment; Wastewater Treatment; Air Quality and Control; Solid Waste; Hazardous Waste; Types Pollution

**Separation Processes 1: EHSEP3A**
Introduction to processes separations; Distillation (binary system); Absorption; Evaporation; Drying; Crystallization

**Reactor Technology 1: EHRTE3A**
Reactor Mole Balance and definitions, Batch Reactor, Continuous Stirred Tank Reactor (CSTR), Plug Flow Reactor (PFR), Packed Bad Reactor, Semi-batch Reactor; Reaction Kinetics, Order of reactions, Type of reactions; Elementary and non-Elementary reactions, Reaction stoichiometry: development of stoichiometry table; Reactor design, Application to Batch reactor, Application to CSTR, Application to PFR; Data analysis, Application of integral method of analysis

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<td>Diploma: Engineering: Civil – Course Codes DI0810 DI0810</td>
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**SEMESTER 1 (Generic Faculty first semester)**
Applied Communication Skills 1
Writing Skills Basic Semester 1 and 2
Writing Skills more advance semester 3
Job related writing and presentation skills semester 4
Explain the basic concepts, principles and approaches in communication
Describe various communication models
Describe various types of communication
Conduct library research, personal interviews, and other information-gathering activities.
Effectively demonstrate reading as well as listening skills

Applied Communication skills 2
Develop interpersonal and professional interaction with clients and engineering teams. Use effective written and oral communication skills in the engineering setting. Effectively plan and execute a high quality oral presentation suitable for audience of peers, the general public, or any other appropriate group of listeners
Exercise ethical considerations in development and presentation of ideas
Develop communication skills that improve competence in intercultural communication.

Applied Mechanics 1
Measurement, Statics, mechanics, basics of structural engineering, mass, vectors, forces, properties of sections, friction. Laboratory work.

Computing Applications 2
On completion of this module learners should have a thorough understanding of the advanced functions of excel and to perform engineering computational tasks using computer applications: Basic Microsoft Excel spreadsheet commands; Advanced Microsoft Excel for Algebraic and Numerical computations; Data representation using tables and graphs; Introduction statistical analysis; Introduction to Computer Programming using Visual Basic for Applications in Microsoft Excel

Construction Methods 1
Construction Plant; Safety; Construction Methods: Foundations, Structures; Major Civil Engineering Structures: Roads, Bridges, Tunnels, Dams; Drainage; Infrastructures: Harbours, Airport, Railways; Labour-Enhanced Construction (LEC)

ICT Skills 1
Describe computers and computer systems;
Explain the organization and operation of computers;
Apply the concept of operating systems, including the features of MS DOS and Windows Operating Systems; Use the features of the modern word processing software, spreadsheet, PowerPoint presentation; Use the internet efficiently in
information gathering and e-mailing; Explain the concept of computer viruses, their needs and control.

**Construction Materials 1**
Overview of construction materials; Aggregates; Concrete, Structural Steel, Plastics, Clay products, Timber; Laboratory work.

**Construction Materials 2**
Overview of highway construction materials: Bitumen, Lime, Binders and Asphalt, Quality control of construction materials; Laboratory Work

**Civil Engineering Management I**
Overview of Civil Engineering Works; Contracts; Tendering; Office and site administration; Work study; Quality control and assurance.

**Civil Engineering Management 2**
Project management; Contract planning; Planning techniques; Financial planning techniques; Labour law; Pricing and cost planning; Basic computer software application.

**Documentation 1**
Quantities of civil works; specifications; Types of contracts; Conditions of contract; Compilation of tender documents; Law of contracts.

**Elements of Structural Steel & Timber Design 2**
Reinforced concrete: Limit state theory, Design of structural elements (Standard connections, Rectangular beams, T-beams and L-beams, slabs, staircases, flat slabs, Columns, foundations); Unreinforced masonry: Design basis; Laboratory work.

**Elements of Reinforced Concrete & Masonry Design 3**
Reinforced concrete: Design Basis, Limit –State Theory, Design of structural elements, Standard connections (SABS 0144), Rectangular beams, T-beams and L-beams, Slabs, Staircases, Flat slabs (introduction only), Columns, Cantilever type retaining walls, Foundations; Unreinforced Masonry: Design Basis, Introduction to the design of a simple wall column using empirical rules; Laboratory work and computer applications.

**Engineering Chemistry 1**
Recognize and explain the fundamental observations, models and experiments in Chemistry;
Explain the atomic and molecular structures;
Explain the principles and techniques of analytical chemistry;
Discuss the applications of analytical and physical chemistry; Carry out experimental qualitative analysis in physical and analytical chemistry; Understand and explain the principles of chemical thermodynamics.

**Engineering Chemistry 2**
To introduce the fundamentals and science of Inorganic chemistry with the study of the synthesis, reactions, structures and properties of compounds of the elements:

*Introduction to chemical bonding; Ionic bonds; Covalent bonding and molecular structure; The Group IA and IIA metals; Chemical reactions in aqueous solutions; Acids, bases, and non-aqueous solvents; Halogens*

**Engineering Drawing 1**
Basic Drawing Principles
Design Component
Identify and use drawing equipment;
Draw common objects using standardized rules;
Represent given data on graph.

**Engineering Drawing 2**
Elements of engineering design presentation: Buildings; plans, elevations, sections. Roads; layout plan, longitudinal sections, cross sections. Hydraulic structures; pipelines, water reticulation, sewer lines and treatment plants.

**Engineering Geology 1**
Introduction to geology; Minerals; Rocks; Geological structure; Surface processes; Geometric techniques; Historical geology

**Engineering Mathematics 1**
Compute problems involving different algebraic structures and the behavior of various mathematical series;
Define and manipulate polynomials, trigonometric and hyperbolic functions;
Explain the concept of scalars and vectors and their applications.
Permutations and combinations.
Explain the concept of statistics and their importance in engineering science
State and apply common theorems used in statistics
Collect, organize and present data in a scientific way.

**Engineering Mathematics 2**
Perform mathematical operations on matrices
Solve problems involving complex numbers
Differentiate and integrate elementary functions
Solve first order ordinary differential equations
**Engineering Physics 1**
Describe the mechanics and properties of matter;
Explain the principles of thermal physics;
Describe the mechanisms of heat transfer;
Explain the concept of sound motion and applications;
Determine the properties of matter.
Lightning, Heat and Sound.

**Engineering Physics 2**
*Projectile motion; rotational motion; simple harmonic motion and elasticity; fluids; gas behaviour; thermodynamics; current and capacitors; magnetism; nuclear physics, radioactivity and ionising radiation; Calculus*

**Engineering Skills 1**
Explain the role of the engineer in society;
Describe the tasks of the engineer;
Explain the processes and related documents in engineering.
Research Methodology
Ethics

**Engineering Survey 1**
Basic Principles; Coordinates (Traversing); Levelling; Tacheometry; Areas and volumes; Map projections; Practical

**Engineering Surveying 2**
Leveling; Traversing; Tacheometry; Setting out of Civil structures; Triangulation, Geographic information system; practical work.

**Workplace Based Learning (Civil)**
The ideal is to give the students work based learning experience in as many aspects related to Civil Engineering as possible. This would imply exposure to most of the topics listed below. The minimum requirement is that a student must acquire an acceptable level of proficiency in at least four (4) of the following major seven (7) categories: Administration; Drawing; Surveying; Design; Contracts; Construction supervision; Materials testing

**Fluid Mechanics 2 (Civil)**
Fluid properties; Fluid statics; Fluid flow; Flow in pipes; Flow measurement; Open channel flow; Introduction to pumps.
<table>
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<th>Social Intelligence 1</th>
<th>Safety Principles and Law 1</th>
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<td>HIV/AIDS Awareness</td>
<td>Describe the concepts of occupational health</td>
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<tr>
<td>Entrepreneurship</td>
<td>Describe the common occupational health problems</td>
</tr>
<tr>
<td>Social Skills</td>
<td>Understand the key OHSA responsibilities in an Engineering project</td>
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<td>Describe the related OHSA preparedness, prevention and responses at the workplace.</td>
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<td>Implement the OHSA management principles within a Engineering project</td>
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<td>Demonstrate the ability to create awareness and acceptance of preparedness and respond to OHSA issues within the workplace</td>
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<td>Explain the laws governing OHSA in South Africa</td>
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<td>Role of different standards</td>
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<thead>
<tr>
<th>Soil Mechanics 1</th>
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<tbody>
<tr>
<td>Engineering Soils; Soil composition; Soil Classification; Classification system for soils; Compactions; Laboratory work.</td>
<td>Water in soils; Measurement of shear strength: shear strength of soil, soil pressure on retaining walls, Stability of slopes, Bearing capacities of foundations, Deep foundations, Consolidation Settlement; Site Investigation.</td>
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<tr>
<th>Structural Analysis 3</th>
<th>Structural Analysis 4</th>
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<tbody>
<tr>
<td>Shear Stress; Momentary area theorems; Influence lines for statically determinant beams and frames; Struts; Combined stresses; Laboratory work.</td>
<td>Slope deflection; Clapeyron’s three moment theorem; Bending moment distribution; Plastic collapse mechanisms; Strain energy (Virtual work); Laboratory work and computer applications.</td>
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<tr>
<th>Theory of Structures 2</th>
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<tbody>
<tr>
<td>Sectional properties; Stresses and strain: Direct stress-strain, Theory of elastic bending, Torsional stress, Stress due to impact loading; Simply supported beams and cantilevers with point loads; Uniformly distributed and uniformly varying loads; Analysis of statically determinate pin-jointed frames; Laboratory work</td>
</tr>
</tbody>
</table>
**Transportation Engineering 1**
Transport planning; Transport Engineering; Geometric Design; Railway Design.

**Transportation Engineering 2**
Earthworks Design; Pavement Materials, Asphalt and Bitumen, pavement materials; Pavement Design and management; Surfacing; Drainage

**Water Engineering 1**

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<td>308124; 308224; 3308324; 308424</td>
</tr>
</tbody>
</table>

**Construction Materials Technology 4**
Concrete technology: Properties and materials; Production and supply; Special applications and testing. Asphalt and bitumen technology: Rehabilitation; Applications and design; Influence of the traffic and the environment and other materials. Testing.

**Earthworks Design 4**

**Geometric Design 4**
Hydraulics 4
Hydrodynamics, hydraulic machinery (pumps, turbines, etc.), hydraulic models, open channel hydraulics, Fluvial hydraulics and wave hydraulics.

Hydrology 4
Introduction to meteorology, groundwater, surface water, flood analysis, water resources analysis and SA Hydrology.

Pavement Technology 4
Pavement Design: Factors; Design life; Standard axles; Block; Flexible; Rigid and Modification. Pavement construction. Pavement evaluation and rehabilitation. Pavement management: Work programs; Pavement materials; Maintenance and Budgeting. Project.

Project Management 4
Planning of project; Management of projects; Handling project phase-out and transfers; Program plan; Management control; Quality and time management; Management systems; Computer applications and Project.

Pre-stressed Concrete Design 4
This module aims to provide both basic and in-depth understanding of the behaviour of Pre-stressed concrete structures at both service and ultimate load conditions. The module will consist of concrete material properties, methods and basic of Pre-stressing design for flexure and shear at both elastic and ultimate limit states, losses in Prestress, continuous beam, concordant profiles, Deflections and anchorage zone design. Application to concrete slabs. Computer applications.

Reinforced Concrete Design 4
General. Element design: Bases; Columns; Beams; Labs; Corbels and Pile caps. Structure types: Arches; Silos; Chimneys; Cores; Shear walls; Simple bridges and Water retaining structures. Computer applications. Project.
<table>
<thead>
<tr>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reticulation Design &amp; Management 4</strong></td>
<td>Hydraulic principles; Design parameters; Ancillary works; Pumping installations; System operation; Water management; Waste management; Environmental aspects and Design project.</td>
</tr>
<tr>
<td><strong>Solid Waste Management 4</strong></td>
<td>Characteristics of waste; Solid waste disposal methods; Design; Operation and management of landfill sites; Operation of management solid waste removal systems; Third world applications; Waste recycling; Emergency waste management and Legal aspects.</td>
</tr>
<tr>
<td><strong>Structural Analysis 4</strong></td>
<td>Virtual work. Arches- 3-pinned, 2-pinned and fixed: Rectangular; Portals; Segmental and Parabolic. Influence lines: Frames; Arches and Portals. Space frames. Suspension bridges; Cables and Stiffening girders. Computer applications.</td>
</tr>
<tr>
<td><strong>Structural Steel Design 4</strong></td>
<td>General. Element design: Beams; Columns; Trusses; Purlins; Girts; Crane girders and Bracing. Structure types: Heavy industrial buildings; Medium and High rise buildings and Industrial portal frame buildings. Computer applications. Project.</td>
</tr>
<tr>
<td><strong>Traffic Engineering 4</strong></td>
<td>Traffic surveys; Traffic characteristics and flow theory; Traffic design; Traffic management and urban works; Traffic safety; Statistical methods; Parking studies; Systems and structures; TSM; TDM traffic impact studies; Traffic control and forms of signing; Signals and ATC systems; Interchange and intersection capacity and Project.</td>
</tr>
</tbody>
</table>
**Transportation Planning 4**

**Transportation Technology 4**

**Urban Planning & Design 4**
Planning: Historical perspective; Modern trends; Land use; Legal procedure; Urban infrastructure management; Maintenance and Finance. Design: Structure; Residential layouts; Informal settlements and Design project.

**Waste Water Treatment Technology 4**
Waste water properties; Treatment processes; Treatment plant design; Environmental aspects; Plant operation and Design project.

**Water Treatment Technology 4**
Water properties; Treatment processes; Treatment plant design; Water recycling; Re-use; Recover and conservation; Environmental aspects; Plant operation and management and Design project.

<table>
<thead>
<tr>
<th>Department</th>
<th>Electronic Engineering</th>
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<tbody>
<tr>
<td><strong>Syllabi</strong></td>
<td><strong>NDip: Electronic Engineering – Course Codes 208083</strong></td>
</tr>
</tbody>
</table>

**Applied Communication 1.1 HKCOX1A**
Social Intelligence and Communication Theory; Critical Thinking; Globalisation;; Communication theory and its application in the workplace; Listening to improve your input at work; Reading and comprehending in a
professional environment; Reading skills; Comprehension skills; Professional writing and correspondence; Good writing style and what to avoid; Dictionary Skills and Introduction to research; Dictionary Skills; Helping with Research

**Applied Communication 1.2 HKCOY1A**
Communication theory; Oral presentation; Technical writing skills; Group communication skills

**Applied Communication 2.1 HKCOX2A**
Communication theory; Oral presentation; Technical writing skills; Group communication skills

**Applied Communication Skills 2.2 HKCOX2A**

**Applied Communication Skills 2**
Speaking and listening intensive, speaking and presentation skills, pronunciation, voice projection, pronunciation, vocabulary, intonation, inflection, accent neutralisation and PowerPoint presentation skills. Practical and functional application of Business Communication skills: meeting procedures, e-business, argumentative orals and interviews, persuasion, problem solving and negotiation skills, conflict resolution, netiquette, project management, business plans, networking and report writing.

**Chemistry 1**
Matter and energy; Atomic structure; Chemical bonding; Periodic table and nomenclature of inorganic compounds; Chemical equations and stoichiometry; Solutions; Acids, bases and salts; Chemical reactions; Chemical equilibrium; Electrochemistry and redox theory; Introduction to inorganic chemistry and Introduction to organic chemistry.

**Communication Skills**
Communication theory; Oral presentation; Technical writing skills and Group communication skills.

**Communication Skills (EDL)**
Life Skills; Basic English Language; Comprehension; Writing Skills and Reading Skills.
**Communication Skills (Module 1)**  
Basic English Language; Comprehension; Writing Skills and Reading Skills.

**Communication Skills (Module 2)**  
Basic English Language; Comprehension; Writing Skills and Reading Skills.

**Communication Studies 1A**  
Life Skills; Basic English Language; Comprehension; Writing Skills and Reading Skills.

**Communication Studies 1B**  
Effective study skills; Speaking and listening; Communication in small groups; Meetings, Fact finding; Information gathering and Interviews.

**Communication Studies 2**  
Communication theory; Oral presentation; Technical writing skills and Group communication skills.

**Computer Aided Draughting 1**  
Introduction to a 3D parametric software interface; Creating sections, parts, assemblies and drawings.

**Computer & Programming Skills 1**  
MS-DOS principles and applications, integrated software packages such as work processors and spreadsheets and the Windows environment.

**Computer Skills**  
MS-DOS principles and application, integrated software packages such as work processors and spreadsheets and the Windows environment.

**Computer Skills 1**  
### Computing Applications for Engineering
Basic Microsoft Excel spreadsheet commands and functions; Advanced Microsoft Excel for Algebraic and Numerical computations; Data representation using tables and graphs; Introduction statistical analysis. Introduction to Computer Programming using Visual Basic for Applications in Microsoft Excel.

### Computing Applications 2 AICOA2A

#### Control Systems 2
Introduction, Laplace transform, differential equations, complex variables, block diagrams, modelling of physical systems like RLC circuits, Routh Hurwitz stability criteria, time domain analysis of control systems, frequency-domain analysis, Nyquists, Bode and Nichols chart.

#### Control Systems 3
Matrix theory, state equations, signal-flow graphs, signal flow algebra, gain formula for signal-flow graphs, mathematical modelling of physical systems, DC motors, gear trains, potentiometers and tachometers, state variable analysis, Root-locus technique and design of control systems.

### Chemical Process Design Principles
Computer simulation and financial assessment; Basic Cost Estimation and Economic Assessment; A simple flash calculation by hand and simulator; Material Streams: energy balances and flow sheeting on computer; Physical property data bases and predictive methods; Degrees of freedom in problem solution; Complex unit operations design; Design with recycles and application to improved design; Emphasis on operability & controllability of processes.

### Chemical Process Industries 1
Industrial gases and heavy chemicals; Inorganic chemicals; Agricultural chemicals; Coal processing; Petroleum refining; Industrial polymers; Iron and steel; Pulp and paper and Sugar refining.

### Construction Methods 1
Construction methods: Labour; Equipment; Material; Earthworks; Correct equipment; Safe slopes; Dewatering techniques; Foundations; Types; Piles;
Caissons; Structures; Concrete; Steel; Timber; Bricks; Components; Roads; Bridges and tunnels; Types; Stormwater; Drainage; Sub-soil drainage; Dams and canals; Types; Typical cross-sections; Pipes; Stormwater; Water supply; Waste water; Construction techniques; Manholes; Trackwork; Harbours; Airports; Moving of services and repair work. Construction plant: Major types; Large plant; Small plant; Earthmoving calculations; Plant management and tyres. Safety: NOSA, Factory Machinery and Building Act and new replacement laws; Acts for Mines and Works and explosives. Codes and building regulations: SABS 0120; SABS 1200 and Quality control.

**Control Systems 2**
Typical control systems, Laplace transform, Differential equations, Complex variables, Block diagrams, Modelling, Routh Hurwitz, Time domain, Frequency-domain, Nyquist, Bode and Nicholls charts.

**Costing and estimating 1.1**
Elements of cost
Introduction to elementary accounts
Absorption costing
Marginal costing
Cost-volume-profit analysis
Budgeting
Profitability of new projects
Just-in-time accounting

**Database Principals 3**
Conceptual and Logical modelling of data, Physical implementation on SQL DBMS.

**Database Principals 3**
System theory, data modelling, normalisation and relation models.

**Database Programming 4**
Advanced SQL Programming on MS SQL server.

**Design Project 3**
Design, construction, testing and documentation of a complete project in an applicable field of specialisation.
**Digital Communication 2**
Differentiation between analogue and digital signals, spread spectrum systems, digital modulation, noise and interference, compression and error detection and communication networks and protocols.

**Digital Control Systems 4**
Sampled data systems, Pulse transfer functions, Stability analyses and root locus techniques, Digital controller design.

**Digital Process Control 2**
Industrial networks for modern Instrumentation control environments.

**Digital Process Control 3**
Distributed Control Systems.

**Digital Signal Processing 4**
Discrete systems and signals, Convolution, Z transform and discrete Fourier transform, Digital filter design.

**Digital Systems 1**
Number systems, Binary codes, Logic gates, Boolean algebra, Simplification Techniques and Combinational logic.

**Digital Systems 2**
Logic families, Multi-vibrators, Sequential Logic, Analogue and Digital, Display and Memory concepts.

**Digital Systems 3**
Memories, Basic microcomputer systems, Microcontrollers, Assembler and C programming.

**Electrical Distribution 3**
Principles of transmission and distribution; Conductors; Insulators; Cables-low and high voltages; Isolators; Bushings; Time supports; Overhead lines and Dampers.

**Electrical Engineering 1**
Introduction to electrical engineering quantities and their application; Batteries; DC theory and network analysis; Capacitance; Electromagnetism; Magnetic circuits; Inductance; Basic AC theory and measurements.

**Electrical Engineering 2**
AC networks; Resonance; Series and parallel circuits; Power factors correction (single phase circuits); AC and DC network theorems; Harmonics and Three-phase circuits.

**Electrical Engineering 3**
Advanced three-phase circuits; Rectification and inversion; Illumination; Interconnectors and Components.

**Electrical Machines 2**
Direct current machines; Single-phase transformers and Three-phase induction machines.

**Electrical Machines 3**
Three-phase transformers; Induction machines and Synchronous machines. Introduction; Basic theory; Fault calculation; Fuses and Fuse protection.

**Electrical Machines 4**
Synchronous Alternators, Synchronous Motors, Induction Motors, Design.

**Electrical Power Systems 4**
**Electrical Protection 3**

**Electrical Protection 4**

**Electrical Protection Technology 4**
Z-bus and Symmetrical Faults, Symmetrical Components and Sequence Networks, Unsymmetrical Faults.

**Electronic Applications 3**
PIC micro-controller application and programming in the field electronic communication using MPLAB and FlowCode software.

**Electronic Communication 2**
Introduction to radio frequency communication; Radio frequency components; Resonance; Modulation AM FM and phase; Radio wave propagation; Basic antenna theory and dB’s

**Electronic Measurements 3**
Electronic measuring methods; Principles of electronic instruments; Digital meter; Tests and Measurements.

**Electronics 1**
Basic measurements; Semiconductor theory; Diodes; Transistor theory; Capacitance and Applied technology.

**Electronics 2**
Field-effect transistors; Other semi-conductor apparatus; Basic rectification; Single-stage transistor amplifiers and Applied technology.
**Electronics 3**
Advanced voltage regulators; Amplification theory and applications; Oscillators; Power amplifiers; Passive filter design and Noise.

**Electronics 4**
Advanced biasing; Universal preamplifier; Three stage semi-power amplifier signal sources and Signal processing; Power amplifier; Power supply; RF coil; Differential amplifier; Dual-gate MOSFET and Power MOSFET.

**Engineering Management 1 BHMAN1A**

**Engineering Mathematics 1 AMMAT1A**
Basic mathematics; Differentiation 1; Integration 1; Statistics A1.

**Engineering Mathematics 2 AMMAT2A**
Differentiation II; Integration II; Matrix algebra; Differential equations (first order).

**Engineering Physics 1 APHYS1A**
Introduction to vectors; Movement in a straight line; Projectile movement, Newton’s laws; Work and energy; impulse and momentum; Equilibrium statistics; Rotational movement; Elasticity; Statistical fluids; Dynamic fluids; Heat, temperature and expansion; Heat Transfer; First and second laws of thermodynamics; Electrostatics; Electricity; Magnetism; Electromagnetic induction; Basic electronics; Nature and propagation of light; Mirrors; Lenses; Prisms; Illumination; Interference, diffraction and polarisation; Introduction to nuclear physics; Practical physics.

**Engineering Physics 2 APHYS2A**
Projectile motion; rotational motion; simple harmonic motion and elasticity; fluids; gas behaviour; thermodynamics; current and capacitors; magnetism; nuclear physics, radioactivity and ionising radiation; Calculus.

**Engineering Skills 1 EEESK1A**
Manipulate standard functions and techniques; perform and apply differentiation techniques; perform and apply integration techniques; use, analyse and apply vectors to solve problems; manipulate complex numbers.
<table>
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<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td><strong>Entrepreneurship 2</strong></td>
<td>Economical business environment; Entrepreneurship; Business types; Financial principals and Market concepts.</td>
</tr>
<tr>
<td><strong>Entrepreneurship 4</strong></td>
<td>Strategic management; Models for business; Situation analysis for business; Strategy formulation; Implementation and control; Continuous improvement approaches; Case studies and Projects.</td>
</tr>
<tr>
<td><strong>Environmental Engineering 1</strong></td>
<td>Material &amp; Energy balances and Separations; Reactors and Reactions; Water Quality &amp; Water Treatment; Wastewater Treatment; Air Quality and Control; Solid Waste; Hazardous Waste; Types Pollution</td>
</tr>
<tr>
<td><strong>ICT Skills 1 ASICT1A</strong></td>
<td>Recognizing Computers; Using Microsoft Windows 7 Professional; Common Elements; Using Microsoft Word 2010; Using Microsoft Excel 2010; Using Microsoft PowerPoint 2010; Getting Connected; Using the Internet.</td>
</tr>
<tr>
<td><strong>Industrial Electronics 2</strong></td>
<td>PLC’s, logic circuits and transducers.</td>
</tr>
<tr>
<td><strong>Industrial Project 4</strong></td>
<td>A study field related project and scientific report. It can be an artefact, workplacebased investigation or a solution to a substantial industrial problem.</td>
</tr>
<tr>
<td><strong>Information Systems</strong></td>
<td>Structure and strategic organisational role; Computer system resources; Decision support system and executive information systems; Development and implementation of information systems and Assignments.</td>
</tr>
<tr>
<td><strong>IT Essentials</strong></td>
<td>System Software 1.1 – A-plus software and hardware.</td>
</tr>
</tbody>
</table>
Management Skills
Business management skills.

Mathematics 1
Basic mathematics: Algebra; Logarithms; Graphs; Trigonometry; Radian measure; Sine function; Cramer’s rule; determinations and simultaneously linear equations. Differentiation: Increments; Limits (Binomial theorem); Function of a function; Products; Quotients and Logarithmic differentiation. Integration: The definite integral and numerical integration. Statistics: Frequency distributions; Measures of locality and dispersion; x; s; Regression and correlation; Elementary probability theory; Probability distributions, Binomial and Poisson.

Mathematics 2
Differentiation: Hyperbolic functions; Parametric equations; Practical applications of maxima and minima and Partial differentiation. Integration: Standard integrals; Integration by parts; Partial fractions; Powers; Products of trigonometric functions and Integration tables. Statistics: Elementary sampling theory; Sampling distributions of means; Statistical estimation theory; Population parameters; Statistical decision theory; Statistical hypotheses; Theory for small samples; Learner’s t-distribution and Analysis of variance. Linear programming: Graphical representation; Matrices; Transpose; Inverse matrix; Gauss-elimination method for solving systems of equations; The simplex method and Maximising and minimising.

Mathematics 3
Applications of integration; First order differential equations and D-operators.

Mathematics 4
Applications of integration; Laplace transform; First order differential equations and D-operators and Two dimensional Laplace equations.

third law of thermodynamics. Phase equilibrium in a single component system; Gas reactions; Reactions of pure condensed phases and a gas phase; The behaviour of solutions; Free energy composition and phase diagrams of binary systems; Reaction equilibrium in condensed solutions and Project.
Metallurgy 1
Module A: Material properties; Atomic bonding; Crystalline structures; Heat treatment; Metals alloys and applications; Ceramics; Polymers; Composites; Environmental degradation and Forming processes.
Module B: Overview of geology; Mining; Ore preparation and Extraction processes.

Microwave Communication 3
Microwave fundamentals; Microwave transmission lines; Impedance matching using the Smith chart; Microwave components; Microwave generations and Microwave applications.

Microwave Engineering 4
Design of microwave amplifiers and circuits using S parameters; Micro-strip design; Design of microwave antennae; Microwave measurements; Industrial applications and Utilisation of CAD.

Micro Systems Design 4
Microcontroller embedded design using high level programming.

Network Systems 2.1
CISCO Exploration CCNA1 and (mod 2) CISCO Exploration CCNA2.

Network Systems 3.1
CISCO Exploration CCNA3 and (mod 2) CISCO Exploration CCNA4.

Network Systems 4
CISCO Discovery CCNA3, Security.

Physics
Simple harmonic motions; Moment of inertia; Thermodynamics; Torque rotation; Acceleration and Electricity.
Physics 1
Introduction to vectors; Movement in a straight line; Projectile movement; Newton’s Laws; Work and energy; Impulse and momentum; Equilibrium statistics; Rotational movement; Elasticity; Statistical fluids; Dynamic fluids; Heat, temperature and expansion; Heat transfer; First and second laws of thermodynamics; Electrostatics; Electricity; Magnetism; Electromagnetic induction; Basic electronics; Nature and propagation of light; Mirrors; Lenses; Prisms; Illumination; Interference, diffraction and polarisation; Introduction to nuclear physics and Practical physics.

Plant Design
Design report; PRO II / ASPEN; HEXTRAN simulation software; Design and optimisation of process units; Reactors; Columns; Heat exchangers and cost calculations, Hazop study; P & ID and PFD.

Power Electronics 3
Rectifiers; Converters and semi-conductor switches. Application: Harmonics; AC drivers; DC drivers and Switch mode power supplies.

Power Electronics 4
AC drivers; DC drives; Inverters; Multilevel inverters; FACTS; Power conversion applications and Resonant conversion techniques.

Process Control
Control of chemical processes: Incentive of chemical process control, Design aspects of a process control system, Control modes (P, PI, PD, PID). Analysis and Design of advanced control systems: Introduction to feedback control, Control systems with multiple loops, Split range control, Feed forward control, Ration control, Adaptive control, Inferential control, Design of control systems for Multivariable processes: Introduction to plant control.

Modelling the dynamic and static behaviour of chemical processes: Development of a mathematical model, Modelling considerations for control purpose. Instrumentation: P&ID (Piping and Instrumentation Diagrams), Temperature measurement, Pressure measurement, Flow measurement, Level measurement.
**Process Control 4**
The control of a chemical process; Modelling the static and dynamic behaviour of chemical processes; Analysis of the dynamic behaviour of a chemical process and Analysis and design of feedback control systems.

**Process Fluid Dynamics 1**

**Process Instrumentation 1**
Process-measurement applications, Process control principles.

**Process Instrumentation 2**
Calculation of applicable and specific process parameters; Process controllers and other measurement applications.

**Process Instrumentation 3**
Instrumentation for unsafe environments; Plant unit operation and control; Telemetering applications; Radio-active instrumentation applications and Process analysers.

**Process Instrumentation 4**
Process analysers; Measurement and control of water and air pollution; Instrumentation engineering; commissioning of newly constructed plants; PLC’s and DCS systems.

**Professional Skills (Module 1)**
Job searching; Interviews; CV compilation; Report writing and Oral presentation.

**Professional Skills (Module 2)**
Job searching; Interviews; CV compilation; Report writing and Oral presentation.
<table>
<thead>
<tr>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>Programming 1</td>
<td>Programming and language; Variables; Data types and Program control.</td>
</tr>
<tr>
<td>Programming 2</td>
<td>Files; Links; Subroutines; External functions; Recursion; State machines and Numerical analysis.</td>
</tr>
<tr>
<td>Programming 3</td>
<td>Hardware linking; Assembly linking; Interrupts; Concurrency and resident programmes.</td>
</tr>
<tr>
<td>Project</td>
<td>Research Project: Experimental work to include draft report and oral presentation.</td>
</tr>
<tr>
<td>Project Engineering</td>
<td>Need and advantages of project management; Definition of the project; Modern project planning methods; Communication and presentation of information; Feasibility studies; Project implementation; Support of operational systems, Case studies and Computer applications.</td>
</tr>
<tr>
<td>Project Management 4</td>
<td>Planning of project; Management of projects; Handling project phase-out and transfers; Program plan; Management control; Quality and time management; Management systems; Computer applications and Project.</td>
</tr>
<tr>
<td>Project Research</td>
<td>Problem identification; Choices and use of measuring instruments; Literature study; Experimental design; Analysis and interpretation of data; Composition of the project report; Case studies and Projects.</td>
</tr>
</tbody>
</table>
**Projects 1**
Applicable computer aided drawing; Ergonomic and aesthetic design principles in construction; Operational procedures and maintenance; Construction techniques and Documentation.

**Projects 2**
CAD component and footprint creation; CAD development of project; Simulation; Construction; Testing and Documentation.

**Radio Engineering 3**
Frequency generation; Modulation; Demodulation and AM SSB and FM; Antennas and Transmission lines.

**Radio Engineering 4**
Theory and design of radio frequency amplifiers (all classes); Radio frequency transmission and systems; Measurements; Theory and design of antennas and Utilisation of CAD.

**Safety Principles and Law 1 HLSPA1A**
Importance of health and safety; Fundamental safety concepts; Hazard control; Electrical safety; Tools and machines; Transportation; Materials handling; Visual environment; Noise and vibration; Ergonomics; Risk assessment and management; Safety management; Safety systems; Safety analyses and management information

**Satellite Communication 4**
History of satellite communication; Orbital parameters; Link design; Platform and payload; Space environment and Launches and deployment.

**Social Intelligence 1 EESIN1A**
Evaluate the importance of social intelligence in the engineering context; Demonstrate knowledge and understanding of self-identity and diversity; Apply critical, creative and conceptual and writing skills; Draw the parallels between global and local perspectives.
Applied Communication 1.1 (HKCOX1A)
Social Intelligence and Communication Theory; Critical Thinking; Globalisation; Communication theory and its application in the workplace; Listening to improve your input at work; Reading and comprehending in a professional environment; Reading skills; Comprehension skills; Professional writing and correspondence; Good writing style and what to avoid; Dictionary Skills and Introduction to research; Dictionary Skills; Helping with Research

Applied Communication 1.2 (HKCOY1A)
Communication theory; Oral presentation; Technical writing skills; Group communication skills

Applied Communication 2.1 (HKCOX2A)
Communication theory; Oral presentation; Technical writing skills; Group communication skills

Applied Communication Skills 2.2 (HKCOX2A)
Speaking and listening intensive, speaking and presentation skills, pronunciation, voice projection, pronunciation, vocabulary, intonation, inflection, accent neutralisation and PowerPoint presentation skills. Practical and functional application of Business Communication skills: meeting procedures, e-business, argumentative orals and interviews, persuasion, problem solving and negotiation skills, conflict resolution, netiquette, project management, business plans, networking and report writing.

Automation 3 (EBAUT3A)
Introduction: What is production? What is automation? What is a system? Automation considerations; Levels of automation; Jigs and figures and its applications; Press work and material usage; Fundamentals of manufacturing and high volume production systems; Numerical control production system; Press work processes: Features of tools: Design of progression tooling, Calculation for minimum material usage; Pneumatic and hydraulic automation of a workstation; Transfer machine; CNC machines: Types, Classification and Writing a programme; The selection of the correct level of automation (cycle time, quantity,
Computer Aided Draughting 1 (EBCAD1A)
Introduction to a 3D parametric software interface; Creating sections, parts, assemblies and drawings.

Computing Applications 2 (EBCOA2A)
Basic Microsoft Excel spreadsheet commands and functions; Advanced Microsoft Excel for Algebraic and Numerical computations; Data representation using tables and graphs; Introduction statistical analysis. Introduction to Computer Programming using Visual Basic for Applications in Microsoft Excel.

Costing 2 (BACOS2A)
Elements of cost; The introduction of elementary accounts; Absorption / marginal costing; Cost-Volume-Profit analyses; Budget and Standard costing variance analysis.

Costing and estimating 1.1 & 1.2 (BACEX1A & BACEY1A)
Elements of cost; Introduction to elementary accounts; Absorption costing; Marginal costing; Cost-volume-profit analysis; Budgeting; Profitability of new projects; Just-in-time accounting

Electrical Engineering 1 (EPEEN1A)
Introduction to electrical engineering quantities and their application; Batteries; DC theory and network analysis; Capacitance; Electromagnetism; Magnetic circuits; Inductance; Basic AC theory and measurements.

Electrical Engineering II (EPEEN2A)
AC networks; Resonance; Series and parallel circuits; Power factors correction (single phase circuits); AC and DC network theorems; Harmonics and Three-phase circuits.
**Engineering Chemistry 1 (AAECH1A)**
Matter and energy; Atomic structure; Chemical bonding; Periodic table and nomenclature of inorganic compounds; Chemical equations and stoichiometry; Solutions; Acids, bases and salts; Chemical reactions; Chemical equilibrium; Electrochemistry and redox theory; Introduction to inorganic chemistry; Introduction to organic chemistry.

**Engineering Skills 1 (EEESK1A)**
Manipulate standard functions and techniques; perform and apply differentiation techniques; perform and apply integration techniques; use, analyse and apply vectors to solve problems; Manipulate complex numbers.

**Engineering Work Study 1 (EBEWS1A)**
Introduction to work study; Productivity; Choice of study method techniques; Study method (standard level); Work measurement (time study); Human factors; Ergonomics; Working conditions and environment, Jigs and fixtures (introduction) and Computer applications.

**Engineering Work Study 2 (EBEWS2A)**
Work environment design; Value engineering; Proposed method implementation; Standard data; Formula construction; Predetermined time systems; Work sampling; Standard follow-up and times; Wage payment and Training other management practices.

**Engineering Work Study 3 (EBEWS3A)**
Information systems analysis and design; Performance improvement programmes; Entrepreneurship theory; Financial plan; Marketing plan and Business plan

**Entrepreneurship 4 (EBESA4A)**
Strategic management; Models for business; Situation analysis for business; Strategy formulation; Implementation and control; Continuous improvement approaches; Case studies and Projects.

**Facility Layout & Materials Handling 2 (EBFLA2A)**
Introduction; Facilities in general; Elementary flow system: Material; People; Equipment and Information; Process design; Auxiliary services; Employee
services; Handling systems: Types; Design; Constructing and Evaluation; The problems with material handling: Area location; Layout evaluation and Selling the layout.

**Financial Planning and Control 3.1 & 3.2 (EBFPX3A & EBFPY3A)**
Elements of costs in production; fixed and variable costs, marginal costs and break-even analysis; The concept of contribution and profitability of marginal products; Planning and controlling plant and equipment expenditure, sources of funds for financing plant and equipment; Long term investment decisions, budgeting and budgetary control; The relationship between the production manager and the cost accountant; Computer software application.

**ICT Skills 1 (ASICT1A)**
Recognizing Computers; Using Microsoft Windows 7 Professional; Common Elements; Using Microsoft Word 2010; Using Microsoft Excel 2010; Using Microsoft PowerPoint 2010; Getting Connected; Using the Internet.

**Industrial Accounting 3 (EBIAC3A)**
Introduction: The finance function; Financial analysis; Planning and Control. Working capital management: Working Capital; Inventory models; Credit management and Investment decisions. Capital budgeting techniques; Risk and investment return; Cost of capital and Capital structure and leverage.

**Industrial Leadership 3 (EBILE3A)**
Managers, diversity and change; Environment competitive advantage and quality operations; International management; Managing ethics and social responsibilities; Fundamentals of planning; Strategic management; Organising; Human resource management; Leading; Motivation; Communication; Interpersonal skills; Group dynamics; Innovation and planned changes and Controlling.

**Introduction to Marketing Management 1.1 & 1.2 (EBMMX1A & EBMMY1A)**
Modern Marketing; The Market; The Product; Distribution structure; Pricing policy and pricing systems; Promotional activities; Planning and evaluation of marketing strategies; Case studies.
Information Systems 4 (EBINA4A)
Structure and strategic organisational role; Computer system resources; Decision support system and executive information systems; Development and implementation of information systems and Assignments.

Labor Law 1.1 (HLAWX1A)
Common law contract of service; Collective labor law includes a working knowledge of the following acts: Labour relations, Work force training, Basic employment conditions, Workmen’s compensation, Unemployment Insurance and the Wages Act

Logistics Engineering 4 (EBLIA4A)
Introduction to logistics; Measures of logistics; System operational requirements; Logistics in systems design; Systems operation and support; Logistics support management and Projects.

Manufacturing Relations 2 (EBMRE2A)
Introduction; Personnel and the personnel function; Job design; Analysis and evaluation; Interviewing. Human relations: Importance; Motivation theories; Organisation climate; Stress and Conflict handling. Labour relations. Labour economy: Demand and supply; Collective bargaining; Law machinery; Acknowledged agreements and Negotiations.

Mathematics 1 (AMMAT1A)
Basic mathematics: Algebra; Logarithms; Graphs; Trigonometry; Radian measure; Sine function; Cramer’s rule; determinations and simultaneously linear equations. Differentiation: Increments; Limits (Binomial theorem); Function of a function; Products; Quotients and Logarithmic differentiation. Integration: The definite integral and numerical integration. Statistics: Frequency distributions; Measures of locality and dispersion; x; s; Regression and correlation; Elementary probability theory; Probability distributions, Binomial and Poisson.

Mathematics 2 (AMMAT2A)
Differentiation: Hyperbolic functions; Parametric equations; Practical applications of maxima and minima and Partial differentiation. Integration: Standard integrals; Integration by parts; Partial fractions; Powers; Products of trigonometric functions and Integration tables. Statistics: Elementary sampling
theory; Sampling distributions of means; Statistical estimation theory; Population parameters; Statistical decision theory; Statistical hypotheses; Theory for small samples; Learner’s t-distribution and Analysis of variance. Linear programming: Graphical representation; Matrices; Transpose; Inverse matrix; Gauss-elimination method for solving systems of equations; The simplex method and Maximising and minimising.

**Mathematics 3 (AMMAT3A)**
Applications of integration; First order differential equations and D-operators.

**Engineering Drawing 1 (EMEDR1A)**
SABS 0111; Part 1-1990 Instruments; Sketching; Orthographic projection; Intersection; Development and interpenetration and Ellipse. Machine drawing: Tolerance and machining symbols and drawing on orthographic projection; Sectional vies of assemblies of machine parts and Costing.

**Mechanical Manufacturing Engineering 1 (EMMEN1A)**
Safety and safety legislation; Identification and application of materials; Elementary measuring equipment and Elementary hand and Machine tools.

**Mechanical Manufacturing Engineering 2 (EMMME2A)**
Fault diagnosis; Failure analysis and measuring equipment; Test methods; Interpretation and action; Power metallurgy; Metal forming; Erosion; Casting; Plastics-moulding and machining; Welding and joining and Obtaining finish and accuracy.

**Manufacturing Technology 1.1 (EBMFX1A)**
Safety and safety legislation; Manufacturing methods, techniques and processes; Hand tools; Power tools; Marking out; Cutting tools and cutting fluids; Drilling machines; Center Lathe; Pedestal grinder and sawing machines; Joining

**Manufacturing Technology 1.2 (EBMFY1A)**
Introduction to product development; PACE - An integrated process for product & cycle time excellence; Core team approach to project organization; Design techniques and automated development; Product strategy; Technology management; Evolution of the product development process; Implementing PACE
**Mechanics 1 (EMMEC1A)**  
Statics: Reaction; Resultant and Moments of force. Centre of gravity; Friction; Dynamics; Linear and angular motion; Momentum and impulse; Work energy and power and Radial acceleration.

**Mechanics of Machines 2 (EMMOM2A)**  
Torque acceleration; Vehicle dynamics; Simple lifting machines; Hoists and haulages; Moment of inertia; Simple harmonic motions and Power transmission.

**Operations Management 1.1 (Industrial) (EBOPX1A)**  
Introduction to production management; Product and service design; Application of forecasting; Facilities planning and layout; Location planning and analysis; Capacity management; Productivity, competitiveness and strategy; Process selection and capacity planing

**Operations Management 1.2 (Industrial) (EBOPY1A)**  
Introduction to reliability centered maintenance; Functions; Functional failure Failure modes and effects analysis; Consequences; Proactive maintenance; Default action; Implementing reliability centered maintenance; Applying the reliability centered maintenance process; What reliability-centered maintenance achieves

**Operations Management 2.1 (EBMAX2A)**  
Management functions; Business functions; Inventory management; Master production schedule; Material requirements planning

**Operations Management 2.2 (EBMAY2A)**  
Just-in-time systems; Scheduling of operations; Quality management; Decision-making; Linear programming; The transportation module; Supply chain management; Project management

**Operations Management 3.1 (EBMAX3A)**  
Production planning; Production control; Quality control & quality management Purchasing; Rating and productivity; Project management; Application of quality management; Maintenance management; Case studies; Use of computer in solving problems
Organizational Effectiveness 1.1 (EBOGX1A)
Introduction to Work Study; Productivity; Method study; Work measurement (time study); Human factors in work study; Ergonomics; Working conditions and environment; Jigs and fixtures

Organizational Effectiveness 1.2 (EBOGY1A)
Introduction to business logistics; Defining the logistic product; Logistic customer service; Forecasting logistics requirement; The storage and handling systems; Storage and material handling decision; Purchasing and production scheduling decision; Inventory policy decision

Organizational Effectiveness 2.1 (EBOGX2A)
Revision of work study techniques; Compiling of operations procedures; Advanced work measurement; Application of ergonomics; Indices of production factors; Value analysis; Work environment design; Value engineering; Proposed method implementation; Standard data; Formula construction; Predetermined time systems; Work sampling; Standard follow-up time; Wage payment; Training other management practices

Organizational Effectiveness 2.2 (EBOGY2A)
Facilities in general; Elementary flow system: Material, People, Equipment, Information; Process design; Auxiliary services; Employee services; Handling systems: Types, Designs, Constructing, Evaluation, Problems with material handling; Area location; Layout evaluation; Selling the layout

Organizational Effectiveness 3 (EBOEG3A)
Information systems analysis and design; Performance improvement programs Entrepreneurship theory; Financial plan; Marketing plan; Business plan; Computer applications; Consultation theory; Project management (review); A 6-month industrial project under supervision of an industrial mentor

Operations Management Techniques II (EBMAT2A)
Game Theory & applications; Decision analysis; Decision trees; Fundamentals of decision theory; Probability concepts and distributions; Forecasting; Inventory models; Involved formulation of decision problems; Graphical solution to linear programming problems; The simplex method; Use of computer in solving problems
Operations Management Techniques III (EBMAT3A)
Multi-dimensional LP; Matrix algebra; Involved LP problems; Sensitivity analysis and dual simplex algorithm; Changing the LP problem; Duality theory Transportation and assignment models; Integer programming; Dynamic programming; Network models; Project management; Waiting lines & queuing theory; Markov analysis; Use of computer in solving problems

Operations Management 4.1 (EBOMX4A)
Project Management, Source analysis; Re-engineering; The Patterson system of job evaluation; Computer assisted manufacturing.

Operations Management Techniques 4.2 (EBOTY4A)
Network analysis; Linear programming; Dynamic programming; Game theory Queuing theory Computer based production; Information and Control systems.

Operational Research 3 (EBORE3A)
Introduction; Decision theory; Decisions trees; Linear programming and formulation; Transportation and network algorithms; Markov analysis; Project management; Simulation; Dynamic programming; Game theory and applications and Use of software packages.

Physics I (APHYS1A)
Simple harmonic motions; Moment of inertia; Thermodynamics; Torque rotation; Acceleration and Electricity.

Physics 1 (APHYT1A)
Introduction to vectors; Movement in a straight line; Projectile movement; Newton’s Laws; Work and energy; Impulse and momentum; Equilibrium statistics; Rotational movement; Elasticity; Statistical fluids; Dynamic fluids; Heat, temperature and expansion; Heat transfer; First and second laws of thermodynamics; Electrostatics; Electricity; Magnetism; Electromagnetic induction; Basic electronics; Nature and propagation of light; Mirrors; Lenses; Prisms; Illumination; Interference, diffraction and polarisation; Introduction to nuclear physics and Practical physics.

Production Engineering 1 (EBPEN1A)
Operating strategies; Forecasting; Process planning and designing; Trade-off analysis; Automated processes; Allocating resources with LP; Decision trees;
Facility location; Aggregate planning; Master production schedules; Inventory systems; Material requirements planning and Lot-sizing for MRP and CRP.

**Production Engineering 2 (EBPEN2A)**
Capacity management; Forecasting; Linear programming; Transportation algorithms; Assignment problems; Scheduling product focused; Manufacturing; Planning and scheduling service; JIT manufacturing; Activity scheduling; MRP I and MRP II; Project planning and control; Scheduling batch processing; Design and scheduling flow; Processing systems; Material and purchasing and Maintenance management and reliability

**Production Technology 4 (EBPTA4A)**
Resources for advanced manufacturing; Uses of more sophisticated technologies; Effective manufacturing equipment; Process planning and factory management; Computer-integrated manufacturing and Project and computer applications.

**Project Engineering 4 (EBPIA4A)**
Need and advantages of project management; Definition of the project; Modern project planning methods; Communication and presentation of information; Feasibility studies; Project implementation; Support of operational systems, Case studies and Computer applications.

**Project Research 4 (EBPNA4A)**
Problem identification; Choices and use of measuring instruments; Literature study; Experimental design; Analysis and interpretation of data; Composition of the project report; Case studies and Projects.

**Qualitative Techniques 1 (EBQTE1A)**
Introduction; Descriptive techniques; Probability and probability distributions; Sample selection and sampling theory; Statistical process control; Hypothesis testing; Regression analysis and Acceptance sampling.

**Quality Management 1 (EBQMA1A)**
Introduction; Descriptive techniques; Probability and probability distributions; Sample selection and sampling theory; Statistical process control; Hypothesis testing; Regression analysis and Acceptance sampling.
Quality Assurance 2 (EBQAS2A)
Introduction to quality; Quality improvement and cost reduction; Strategic quality management; Developing a quality culture; Designing for quality; Inspection, test and sampling plans; Assessment of quality; Control of quality; Organisation for quality; Understanding customer needs; Manufacture; Inspection test and measurement and Quality assurance.

Research Methodology 1.1 & 1.2 (EBRMX1A & EBRMY1A)
The aim and importance of research, aids in research, and development of the techniques required to conduct a research project, introduction to design of experiments.

Safety Principles and Law 1 (EBSPA1A)
Importance of health and safety; Fundamental safety concepts; Hazard control; Electrical safety; Tools and machines; Transportation; Materials handling; Visual environment; Noise and vibration; Ergonomics; Risk assessment and management; Safety management; Safety systems; Safety analyses and management information

Social Intelligence 1 (EESIN1A)
Evaluate the importance of social intelligence in the engineering context; Demonstrate knowledge and understanding of self-identity and diversity; Apply critical, creative and conceptual and writing skills; Draw the parallels between global and local perspectives.

Strength of Materials 2 (EMSOM2A)
Pin jointed structures; Stress and strain; Testing of materials; Stresses in thin rotating cylinders; Thin cylinders; Shafts; Rigid couplings; Helical springs; Shear force and bending moments in simply supported beams and cantilevers.

Systems Dynamics 4 (EBSDA4A)
Fundamentals of modelling; Systems definition and model formulation; Model validation and analysis; Interpretation of simulation outputs; Animation of simulation model; Additional discrete modelling concepts; Advanced manufacturing features; Projects and Computer applications.
Workplace Dynamics 1.1 (EBWPX1A)
Production environment; Human behavior; Group behavior; Communication skills; Legal aspects; Negotiation skills and the application of these skills; Performance expectations

Workplace Dynamics 1.2 (EBWYP1A)
Evaluate and implement personnel administration procedures; Personnel and the personnel function; Job design, analysis and evaluation; Interviewing; Human relations; Labor

<table>
<thead>
<tr>
<th>Department</th>
<th>Power Engineering</th>
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<tr>
<td>Syllabi</td>
<td>Diploma: Power Engineering: – Course Codes xxxxxx</td>
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</table>

Applied Communication 1.1 HKCOX1A
Social Intelligence and Communication Theory; Critical Thinking; Globalisation; Communication theory and its application in the workplace; Listening to improve your input at work; Reading and comprehending in a professional environment; Reading skills; Comprehension skills; Professional writing and correspondence; Good writing style and what to avoid; Dictionary Skills and Introduction to research; Dictionary Skills; Helping with Research

Applied Communication 2.1 HKCOX2A
Communication theory; Oral presentation; Technical writing skills; Group communication skills

Applied Communication Skills 2.2 HKCOY2A

Engineering Mathematics 1 AMMAT1A
Basic mathematics; Differentiation 1; Integration 1; Statistics A1.

Engineering Skills 1 EEESK1A
Manipulate standard functions and techniques; perform and apply differentiation techniques; perform and apply integration techniques; use, analyse and apply vectors to solve problems; manipulate complex numbers

Engineering Physics 1 APHYS1A
Introduction to vectors; Movement in a straight line; Projectile movement, Newton’s laws; Work and energy; impulse and momentum; Equilibrium statistics; Rotational movement; Elasticity; Statistical fluids; Dynamic fluids;
Heat, temperature and expansion; Heat Transfer; First and second laws of thermodynamics; Electrostatics; Electricity; Magnetism; Electromagnetic induction; Basic electronics; Nature and propagation of light; Mirrors; Lenses; Prisms; Illumination; Interference, diffraction and polarisation; Introduction to nuclear physics; Practical physics.

**ICT Skills 1 ASICT1A**

Recognizing Computers; Using Microsoft Windows 7 Professional; Common Elements; Using Microsoft Word 2010; Using Microsoft Excel 2010; Using Microsoft PowerPoint 2010; Getting Connected; Using the Internet.

**Social Intelligence 1 EESIN1A**

Evaluate the importance of social intelligence in the engineering context; Demonstrate knowledge and understanding of self-identity and diversity; Apply critical, creative and conceptual and writing skills; Draw the parallels between global and local perspectives.

**Applied Communication 1.2 HKCOY1A**

Communication theory; Oral presentation; Technical writing skills; Group communication skills

**Engineering Drawing 1 EMEDR1A**

Letter and number notation; Line notation; Handling of apparatus; Measurement notation; Geometrical Construction; Orthographic Projections; Arcs of penetration and Developments; Detailed works drawing; Composite drawings.

**Engineering Mathematics 2 AMMAT2A**

Differentiation II; Integration II; Matrix algebra; Differential equations (first order).

**Engineering Physics 2 APHYS2A**

Projectile motion; Rotational motion; Simple harmonic motion and elasticity; Fluids; Gas behaviour; Thermodynamics; Current and capacitors; Magnetism; Nuclear physics, radioactivity and ionising radiation; Calculus.

**Safety Principles and Law 1 HLSPA1A**

Importance of health and safety; Fundamental safety concepts; Hazard control; Electrical safety; Tools and machines; Transportation; Materials handling; Visual environment; Noise and vibration; Ergonomics; Risk assessment and management; Safety management; Safety systems; Safety analyses and management information

**Mechanics 1**

Statics: Reaction; Resultant and Moments of force. Centre of gravity; Friction; Dynamics; Linear and angular motion; Momentum and impulse; Work energy and power and Radial acceleration.
Control Systems 2
Introduction, Laplace transform, differential equations, complex variables, block diagrams, modelling of physical systems like RLC circuits, Routh Hurwitz stability criteria, time domain analysis of control systems, frequency-domain analysis, Nyquits, Bode and Nicholds chart.

Control Systems 3
Matrix theory, state equations, signal-flow graphs, signal flow algebra, gain formula for signal-flow graphs, mathematical modelling of physical systems, DC motors, gear trains, potentiometers and tachometers, state variable analysis, Root-locus technique and design of control systems.

Digital Systems 1
Number systems, Binary codes, Logic gates, Boolean algebra, Simplification Techniques and Combinational logic.

Digital Systems 2
Logic families, Multi-vibrators, Sequential Logic, Analogue and Digital, Display and Memory concepts.

Digital Systems 3
Memories, Basic microcomputer systems, Microcontrollers, Assembler and C programming.

Electronics 1
Basic measurements; Semiconductor theory; Diodes; Transistor theory; Capacitance and Applied technology.

Electronics 2
Field-effect transistors; Other semi-conductor apparatus; Basic rectification; Single-stage transistor amplifiers and Applied technology.

Electronics 3
Advanced voltage regulators; Amplification theory and applications; Oscillators; Power amplifiers; Passive filter design and Noise.

Process Instrumentation 1
Process-measurement applications, Process control principles.

Engineering Management 1 BHMAN1A

Mathematics 3
Applications of integration; First order differential equations and D-operators.

Mathematics 4
Applications of integration; Laplace transform; First order differential equations and D-operators and Two dimensional Laplace equations.

**Power Electronics 3**
Rectifiers; Converters and semi-conductor switches. Application: Harmonics; AC drivers; DC drivers and Switch mode power supplies.

**Power Electronics 4**
AC drivers; DC drives; Inverters; Multilevel inverters; FACTS; Power conversion applications and Resonant conversion techniques.

**Projects 1**
Applicable computer aided design principles in construction; Operational procedures and maintenance; Construction techniques and Documentation.

**Projects 2**
Simulation based Construction; Testing with different software applications being subject related

**Projects 3**
Simulation based Construction; Testing with different software applications subject related.

**Project 4**
Research Project: Experimental work to include draft report and oral presentation.

**Engineering Project 4**
Problem identification; Choices and use of measuring instruments; Literature study; Experimental design; Analysis and interpretation of data; Composition of the project report; Case studies and Projects.
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</table>

Course Codes 208383 and 206017

**Applied Communication 1.1**
Social Intelligence and Communication Theory; Critical Thinking; Globalisation; Communication theory and its application in the workplace; Listening to improve your input at work; Reading and comprehending in a professional environment; Reading skills; Comprehension skills; Professional writing and correspondence; Good writing style and what to avoid; Dictionary Skills and Introduction to research; Dictionary Skills; Helping with Research

**Applied Communication 1.2**
Communication theory; Oral presentation; Technical writing skills; Group communication skills

**Applied Communication 2.1**
Communication theory; Oral presentation; Technical writing skills; Group communication skills

**Applied Communication Skills 2**
Speaking and listening intensive, speaking and presentation skills, pronunciation, voice projection, pronunciation, vocabulary, intonation, inflection, accent neutralisation and PowerPoint presentation skills. Practical and functional application of Business Communication skills: meeting procedures, e-business, argumentative orals and interviews, persuasion, problem solving and negotiation skills, conflict resolution, netiquette, project management, business plans, networking and report writing.

**Communication Skills**
Communication theory; Oral presentation; Technical writing skills and Group communication skills.

**Communication Skills (EDL)**
Life Skills; Basic English Language; Comprehension; Writing Skills and Reading Skills.

**Computer & Programming Skills 1**
MS-DOS principles and applications, integrated software packages such as work processors and spreadsheets and the Windows environment.
Computer Skills
MS-DOS principles and application, integrated software packages such as work processors and spreadsheets and the Windows environment.

Computer Skills 1

Control Systems 2
Introduction, Laplace transform, differential equations, complex variables, block diagrams, modelling of physical systems like RLC circuits, Routh Hurwitz stability criteria, time domain analysis of control systems, frequency-domain analysis, Nyquists, Bode and Nicholds chart.

Control Systems 3
Matrix theory, state equations, signal-flow graphs, signal flow algebra, gain formula for signal-flow graphs, mathematical modelling of physical systems, DC motors, gear trains, potentiometers and tachometers, state variable analysis, Root-locus technique and design of control systems.

Control Systems 2
Typical control systems, Laplace transform, Differential equations, Complex variables, Block diagrams, Modelling, Routh Hurwitz, Time domain, Frequency-domain, Nyquist, Bode and Nicholls charts.

Database Principals 3
Logical modelling and Physical modelling of data using a Data Centric approach to derive a Logical Model and Physical Model of a System. Physical implementation on a SQL DBMS.

Database Programming 4
Advanced SQL Programming on MS SQL server on a MS SQL server.

Design Project 3
Design, construction, testing and documentation of a complete project in an applicable field of specialisation.
Digital Communication 2
Differentiation between analogue and digital signals, spread spectrum systems, digital modulation, noise and interference, compression and error detection and communication networks and protocols.

Digital Control Systems 4
Sampled data systems, Pulse transfer functions, Stability analyses and root locus techniques, Digital controller design.

Digital Process Control 2
Industrial networks for modern Instrumentation control environments.

Digital Process Control 3
Distributed Control Systems.

Digital Signal Processing 4
Discrete systems and signals, Convolution, Z transform and discrete Fourier transform, Digital filter design.

Digital Systems 1
Number systems, Binary codes, Logic gates, Boolean algebra, Simplification Techniques and Combinational logic.

Digital Systems 2
Logic families, Multi-vibrators, Sequential Logic, Analogue and Digital, Display and Memory concepts.

Digital Systems 3
Memories, Basic microcomputer systems, Microcontrollers, Assembler and C programming.

Electrical Engineering 1
Introduction to electrical engineering quantities and their application; Batteries; DC theory and network analysis; Capacitance; Electromagnetism; Magnetic circuits; Inductance; Basic AC theory and measurements.
Electrical Engineering 2
AC networks; Resonance; Series and parallel circuits; Power factors correction (single phase circuits); AC and DC network theorems; Harmonics and Three-phase circuits.

Electrical Engineering 3
Advanced three-phase circuits; Rectification and inversion; Illumination; Interconnectors and Components.

Electrical Machines 2
Direct current machines; Single-phase transformers and Three-phase induction machines.

Electrical Machines 3
Three-phase transformers; Induction machines and Synchronous machines. Introduction; Basic theory; Fault calculation; Fuses and Fuse protection.

Electrical Machines 4
Synchronous Alternators, Synchronous Motors, Induction Motors, Design.

Electrical Power Systems 4

Electronics 1
Basic measurements; Semiconductor theory; Diodes; Transistor theory; Capacitance and Applied technology.

Electronics 2
Field-effect transistors; Other semi-conductor apparatus; Basic rectification; Single-stage transistor amplifiers and Applied technology.

Electronics 3
Advanced voltage regulators; Amplification theory and applications; Oscillators; Power amplifiers; Passive filter design and Noise.
Electronics 4
Advanced biasing; Universal preamplifier; Three stage semi-power amplifier signal sources and Signal processing; Power amplifier; Power supply; RF coil; Differential amplifier; Dual-gate MOSFET and Power MOSFET.

Engineering Mathematics 1
Basic mathematics; Differentiation 1; Integration 1; Statistics A1.

Engineering Mathematics 2
Differentiation II; Integration II; Matrix algebra; Differential equations (first order).

Engineering Physics 1
Introduction to vectors; Movement in a straight line; Projectile movement, Newton’s laws; Work and energy; impulse and momentum; Equilibrium statistics; Rotational movement; Elasticity; Statistical fluids; Dynamic fluids; Heat, temperature and expansion; Heat Transfer; First and second laws of thermodynamics; Electrostatics; Electricity; Magnetism; Electromagnetic induction; Basic electronics; Nature and propagation of light; Mirrors; Lenses; Prisms; Illumination; Interference, diffraction and polarisation; Introduction to nuclear physics; Practical physics.

Engineering Physics 2
Projectile motion; Rotational motion; simple harmonic motion and elasticity; fluids; gas behaviour; thermodynamics; current and capacitors; magnetism; nuclear physics, radioactivity and ionising radiation; Calculus.

Engineering Skills 1
Manipulate standard functions and techniques; perform and apply differentiation techniques; perform and apply integration techniques; use, analyse and apply vectors to solve problems; manipulate complex numbers.

Hardware Design 4
Microcontroller embedded design using high level programming.

ICT Skills 1
Recognizing Computers; Using a current versions of Microsoft Windows Professional; Common Elements; Microsoft Word; Microsoft Excel; Microsoft PowerPoint; Getting Connected; Using the Internet.
<table>
<thead>
<tr>
<th><strong>Information Systems</strong></th>
<th>Structure and strategic organisational role; Computer system resources; Decision support system and executive information systems; Development and implementation of information systems and Assignments.</th>
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</thead>
<tbody>
<tr>
<td><strong>Logic Design 3</strong></td>
<td>Logic design using C high level language, Embedded control applications.</td>
</tr>
<tr>
<td><strong>Mathematics 1</strong></td>
<td>Basic mathematics: Algebra; Logarithms; Graphs; Trigonometry; Radian measure; Sine function; Cramer’s rule; determinations and simultaneously linear equations. Differentiation: Increments; Limits (Binomial theorem); Function of a function; Products; Quotients and Logarithmic differentiation. Integration: The definite integral and numerical integration. Statistics: Frequency distributions; Measures of locality and dispersion; x; s; Regression and correlation; Elementary probability theory; Probability distributions, Binomial and Poisson.</td>
</tr>
<tr>
<td><strong>Mathematics 2</strong></td>
<td>Differentiation: Hyperbolic functions; Parametric equations; Practical applications of maxima and minima and Partial differentiation. Integration: Standard integrals; Integration by parts; Partial fractions; Powers; Products of trigonometric functions and Integration tables. Statistics: Elementary sampling theory; Sampling distributions of means; Statistical estimation theory; Population parameters; Statistical decision theory; Statistical hypotheses; Theory for small samples; Learner’s t-distribution and Analysis of variance. Linear programming: Graphical representation; Matrices; Transpose; Inverse matrix; Gauss-elimination method for solving systems of equations; The simplex method and Maximising and minimising.</td>
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<td><strong>Mathematics 3</strong></td>
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<tr>
<td><strong>Mathematics 4</strong></td>
<td>Applications of integration; Laplace transform; First order differential equations and D-operators and two dimensions Laplace equations.</td>
</tr>
<tr>
<td><strong>Micro Systems Design 4</strong></td>
<td>Microcontroller embedded design using high level programming.</td>
</tr>
<tr>
<td><strong>Network Systems 2.1</strong></td>
<td>CISCO Exploration CCNA1 and (mod 2) CISCO Exploration CCNA2.</td>
</tr>
</tbody>
</table>
Network Systems 3.1
CISCO Exploration CCNA3 and (mod 2) CISCO Exploration CCNA4.

Network Systems 4
CISCO Discovery CCNA3, Security.

Physics
Simple harmonic motions; Moment of inertia; Thermodynamics; Torque rotation; Acceleration and Electricity.

Physics 1
Introduction to vectors; Movement in a straight line; Projectile movement; Newton’s Laws; Work and energy; Impulse and momentum; Equilibrium statistics; Rotational movement; Elasticity; Statistical fluids; Dynamic fluids; Heat, temperature and expansion; Heat transfer; First and second laws of thermodynamics; Electrostatics; Electricity; Magnetism; Electromagnetic induction; Basic electronics; Nature and propagation of light; Mirrors; Lenses; Prisms; Illumination; Interference, diffraction and polarisation; Introduction to nuclear physics and Practical physics.

Process Control
Control of chemical processes: Incentive of chemical process control, Design aspects of a process control system, Control modes (P, PI, PD, PID), Analysis and Design of advanced control systems: Introduction to feedback control, Control systems with multiple loops, Split range control, Feed forward control, Ration control, Adaptive control, Inferential control, Design of control systems for Multivariable processes: Introduction to plant control. Modelling the dynamic and static behaviour of chemical processes: Development of a mathematical model, Modelling considerations for control purpose. Instrumentation: P&ID (Piping and Instrumentation Diagrams), Temperature measurement, Pressure measurement, Flow measurement, Level measurement.

Process Control 4
The control of a chemical process; Modelling the static and dynamic behaviour of chemical processes; Analysis of the dynamic behaviour of a chemical process and Analysis and design of feedback control systems.

Process Instrumentation 1
Process-measurement applications, Process control principles.

Process Instrumentation 2
Calculation of applicable and specific process parameters; Process controllers and other measurement applications.

**Process Instrumentation 3**
Instrumentation for unsafe environments; Plant unit operation and control; Telemetering applications; Radio-active instrumentation applications and Process analysers.

**Process Instrumentation 4**
Process analysers; Measurement and control of water and air pollution; Instrumentation engineering; commissioning of newly constructed plants; PLC’s and DCS systems.

**Programming 1**
Programming and language; Variables; Data types and Program control.

**Programming 2**
Files; Links; Subroutines; External functions; Recursion; State machines and Numerical analysis.

**Programming 3**
Hardware linking; Assembly linking; Interrupts; Concurrency and resident programmes.

**Research Project**
Research Project: Experimental work to include draft report and oral presentation.

**Project Engineering**
Need and advantages of project management; Definition of the project; Modern project planning methods; Communication and presentation of information; Feasibility studies; Project implementation; Support of operational systems, Case studies and Computer applications.

**Project Management 4**
Planning of project; Management of projects; Handling project phase-out and transfers; Program plan; Management control; Quality and time management; Management systems; Computer applications and Project.
Project Research
Problem identification; Choices and use of measuring instruments; Literature study; Experimental design; Analysis and interpretation of data; Composition of the project report; Case studies and Projects.

Projects 1
Applicable computer aided drawing; Ergonomic and aesthetic design principles in construction; Operational procedures and maintenance; Construction techniques and Documentation.

Projects 2
CAD component and footprint creation; CAD development of project; Simulation; Construction; Testing and Documentation.

Signal Processing 4
Linear systems and Fourier spectrum analysis, Laplace network analysis and active Butterworth and chebychev filter design.

Software Engineering 3
Object Orientated Design implementation on a core system using Object Orientated language.

Systems Analysis 2
Object Orientated Analysis to build the analysis model for a system using UML.

Software Engineering 3
Object Orientated Design with implementation of a system using an Object Orientated language.

Syllabi

NDip: Process Control (208383) and Computer Systems (206017)
Course Codes 208383 and 206017

ICT Skills 1

Engineering Mathematics 1
Standard functions and techniques, Differentiation, The Derivative from First Principles, Derivatives of functions, Rules of Differentiation Higher Order Derivatives Implicit Differentiation and Logarithmic, Differentiation
Applications of Differentiation Curve Sketching, Velocity and Acceleration for Linear and circular motion. Approximation of roots of equations using Newton-Raphson Method. Integration, The Indefinite Integral as the Anti-derivative and Rules of Integration. Definite Integrals area of a Region enclosed by curves, Approximation of Definite Integrals. Matrices. Perform elementary operations on 2 X 2 matrices. Find the determinant of a 2 X 2 matrix. Write and represent vectors graphically. Perform elementary operations with vectors. Write a vector as a linear combination of standard unit vectors. Determine the magnitude of a vector. Resolve a vector into x- and y-components. Use vectors to solve problems involving force, velocity, etc. Plot points on a three-dimensional coordinate system. Find the distance between two points in space. Vectors in space. Scalar products of two vectors in the plane or in space. The dot product to find the angle between two vectors and work done. Vector products in space and moment vectors.

**Engineering Physics 1**


**Electrical Engineering 1**

Electrical principles, Basic electrical concepts, Network theorems in direct current, Electromagnetism, Inductance in direct current circuits, Capacitance in direct current circuits, Alternating voltage and current, Single phase alternating current series circuits.

**Digital Systems 1**

Introductory Concepts; Digital vs. Analogue, Basic Logic functions. Number Systems; Decimal, Binary, Hexadecimal, Octal, BCD, Digital Codes. Logic Gates, Boolean Algebra and Logic Simplifications. Combinational Logic Analysis, Functions of Combinational Logic; Adders, Comparators, Encoders, Multiplexing etc.

**Applied Communication Skills 1.1**

Critical thinking and creative thinking, Globalisation, Communication and civilisation, Communication theory and application in the workplace,
Communication contexts, Workplace communication, Brainstorming techniques and processes Active listening vs passive hearing, Note taking, Listening comprehension, Barriers to listening Business etiquette, Understanding context Non-verbal communication, Reading skills, Different types and purposes of reading, Comprehension skills, Following instructions Good writing style and language reference guide, Grammar and spelling, The correct use of frequently misused words Dictionary skills, Introduction to research, Referencing – plagiarism, Harvard Style of Referencing, bibliography, Find and use different sources of information – dictionaries, journals, libraries, websites, etc.

Introductory Computing 1

Introduction into computational thinking, Computer Science for Engineers. Simplistic Programming using Snap, Numbering Systems, Pseudo Code, Variables, Loops, Conditions, Linux as a development platform, Command Line Programming, Introduction to the C language, Loops, Conditions, Compiler, Introduction to C, Why C, Hello World in C, Usage in C, Floating Point Impression; Concept of Abstraction, Why Abstraction helps, Functions, Libraries, Prototypes, Data Types, Header Files, Arrays, Libraries Bugs, Strings in Memory; Command Line (CL) I/O, Strings in C, Man Pages, CL Arguments, Return Values, Main Return Value, Main Return Value, Debugging, Make file, Show Debugging Introduce String Library of C and understand String (Array) manipulation, Use CL arguments; Recursion & Performance, Sort Algorithms, Performance Order, Speed vs. Storage on Different Algorithms; Performance and Files (Persistence) and some further performance considerations, Recursion Threads, Stack, Files and File I/O in C (persistence), File I/O Impact on Performance, Sneak Peak Pointers, Reading Bit Map Stack Overflow; Pointer arithmetic and dynamic Memory, Pointers, Swap Function, Pointer Arithmetic’s, Malloc, Memory leaks, Buffer Overflow, ; Advanced Data structures;

Engineering Mathematics 2

in a frequency distribution. Probabilities for normally distributed random variables. Error in the estimation of the mean for large and small samples. Confidence intervals for means and differences of means of large and small samples.

**Engineering Physics 2**


**Electrical Engineering 2**

Single-Phase AC circuits, Power and power factor correction, Network Theorems in AC, Resonance, Complex Waves and Balanced Three Phase Systems.

**Introduction to Networks 1**

Devices, media and protocols. The application layer, services and applications focusing on HTTP, DNS, DHCP, SMTP/POP, Telnet and FTP. The transport layer TCP and UDP protocols. Packet routing, addressing and path determination as defined in the OSI network layer. IP addressing concepts sub-networks and hosts in a network. ICMP tools such as ping and trace. The data-link layer, encapsulation processes that occur on LANS and WANS. The physical layer. Media types and their connectors. Ethernet technologies, MAC and Address Resolution Protocol. Cables, how to connect devices and how to develop an addressing and testing scheme. Cisco IOS commands for routers and switches.
**Introduction to Electronics 1**

**Engineering Safety and Law 1**
Concepts of occupational health, Common occupational health problems, Key OHSA responsibilities in an Engineering project, OHSA preparedness, prevention and responses at the workplace, OHSA management principles within a Engineering project, Awareness and acceptance of preparedness and response to OHSA issues within the workplace, Laws governing OHSA in South Africa, Role of different standards, Ethics

**Applied Communication Skills 1.2**
Paragraphing, Summaries, Paraphrasing, Plagiarism, Ethical behaviour, Emotional Intelligence, Social Intelligence, Inter-subjectivity, Facts versus opinion, Subjective and objective language, Denotation and connotation, Bias versus cultural differences, Stereotypes, Interpretation of visual texts and ideas, Types of visual literacy, Advertisements, Cartoons, Purpose of report writing, Different types of reports and examples of reports, Requirements, Writing a report, Bibliography

**Engineering Programming 1**
An Entry Level Certified Object Orientated Programming Course selected out of the mainstream Object Orientated Courses such as CPA - C++ Certified Associate Programmer. Sample Curriculum for CPA - C++ Certified Associate Programmer: Absolute basics: Integrated Development Environment, Machine and high-level programming languages, Compilation process; Obtaining the machine code: compilation process; Writing simple programs, variables; Integers: values, literals, operators; Characters: values, literals, operators; Dealing with streams and basic input/output operations; Flow control and more data types: How to control the flow of the program; Floating point types: values, literals, operators; More integer types: values and literals; Loops and controlling the loop execution; Logic, bitwise and arithmetic operators; Functions: functions, declaring and invoking functions, side effects, different methods of passing parameters and their purpose, default parameters, inline functions, overloaded functions; Accessing data and dealing with exceptions: converting values of different types; strings: declarations, initializations, assignments; String as an example of object: introducing methods and properties; Namespaces: using and
declaring, dealing with exceptions; Fundamentals of the object-oriented approach: class, objects, class, components, constructors, referring to objects, static members, classes and their friends, defining and overloading operators; Class hierarchy: base class, superclass, subclass, inheritance: how it works, types of inheritance, inheriting different class components, multiple inheritance. More on classes: polymorphism: the notion and the purpose, virtual methods: declaration and usage, inheriting virtual methods, abstraction and abstract classes. Exceptions: dealing with expected and unexpected problems: what is an exception, catching and throwing exceptions, different classes and hierarchy of exceptions, defining your own exceptions.

**Software Engineering 1**
Model Driven Architecture (MDA), Object Methods Groups (OMG) and Unified Modelling Language (UML); Rational Unified Process (RUP); Software Engineering Body of knowledge (SWEBOK); Tools, IBM Rational Software Architect, IBM Info Sphere Data Architect; Building the Analysis Model, Problem Statement, Use Case Diagram (Actors and Use Cases), Activity Diagram, Use Case Specification (Overview and Detail), Structure Use Case Model, Design and Prototype the User Interface, Concepts of Object Orientated Analysis, Introduction to Use Case Analysis, Use Case Realization, Finding Analysis Classes and Class Responsibility Analysis, Domain Model, View of Participating Classes (VOPC), Distribute Use Case Behaviour to Analysis Classes, Describe Attributes and Associations and Qualify Analysis Mechanism, Integrate Project VOPC from Individual Use Case VOPC’s, Conceptual and Logical Data Modelling Concepts, Derive the Integrated Logical Data Model for the Use Case from the VOPC.

**Electronics 2**
Applications, The Diac and Triac, The Silicon-Controlled Switch (SCS), Programmable Unijunction Transistor (PUT).

**Digital Systems 2**
Latches, Flip-Flops and Timers. Shift registers, Counters, Counter design. Data storage types and memory expansion, Analogue and Digital signal conversions

**Networks Routing and Switching 2**
Switching technologies such as VLANs and 802.1q. Design, configure, implement and troubleshoot basic operations of switched and routed networks. Implement and verify static routing and default routing. Configure and implement Dynamic Routing Protocols such as RIPv2. Implement and troubleshoot VLANs and inter-VLAN routing. ACLs for IPv4 and IPv6. Implement DHCP and NAT.

**Engineering Mathematics 3**
Equations of variable separable type, Exact differential equations, homogeneous differential equations, linear differential equations, first order equations in real life situations, linear homogeneous equations with constant coefficients, operator D and inverse operator 1/D to solve non-homogeneous equations, steady state, transient state and amplitude, frequency and period of the steady state motion, Use properties (linearity, translation/shifting, derivatives, multiplication) to evaluate Laplace Transforms of given functions, Evaluate inverse Laplace Transforms, Laplace Transforms of step functions: Heaviside and delayed, Dirac delta (unit impulse) functions, Laplace Transforms to solve differential equations, Laplace Transforms to solve equations pertaining to real life situations (Mechanical, electrical circuits and beams), harmonics, Fourier series for periodic functions with period 2π, Fourier series for periodic functions with period 2l, Fourier series of even and odd functions, half-range Fourier series, Numerical Harmonics Analysis, Evaluate an iterated integral, an iterated integral to find the area of a plane region, the order of integration, double integral to represent the volume of a solid region, a double integral as an iterated integral, evaluate double integrals in polar coordinates.

**Applied Communication Skills 2.1**
Public speaking and presentation skills, Stage fright, PowerPoint presentations and referencing, Preparation, venues, technology, non-verbal communication, Models of Communication in the context of a PowerPoint presentation, Listening and hearing in the context of public speaking, Barriers, The use of non-verbal language, The impact of intercultural communication on public speaking, Meetings and meeting procedure, Meeting terminology, Notices, agendas and minutes, Types of interviews, The interview stages and process, Small group
Faculty Prospectus


**Engineering Programming 2**
An Intermediate Level Certified Object Orientated Programming Course selected out of the mainstream Orientated Courses such as CPP - C++ Certified Professional Programmer or The Equivalent Certified Java Course or the equivalent C Programming course such as CLP - C Programming Language Certified Professional, depending on the programming demands of Software Engineering. Sample Curriculum for CPP - C++ Certified Professional Programmer:

**Templates:** What are templates, Basic syntax, Function templates, Class templates,

When to use templates, Typical problems when using templates; STL Sequential containers: Types of sequential containers: vector, deque, list and their API; Sequential container adapters – stack, queue and priority queue; Dealing with objects as container elements; Usage – when to use what. STL Associative containers: Types of associative containers, set and multiset – behavior and API, map and multimap –behavior and API. Putting objects into set and map, Usage – when to use what. Non-modifying STL algorithms: Definition of a non-modifying algorithm; List of non-modifying algorithms: for_each, find, find_if, find_end, find_first_of, adjacent_find, count, count_if, mismatch, equal, search, search_n, Examples; Container compatibility. Modifying STL algorithms: Definition of a modifying algorithm; List of modifying algorithms: transform, copy, copy_backward, swap, swap_ranges, iterswap, replace, fill, fill_n, generate, generate_n, remove, remove_if, unique, unique_copy, reverse, reverse_copy, rotate, partition, stable_partition; Examples, Container compatibility. Sorting STL operations: List of sorting algorithms: random_shuffle, sort, stable_partition, lower_bound, upper_bound, equal_range, binary_search; Examples; Containers compatibility. Sorting of objects. STL merge operations: List of merging algorithms: merge, includes, min_element, max_element, inplace_merge, STL operations for sets, Examples, Container compatibility. STL utilities and functional library: STL “small” tools; List of useful functors; Examples. STL advanced I/O: Classes which provide the input and output capability; Console I/O; Formatting; File I/O; Strings I/O; Examples.

**Software Engineering 2**
Understand the Analysis Model of a system and select from this model and prepare for a Build of a system to be developed iteratively: Select and Prepare a use case for design and/or code; Perform Use Case Design; Perform Class Design; Code and Unit Test a use case using the build tools as defined in the Architecture document; Integrate and test the use case with all other use cases in
the build. Principles of Database Design and programming: The Logical Data model is transformed into a physical Data Base.

**Digital Systems 3**
Microcontrollers, Assembly Language Programming, Jump, Loop and Call Instructions, I/O Port Programming, Addressing Modes, Arithmetic Logic Instructions and Programs, Programming in C, Hardware Connection & Intel Hex File

**Operating Systems 2**
Basic functioning of an operating system, The kernel, memory management, process management, Scripts, and BASH commands. NOS in a networked environment, Roles and services, Deploying a server, Client access, Access to network resources, Providing security.

**Scaling Networks 3**

**Applied Communication Skills 2.2**
The Business Plan, Marketing, branding, advertising (of your new business), Intellectual property, The business / sales pitch, Curriculum Vitae, Letter of application, Analysing job advertisements, Conflict resolution, Persuasion, Negotiation, Mediation, Small group communication, Meeting procedure and documentation, Social media: application and etiquette, Memoranda, Business documents, Analyse news articles, Grammar, style and tone in business / professional environment, Background on disability in South Africa, Types of disability, Social vs medical modes of disability, Disability etiquette (communication and interaction), Working with people with disabilities, Sign language.

**Electronics 3**
Operational Amplifiers, Op-Amp Input Modes And Parameters, Negative Feedback Op-Amps With Negative Feedback, Effects Of Negative Feedback On Op-Amp Impedances Bias Current And Offset Voltage, Open-Loop Response, Closed-Loop Frequency Response. Basic Filter Responses Filter Response Characteristics, Active Low-Pass Filters, Active High-Pass Filters, Active Low-

**Digital Electronic Communication 3**

**Engineering Programming 3**
A Senior Level Certified Object Orientated Programming Course selected out of the mainstream Object Orientated Courses such as CPS - C++ Certified Senior Programmer or The Equivalent Certified Java Course or the equivalent C Programming course such as CLS - C Certified Senior Programmer Certificate or An appropriate level web-based development course, depending on the programming demands of Software Engineering Project. Sample Curriculum for CPS - C++ Certified Senior Programmer:

**Digital Systems 4**

**Engineering Research Methods**
Theory and practise of conducting research in engineering. Types of research, selection of topic, title, the problem statement, a thesis statement. Research strategy reading a scientific paper, is a topic researchable. Intellectual property, funding applications.
**Engineering Mathematics 4**
Application of integration, Laplace transforms, First order differential equations and D-operators, Two dimensional Laplace equations

**Engineering Management**
Contracts, Tenders, Planning techniques, Financial planning and control, Labour, Plant and materials, Scheduling, Budgets Cash flow and cost control, Labour law.

**Software Engineering 3**
Class Project using a pre-developed Problem where all the aspects learned are put together in one project to complete phase by phase. Each phase to be started with the best solution.

**Operating Systems 3**
Configuring Load balancing on servers, Configuring Failover Clustering, Virtualisation, Cloud computing, Configuring Site-Level Fault Tolerance, Advanced Active Directory implementation.

**Internetworking 4**

**Engineering Project 4**
Industry relevant project, literature study, application and report.

**New Technology Systems 4**
New and emerging software and development systems as applicable to the operability of various types of engineering systems.

**Hardware Design 4**
Microcontroller embedded system design and high level programming application. System Development Tools.

**Electronics 4**
Advanced Biasing, Universal pre-amplifier, Three-stage semi-power amplifier signal sources and signal processing, Power amplifier, Power supply, RF Coils, Differential amplifiers, Dual gate MOSFET and Power MOSFET.

**Advanced Networking 4**
VOIP in the LAN, Management and Configuration, Connection via Gateways and Trunks, Smart Communication Systems. Wireless LAN principles, WLAN RF Principles, Antenna Communications, Wireless Network Architecture, Network Configuration, QOS,

**Software Engineering 4**
Overview and Perspectives on the Knowledge Areas embedded in Software Engineering, their practise and application in the discipline of Software Engineering as applied to the Engineering of Software as proposed in Industry Leading publications such as the Software Engineering Body of Knowledge (SWEBOK) and related publications.

**Systems Engineering 4**
Develop a Foundational comprehension of selected Knowledge Areas, their practise and application in the Discipline of Systems Engineering as applied to Engineered Systems (ES) and proposed in Industry Leading publications such as the Systems Engineering Body of Knowledge (SEBoK) and the related publications.

**Engineering Data Systems**
Principles and Practice of creating and maintaining data on, as well as extracting and manipulating data from, an enterprise grade Relational Database Management System (RDBMS) using SQL programming language. Introduction to the exchange of data between systems using XML.

**Artificial Intelligence**

<table>
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<th>Department</th>
<th>Mechanical Engineering</th>
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<tr>
<td><strong>Syllabi</strong></td>
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<td>NDip: Engineering Mechanical: Course Codes 208082</td>
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**YEAR 1: SEMESTER 1**

Applied Communication Skills 1.1: HKCOX1A
Listening skill; reading skills; comprehension skills; dictionary skills; constructing sentences; applying the correct writing style and paragraph development.

**Engineering Chemistry I: AAECH1A**
Matter and Measurement; Atoms; Molecules and Ions; Formulas, Equations, and Moles; Chemical reactions in aqueous solution; Periodicity and Atomic Structure; Ionic Bonds; Covalent Bonds and Molecular Structure; Chemical Equilibrium; Acids and Bases; Organic Chemistry.

**Engineering Skills 1: EEESK1A**
Explain the role of the engineer in society; Describe the tasks of the engineer; Explain the processes and related documents in engineering. Engineering Ethics

**ICT Skills 1 ASICT1A**
Recognizing Computers; Using Microsoft Windows; Common Elements; Using Microsoft Word; Using Microsoft Excel; Using Microsoft PowerPoint; Getting Connected; Using the Internet.

**Mathematics 1: AMMAT1A**
Standard functions and techniques; Differentiation; Integration; Vectors; Complex numbers

**Physics 1: APHYS1A**
Units waves and sound; The Principle of linear Superposition; Electromagnetic waves; Interference and the wave nature of light; The Reflection of Light; Lenses and optical instruments; Introduction and Mathematical Concept components; Kinematics in One Dimension; Forces and Newton’s Law of Motion; Work and Energy; Impulse and Momentum; Electric Forces and Electric Fields; Electric Potential Energy and the Electric Potential; Electric circuits; Fluids; Temperature and Heat; The transfer of heat; Nuclear Physics and Radioactivity

**Social Intelligence 1: EESIN1A**
Evaluate the importance of social intelligence in the engineering context; Demonstrate knowledge and understanding of self-identity and diversity; Apply critical, creative and conceptual and writing skills; Draw the parallels between global and local perspectives.

**YEAR 1: SEMESTER 2**

**Applied Communication Skills 1.2: HKCOY1A**
Power Point presentations; Communication Theory and Pronunciation.

**Computing Applications 2: EMCOA2A**
1. Introducing Mathcad; Handling of Text; Worksheet Layout; Mathcad as a Calculator; Variables and Functions; Editing of Equations;
1. Further: Ranges and Plots; 2D Plots of Functions; 3D Plots of Functions; Labels and Units; Programming – Branches; Programming - Loops

**Mathematics 2: AMMAT2A**
Differentiation: Hyperbolic functions; Parametric equations; Practical applications of maxima and minima and Partial differentiation. Integration: Standard integrals; Integration by parts; Partial fractions; Powers; Products of trigonometric functions and Integration tables. Statistics: Elementary sampling theory; Sampling distributions of means; Statistical estimation theory; Population parameters; Statistical decision theory; Statistical hypotheses; Theory for small samples; Learner’s t-distribution and Analysis of variance. Linear programming: Graphical representation; Matrices; Transpose; Inverse matrix; Gauss-elimination method for solving systems of equations; The simplex method and Maximising and minimising.

**Physics 2: APHYS2A**
Electric circuits; Magnetic forces and magnetic fields; Electromagnetic induction; Alternating current circuits; Fluids; The ideal gas law and kinetic theory; Thermodynamics; The nature of the atom; Ionizing radiation; nuclear energy; elementary particles; Kinematics in two dimensions; Dynamics of uniform circular motion; Rotational kinematics; Rotational dynamics; Simple harmonic motion and elasticity

**Engineering Chemistry: 2 AAECH2A**
Introduction to chemical bonding; Ionic bonds; Covalent bonding and molecular structure; Hydrogen; The Group IA and IIA metals; Boron and Aluminium; Chemical reactions in aqueous solutions; Carbon, Silicon, Germanium, Tin, and Lead; Acids, bases, and non-aqueous solvents; Nitrogen Phosphorus, Arsenic; Oxygen, Sulphur, Selenium, and Tellurium; Halogens.

**Safety Principles and Law 1: EMSPA1A**
Importance of Safety and Health; Safety Management; Fundamental concepts and terms for Engineers; General principles of Hazard Control; Electrical Safety; Tools and Machines; Transportation; Materials Handling; Fire
Protection and Prevention; Visual Environment; Noise and Vibration; Personal Protective Equipment

**Engineering Drawing 1: EMEDR1A**
Drawing instruments; Drawing skills; Object visualization and drawing; sketch and drawing of chemical engineering process equipment’s using computer software.

**YEAR 2: SEMESTER 1**

**Mechanics 1: EMMEC1A**
Statics: Analysis of vectors in 2-D and 3-D Cartesian spaces
Equilibrium of mechanical system and application to the calculation of reaction; Resultant, Moments of force and coordinates of Centre of gravity (Centroid); Friction;
Dynamics; Linear and angular motion; Momentum and impulse; Work energy and power and Radial acceleration.

**Mathematics 3: AMMAT3A**
Applications of integration; First order differential equations and D-operators.

**Applied Communication Skills 2.1: HKCOX2A**
Public speaking and presentation skills, Stage fright, PowerPoint presentations and referencing, Preparation, venues, technology, non-verbal communication,

**Manufacturing Engineering 1: EMMEN1A**
Safety and safety legislation; Identification and application of materials;
Elementary measuring equipment and Elementary hand and Machine tools.

**Engineering Drawing 2: EMEDR2A**
Advance constructions; Orthographic projection of true planes; Isometric; Interpenetration and development; Machine drawing and Assemblies.
Electrical Engineering 1: EPEEN1A
Introduction to electrical engineering quantities and their application; Batteries; DC theory and network analysis; Capacitance; Electromagnetism; Magnetic circuits; Inductance; Basic AC theory and measurements.

Project 1 (WIL Mechanical): EMPRJ1A
Ref. paragraph 12.7

YEAR 2: SEMESTER 2

Mechanical Engineering Design 2: EMMED2A
Design process steps; Simple design without calculations; Engineering material selection; Rod connections; Riveted joints; Fasteners and connections; Shafts; Couplings; Keys and splines; Plain bearings; Spur gears; Eccentric loading of connections and Project.

Mechanics of Machines 2: EMMOM2A
Torque acceleration; Vehicle dynamics; Simple lifting machines; Hoists and haulages; Moment of inertia; Simple harmonic motions and Power transmission.

Strength of Materials 2: EMSOM2A
Pin jointed structures; Stress and strain; Testing of materials; Stresses in thin rotating cylinders; Thin cylinders; Shafts; Rigid couplings; Helical springs; Shear force and bending moments in simply supported beams and cantilevers.

Fluid Mechanics 2: EMFMM2A
Hydrostatics; Fluid dynamics; Fluid power circuit elements; Hydraulic and Pneumatic systems.

Thermodynamics 2: EMTHE2A
Heating and expansion of gases: Steam generation; Condensers; Combustion; Feed water treatment and Heat transfer.
Project 2 (WIL Mechanical): EMPRJ2A

Applied Communication Skills 2.2: HKCOX2A

The Business Plan, Marketing, branding, advertising (of your new business), Intellectual property, The business / sales pitch, Curriculum Vitae, Letter of application, Analysing job advertisements, Conflict resolution, Persuasion, Negotiation, Mediation, Small group communication, Meeting procedure and documentation, Social media: application and etiquette, Memoranda, Business documents, Analyse news articles, Grammar, style and tone in business / professional environment, Background on disability in South Africa, Types of disability, Social vs medical modes of disability, Disability etiquette (communication and interaction), Working with people with disabilities, Sign language.

Computer Aided Draughting 1: EMCAI1A

Introduction to a 3D parametric software interface; Creating sections, parts, assemblies and drawings.

YEAR 3: SEMESTER 1

Mechanics of Machines 3 : EMMOM3A
Kinematics; Balancing and Gears.

Strength of Materials 3: EMSOM3A
Temperature stress; Properties of beam sections; Bending moments and beam sections; The theory of bending; Fatigue; Short columns and struts; Strain energy and Shear stress in beams.

Fluid Mechanics 3: EMFME3A
Pipe flow; Viscous flow; Flow under varying head; Fluid friction in oiled bearings, Channel Flow; Wetted Perimeter and Positive displacement piston pumps.
Thermodynamics 3: EMTHE3A
General thermodynamics; Ideal cycles; Internal combustion engines; Steam turbines; Refrigeration; Air compressors and Natural flow heat transfer.

Mechanical Engineering Design 3: EMMED3A
Lubrication; Ergonomics; Springs; Bearings; Brakes; Clutches; Spur gears; Welded joints; Frame structure analysis by computer; Wire ropes; OSH Act; Parametric modelling; Pro-Engineer advanced; Mechanical elements into CAD models and Project.

Manufacturing Engineering 2: EMMEN2A
Fault diagnosis; Failure analysis and measuring equipment; Test methods; Interpretation and action; Powder metallurgy; Metal forming; Erosion; Casting; Plastics-molding and machining; Welding and joining and Obtaining finish and accuracy.

Maintenance Engineering 1: EMMAE1A

Project 3 (WIL Mechanical): EMPRJ3A
Ref. paragraph 12.7

YEAR 3: SEMESTER 2

Theory of Machines 3: EMTOM3A
Energy diagrams; Governors; Cams and Introduction to vibrations.

Applied Strength of Materials 3: EMAOM3A
Slope and deflection of beams; Leaf springs; Struts; Complex stress and complex strain and Thick cylinders.
Hydraulic Machines 3: EMHYM3A

Steam Plant 3: EMSPL3A
Steam plant; Psychrometry; Rotary compressors; Heat transfer; Gas turbines; Cooling towers and Legislation and Forced convection.

Machine Design 3: EMMDE3A

Maintenance Engineering 2: EMMAE2A
Condition Monitoring; Failure analysis; Vibration Analysis; Fault detection techniques and tools: Thermography Analysis, Oil Analysis, Ultrasound Analysis

Modelling and Engineering Computation 2: EMMEC2A
Analysis and mathematical modeling of mechanical engineering systems for computation purpose

Workplace Based Learning 1 (Mechanical): EMEXM1A
Ref. paragraph 12.7
Advanced Diploma in Mechanical Engineering

YEAR 4: SEMESTER 1

Engineering Professionalism
The module is to provide students with the knowledge and understanding of the general and necessary responsibilities of the engineering profession, the roles of engineers in society, and the need for professionalism and ethics in the engineering profession.

Engineering Economics
This module will enable the student to:
1. Explain financial statements and perform ratio analysis, cost control and its application.
2. Classify and distribute overheads, depreciation, perform depreciation calculations, determine the effects of overheads to production cost.
3. Apply standard costing and its utility variances, budgetary control, marginal costing to production.
4. Explain the significance of waste extraction, waste recovery in relation to engineering costing.

Applied Engineering Mathematics
The module enables the student to, perform numerical analysis, perform error analysis, solve and estimate solutions of ordinary and partial differential equations, demonstrate the solutions of equations using examples from mechanical engineering systems, and to apply the solution techniques in polar, cylindrical and spherical co-ordinates to mechanical engineering problems.

Material Science
This module aims at enabling Mechanical engineering students to identify different types of engineering materials, the processes that enhance their properties, selection and their uses.

YEAR 4: SEMESTER 2

Thermo-Fluids and Turbo machinery
The module enables students apply the laws of Thermodynamics and Fluid Mechanics to predict and analyse Rotor-dynamics in Turbo Machines,
specifically Turbines and Compressors, with emphasis on flow regimes, energy transformation and performance characteristics.

**Heat and Mass Transfer**

The optimal transfer of mass and energy in modern industry cannot be over-emphasised. This module will equip students with the appropriate tools required in the prediction and analysis of the performance of units/systems involved in this process.

**Solid Mechanics and Stress Analysis**

The purpose of this module is to equip the students with the fundamental principles of determining Stress and strain in a Mechanical system and apply Finite Element Method for numerical representation and analysis of Stress distributions in a loaded Mechanical system.

**Vibration and Control Engineering**

The module enables the student to develop representative models of real vibrating systems and determine or analyse the systems performance and behaviour parameters under given set of constraints.

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<td>NDip: Engineering Metallurgical Course Codes 208088</td>
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**OLD DIPLOMA SYLLABI (METFALLURGY):**

**SEMESTER 1**

**Applied Communication Skills (HKACX1A, HKACY1A, HKACY2A)**

Communication theory; Oral presentation; Technical writing skills; Group communication skills.

**Computer Skills AEREY1B**

Computer Hardware; Software; Computer Utilisation.

**Chemistry AACHA1C**

Matter and energy; Atomic structure; Chemical bonding; Periodic table and nomenclature of inorganic compounds; Chemical equations and stoichiometry;
Solutions; Acids, bases and salts; Chemical reactions; Chemical equilibrium; Electrochemistry and redox theory; Introduction to inorganic chemistry; Introduction to organic chemistry.

**Mechanical Engineering Drawing EMMDA1B**
Letter and number notation; Line notation; Handling of apparatus; Measurement notation; Geometrical Construction; Orthographic Projections; Arcs of penetration and Developments; Detailed works drawing; Composite drawings

**Mathematics AMATH1E**
Basic mathematics; Differentiation 1; Integration 1; Statistics A1.

**Metallurgy EYMMM1A**

*Module A:*
Material properties; Atomic bonding; Crystalline structures; Heat treatment; Metals alloys and applications; Ceramics; Polymers; Composites; Environmental degradation; Forming processes.

*Module B:*
Overview of geology; Mining; Ore preparation; Extraction processes.

**Physics APFSG1A**
Introduction to vectors; Movement in a straight line; Projectile movement, Newton’s laws; Work and energy; impulse and momentum; Equilibrium statistics; Rotational movement; Elasticity; Statistical fluids; Dynamic fluids; Heat, temperature and expansion; Heat Transfer; First and second laws of thermodynamics; Electrostatics; Electricity; Magnetism; Electromagnetic induction; Basic electronics; Nature and propagation of light; Mirrors; Lenses; Prisms; Illumination; Interference, diffraction and polarisation; Introduction to nuclear physics; Practical physics.

**SEMESTER 2**

**Extractive Metallurgy EYTEC2B**
Production of non-ferrous metals; Production of iron and steel; Pollution and pollution control; Refractories.

**Mathematics AMATH2A**
Differentiation II; Integration II; Matrix algebra; Differential equations (first order).
Metallurgical Chemistry AAWMC2A
Properties of gases; Solutions; Kinetics; Chemical equilibrium; Acid-base equilibria, Solubility; Electrochemistry; Emission spectroscopy; X-ray Fluorescence Spectroscopy; Atomic absorption Spectrophotometry.

Mineral Processing EYMEM2A
The concept of distribution functions; Basics of ore preparation; Comminution; Sizing and classification; Screens, classifiers; Solid/Liquid separations.

Physical Metallurgy EYTFD1A
Electron configuration in metals; Crystallography; Solidification of metals; Introduction to plastic deformation; Constitution of alloys; Phases and phase diagrams; Heat treatment; Alloy specification; Corrosion.

Practical Metallurgy
(Select either Module A or B)
Module A: Physical Metallurgy EYPRP2B
Sampling and specimen mounting; Polishing and etching techniques; Macro and micro preparation; Optical microscopy; Qualitative and quantitative metallography; Photography; Introduction to scanning electron microscopy; Pyrometry; Evaluation of material properties.
Module B: Extractive Metallurgy EYPRE2B
Ore dressing; Gravity concentration; Magnetic separation; Froth flotation.

Strength of Materials (Metallurgy) EYTST2B
Static; Direct stresses; Thermal effects and material combinations; Deformation, Poisson’s ratio and Young’s modules; Centroid and second moment of area; Shear force diagrams; Bending moment diagrams; Torsion; Combined stresses.

SEMESTER 3

Applied Mineral Processing EYMEN2A
Application of distribution functions to selection; Minerals and physical properties; Mineral classification based upon elementary compositions and physical properties; Sampling; Concentration processes; Economics.

Chemical Metallurgy EYTCD2A
Free energies, Phase equilibria: the Clausius-Clapeyron equations; Fugacity, activity and equilibrium constant; Solutions, The thermodynamics of electrochemical cell reactions; Reactions kinetics; Advanced slag chemistry

**Composite Materials EYTCM2A**
Introduction, Raw materials, Processing and manufacturing, Properties and design, safety.

**Extraction of Non-Ferrous Metals EYMEC2A**
Copper; Gold; Aluminium; Lead; Tin; Zinc; Calculations; Laboratory practice; Casting of non-ferrous metals.

**Foundry Technology EYTGC2A**
Solidification of metals; Foundry melting methods; Pouring techniques; Ladle treatment of metals; Runners and gating systems; Casting construction and pattern design; Moulding materials; Moulding boxes; Cores and coremaking; Production techniques; Calculations of: Furnace charge make-up, solidification rates, pouring mass.

**Ferro-Alloy Technology EYTFB2A**
Söderberg paste and electrodes; Separation processes (in the furnace, after tap hole); Furnace design; Production of Ferro-silicon; Production of Ferro-manganese; Production of Ferro chrome; Production of special Ferro-alloys; Ferro-alloy furnace equipment; Pollution control and pollution control equipment.

**Geology EYTGA1B**
Earth: surface, structure and age; Mineralogy and mineralogy of ore deposits; Petrology; Structural geology; Surface processes; Stratigraphy; Practical work.

**Mechanical Deformation Technology EYTMI2A**
Elements of the theory of elasticity and plasticity; Fundamentals of metal working; Forging processes; Rolling of metals; Extrusion; Drawing of rod and wire; Sheet metal forming.

**Metallurgical Thermodynamics EYMMW2A**
Enthalpy; Entropy: processes – spontaneous, reversible and irreversible; Free energy; Ellingham diagram for oxides and sulphides; Chemical equilibrium; Behaviour of gases; Principles of phase equilibrium; Construction of phase diagrams: binary, free energy.
Materials Testing: Metallurgy EYTMH3B
*Destructive Testing:* The tension test; The torsion test; Hardness; Fatigue; Creep and stress rupture; Brittle fracture and Impact testing.
*Non-destructive Testing:* Basic principles; Surface and sub-surface defects; Dye-penetrant testing; Magnetic particle testing; Eddy current testing; Internal defects: Ultrasonic testing; Radiographic inspection.

Physical Metallurgy EYTFD2D
Mechanical metallurgy; Strengthening mechanisms; Phase transformations; Corrosion; Diffusion; Ternary phase diagrams; Alloys.

Production of Iron and Steel EYTYA2A
Blast furnace ironmaking; Steel production; Production of alloy steels/stainless steel; Casting of steels; Off-gas systems and pollution; Steel slags.

Quality Control EYTKU2C
Fundamentals of statistics; Statistical process control; Product acceptance (sampling); Quality engineering; Quality and economy; Computers and quality.

Refractories EYTVH2A
Classification of refractories; Properties and standard test methods; Isolation materials; Raw materials for refractories; Fusion point; Load carrying capacity; Spalling; Resistance to gases and slags; Expansion and shrinkage; Heat transfer.

**SEMESTER 4**

Applied Mineral Processing EYMEN3A
Equipment sizing; Power consumption; Industrial flow sheets; Environmental impact; Basic plant design.

Composite materials EYTCM3A
Thermoplastic composites, particle reinforcement, fibre reinforcement, structural composites, properties and design, applications.

Corrosion EYMKR3A
Corrosion processes and corrosion testing; Electrochemistry of corrosion; Passivity; Corrosion of iron and steel; Protection against corrosion; Alloying against corrosion; Non-ferrous alloys and polymers.
Chemical Metallurgy EYTCD3B
Kinetics of heterogeneous reactions; Solid-gas reactions; Solid-liquid reactions; Liquid-gas reactions; Liquid-liquid reactions; Treatment of solutions; Electrode processes; Interfacial phenomena; Precipitation and co-precipitation.

Extraction of Non-Ferrous Metals EYMEC3A
Gold; Uranium; Tin; Zinc; Vanadium; Titanium; Platinum; Nickel; Calculations; Project; Laboratory Practice.

Heat and Mass Transfer EYMHE2A
Introduction; Steady state conduction: one dimension, multiple dimensions; Steady state convection: natural convection systems, forced convection systems; Radiation heat transfer: processes and properties, exchange between surfaces; Unsteady state heat transfer: conduction, convection, radiation; Mass transfer; Fluid flow processes; Heat exchangers.

Foundry Technology EYTGC3B
Quantitative design of patterns and moulds; Control of chemical composition; Moulding and core sand mixtures; Production methods; Moulding machines; Defects and defect evaluation; Heat treatment; Factors influencing costs and estimating; Salvaging of castings; Projects.

Mechanical Metallurgy EYMMP3A
Deformation of metal crystals; Deformation and strengthening; Annealing of deformed metals; Creep; Fatigue of metals; Residual stress concentration; Fracture and fracture mechanics; Failure analysis.

Mechanical Deformation Technology EYTMI3B
Stress and strain; Macroscopic plasticity and yield criteria; Work hardening; Plastic instability; Strain rate and temperature; Ideal work or uniform energy; Slag analysis – force balance; Deformation zone geometry; Formability; Bending; Plastic anisotropy; Cupping; Redrawing and ironing; Complex stamping; Sheet metal properties.

Mineralogy EYMKN2A
Crystallography; Mineral classification; Physical properties of minerals; Mineral identification; Petrography; Ore mineralogy; Industrial minerals.
Physical Metallurgy EYTFD3D
Ultra Low carbon steels; Low carbon steels; High strength low alloy steels; Ultra high strength steels; High alloy and heat resistant steels; Cast irons; Aluminium and Aluminium alloys; Copper and copper alloys.

Production of Iron and Steel EYTYA3B
Thermodynamics of the blast-furnace process; Chemical principles in the blast-furnace; Blast-furnace stoichiometry; The removal of sulphur in the blast furnace; Direct reduction of iron ore; Steel production processes (chemistry of processes); Slags in steelmaking; Continuous casting; Vacuum metallurgy; Appropriate calculations on all processes.

Quality Control EYTKU3A
Introduction; Different philosophies; Quality cost; Quality control; Quality improvement; Acceptance quality control: Inspection and testing, measurement, acceptance sampling; Special quality experiments.

Welding Technology EYTSL2A
Welding processes; Manual arc welding processes; Physics of welding; Defects in welding; Welding and weldability tests; Weld distortion; Welding procedures; Welding specifications, codes, symbols.

Refractories EYTVH3D
Raw materials for monolithic refractories; Manufacture and properties of monolithic refractories; Wear mechanisms of monolithic refractories; Designing; Applications; Installations.

B TECH: ENGINEERING: METALLURGY
Applied Mineral Processing IV (EYMEN4A)
Metallurgical process control; Metallurgical plant design; Cost estimation; Metallurgical plant commissioning; Practical laboratory work, Computer simulations; Assignments.

Corrosion IV (EYMKR4A)
Advanced corrosion theory; Aqueous corrosion theory; Protection against corrosion; Dry corrosion; Irradiation damage of metals.
**Extraction of Non-Ferrous Metals IV (EYMEC4A)**
Reaction kinetics and thermodynamics; Applied thermodynamics; Pyrometallurgy; Hydrometallurgy; Electro-metallurgy; Practical laboratory work, assignments.

**Mathematics III (AMISS3A)**
Applications of integration; First order differential equations and D-operators.

**Mechanical Deformation Technology IV (EYMMI4A)**
Stress and deformation process; Upper-bond analysis; Slip line field theories; Numerical methods in metalworking theory; Examination of deformation processes; Friction and metallurgical factors; Practical laboratory work, Assignments.

**Metallurgical Project IV (EYMPR4A)**
Research methodology and technical writing. Industrial-based or laboratory-based research project in physical metallurgy, pyro-metallurgy, hydrometallurgy or mineral processing.

**Metallurgical Thermodynamics III (EYMMW3A)**
Auxiliary functions: Heat capacity; Enthalpy; Entropy and The third law of thermodynamics. Phase equilibrium in a single component system; Gas reactions; Reactions of pure condensed phases and a gas phase; The behaviour of solutions; Free energy composition and phase diagrams of binary systems; Reaction equilibrium in condensed solutions.

**Mineralogy III (EYMKN3A)**
Mineral chemistry; Polarising microscopy; Process mineralogy; Analytical techniques; Ore genesis; Mineral resources of South Africa; Practical laboratory work, Assignments.

**Physical Metallurgy IV (EYMFD4A)**
Solidification; Diffusion controlled transformation in solids; Diffusionless transformation in solids; Coarsening of particles; Non-continuous phase transformation; Practical laboratory work, Assignments.

**Production of Iron & Steel IV (EYMYA4A)**
Physical: Chemical principles of iron production and Important systems in iron and steel production. Blast furnace aerodynamics; Mathematics modelling; Control of oxygen and electric arc furnace steel production; Vacuum metallurgy; Computer simulations.
SYLLABI FOR NEW DIPLOMA (METALLURGY):
Year 1: SEMESTER 1

Applied Communication 1.1 HKCOX1A
Social Intelligence and Communication Theory; Critical Thinking; Globalisation; Communication theory and its application in the workplace; Listening to improve your input at work; Reading and comprehending in a professional environment; Reading skills; Comprehension skills; Professional writing and correspondence; Good writing style and what to avoid; Dictionary Skills and Introduction to research; Dictionary Skills; Helping with Research

Engineering Chemistry 1 AAEC1A
Matter and energy; Atomic structure; Chemical bonding; Periodic table and nomenclature of inorganic compounds; Chemical equations and stoichiometry; Solutions; Acids, bases and salts; Chemical reactions; Chemical equilibrium; Electrochemistry and redox theory; Introduction to inorganic chemistry; Introduction to organic chemistry.

Engineering Mathematics 1 AMMAT1A
Basic mathematics; Differentiation 1; Integration 1; Statistics A1.

Engineering Skills 1 EEESK1A
Manipulate standard functions and techniques; perform and apply differentiation techniques; perform and apply integration techniques; use, analyse and apply vectors to solve problems; manipulate complex numbers

Engineering Physics 1 APHYS1A
Introduction to vectors; Movement in a straight line; Projectile movement, Newton’s laws; Work and energy; impulse and momentum; Equilibrium statistics; Rotational movement; Elasticity; Statistical fluids; Dynamic fluids; Heat, temperature and expansion; Heat Transfer; First and second laws of thermodynamics; Electrostatics; Electricity; Magnetism; Electromagnetic induction; Basic electronics; Nature and propagation of light; Mirrors; Lenses; Prisms; Illumination; Interference, diffraction and polarisation; Introduction to nuclear physics; Practical physics.

ICT Skills 1 ASICT1A
Recognizing Computers; Using Microsoft Windows 7 Professional; Common Elements; Using Microsoft Word 2010; Using Microsoft Excel
2010; Using Microsoft PowerPoint 2010; Getting Connected; Using the Internet.

Social Intelligence 1 EESIN1A
Evaluate the importance of social intelligence in the engineering context; Demonstrate knowledge and understanding of self-identity and diversity; Apply critical, creative and conceptual and writing skills; Draw the parallels between global and local perspectives.

Year 1: SEMESTER 2
Applied Communication 1.2 HKCOY1A
Communication theory; Oral presentation; Technical writing skills; Group communication skills
Computing Applications 2 EYCOA2A
Engineering Chemistry 2 AAECH2A
Introduction to chemical bonding; Ionic bonds; Covalent bonding and molecular structure; Hydrogen; The Group IA and IIA metals; Boron and Aluminium; Chemical reactions in aqueous solutions; Carbon, Silicon, Germanium, Tin, and Lead; Acids, bases, and non-aqueous solvents; Nitrogen Phosphorus, Arsenic; Oxygen, Sulphur, Selenium, and Tellurium; Halogens.

Engineering Drawing 1 EMEDR1A
Letter and number notation; Line notation; Handling of apparatus; Measurement notation; Geometrical Construction; Orthographic Projections; Arcs of penetration and Developments; Detailed works drawing; Composite drawings.

Engineering Mathematics 2 AMMAT2A
Differentiation II; Integration II; Matrix algebra; Differential equations (first order).

Engineering Physics 2 APHYS2A
Projectile motion; rotational motion; simple harmonic motion and elasticity; fluids; gas behaviour; thermodynamics; current and capacitors; magnetism; nuclear physics, radioactivity and ionising radiation; Calculus.

Safety Principles and Law 1 EYSPA1A
Importance of health and safety; Fundamental safety concepts; Hazard control; Electrical safety; Tools and machines; Transportation; Materials handling; Visual environment; Noise and vibration; Ergonomics; Risk assessment and management; Safety management; Safety systems; Safety analyses and management information

Year 2: SEMESTER 1
Applied Communication 2.1 HKCOX2A
Communication theory; Oral presentation; Technical writing skills; Group communication skills
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Communication Skills 2.2 HKCOX2A</td>
<td>Engineering Geology 1 EYEGE1A</td>
<td>Earth: surface, structure and age; Mineralogy; Petrology; Structural geology; Surface processes; Stratigraphy; Ore deposits; Industrial minerals; Practical work.</td>
</tr>
<tr>
<td>Extractive Metallurgy 1 EYEME1A</td>
<td></td>
<td>Production of non-ferrous metals; Production of iron and steel; Pollution and pollution control; Refractories. The concept of distribution functions; Basics of ore preparation; Comminution; Sizing and classification; Screens, classifiers.</td>
</tr>
<tr>
<td>Manufacturing Metallurgy 1 EYMAM1A</td>
<td></td>
<td>Solidification of metals; casting technologies; design of Runners and gating systems; Casting construction and pattern design; Moulding materials; Moulding boxes; Cores and coremaking; Production techniques; Calculations of: solidification rates. Defects in castings; Dye-penetrant testing; Magnetic particle testing; Eddy current testing; Internal defects: Ultrasonic testing; Radiographic inspection. Introduction to Simulation of Casting Processes. Additive Manufacturing in Casting Processes.</td>
</tr>
<tr>
<td>Mineral Processing 1 EYMPR1A</td>
<td></td>
<td>Ore deposits; Mining and mining methods; Ore handling; Ore preparation; Principles of comminution; Economic considerations</td>
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<tr>
<td>Physical Metallurgy 1 EYPME1A</td>
<td></td>
<td>Electron configuration in metals; Crystallography; Solidification of metals; Introduction to plastic deformation; Constitution of alloys; Phases and phase diagrams; Heat treatment; Alloy specification.</td>
</tr>
<tr>
<td>Process Thermodynamics 1 EYPTH1A</td>
<td></td>
<td>Enthalpy; Entropy: processes – spontaneous, reversible and irreversible; Free energy; Ellingham diagram for oxides and sulphides; Chemical equilibrium; Behaviour of gases; Principles of phase equilibrium; Construction of phase diagrams: binary, free energy. Phase equilibria: the Clausius- Clapeyron equations; Fugacity, activity and equilibrium constant; The thermodynamics of electrochemical cell reactions; Solutions binary and multiple and partial molar quantities; Advanced slag chemistry; Collision frequencies and reaction rate calculations; Construction binary phase diagrams and application of Gibbs phase rule.</td>
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<tr>
<td>Year 2: SEMESTER 2</td>
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<tr>
<td>Hydrometallurgy 2 EYHYD2A</td>
<td></td>
<td>Kinetics of heterogeneous reactions; Solid-gas reactions; Solid-liquid reactions; Liquid-gas reactions; Liquid-liquid reactions; Treatment of solutions; Electrode processes; Interfacial phenomena; Surface chemistry; Precipitation and co- precipitation. Advanced slag chemistry and slag theories; Electro metallurgy of copper with electro refining and electrowinning; Recovery of copper from scrap;</td>
</tr>
</tbody>
</table>
Aluminium production using the Bayer and Hall Herouldt processes; Hydro metallurgy of Copper; Aluminium; Lead; Tin; Zinc; Calculations; Laboratory practice.

**Manufacturing Metallurgy 2 EYMAM2A**
Deformation of metal crystals; Deformation and strengthening; Annealing of deformed metals; Residual stress concentration; Welding processes; Manual arc welding processes; Physics of welding; Defects in welding; Welding and weldability tests; Weld distortion; Welding procedures; Welding specifications, codes, symbols. Additive Manufacturing in Welding Processes. Automation in Welding Processes.

**Mineral Processing 2 EYMPR2A**
Application of distribution functions to selection; Sampling and material balance; Mineral separation methods based on physical properties; Dewatering.

**Physical Metallurgy 2 EYPME2A**
Mechanical metallurgy; Strengthening mechanisms; Phase transformations; Diffusion; The tension test; The torsion test; Hardness; Fatigue; Creep and stress rupture; Brittle fracture and Impact testing

**Pyrometallurgy 2 EYPYR2A**
Kinetics of heterogeneous reactions; Solid-gas reactions; Solid-liquid reactions; Liquid-gas reactions; Liquid-liquid reactions; Treatment of solutions; Electrode processes; Interfacial phenomena; Surface chemistry; Precipitation and co-precipitation. Advanced slag chemistry and slag theories; Electro metallurgy of copper with electro refining and electrowinning; Recovery of copper from scrap; Aluminium production using the Bayer and Hall Herouldt processes; Hydro metallurgy of Copper; Aluminium; Lead; Tin; Zinc; Calculations; Laboratory practice. Classification of refractories; Properties and standard test methods; Isolation materials; Raw materials for refractories; Fusion point; Load carrying capacity; Spalling; Resistance to gases and slags; Expansion and shrinkage; Heat transfer.

**Quality Control 2 EBQCO2A**

**Year 3: SEMESTER 1**

**Engineering Management 1 BHMAN1A**

**Environmental Chemistry 1 EYENC1A**
Review of chemical principles, reactions at the solid-water interface, soil chemistry, contaminants in soils and sediments, medical geochemistry of Earth materials, hydro-geochemistry and hydrologic cycle, water chemistry and contamination, groundwater geochemistry and contamination, atmospheric chemistry and pollution, waste dumps, acid mine drainage.
Hydrometallurgy 3 EYHYD3A
Hydro metallurgy and refining of Gold and Silver; Recovery of Uranium using Leaching, Ion exchange and Solvent extraction processes; Recovery of Tin by Hard Head and ferro silicon processes; Recovery of Vanadium from titaniferous ores; Recovery of Titanium from beach sands; Platinum Group metals extraction and refining; Leaching a reduction of Nickel; Calculations; Project; Laboratory Practice.

Manufacturing Metallurgy 3 EYMAM3A
Fundamentals of metal working; Forging processes; Rolling of metals; Extrusion; Drawing of rod and wire; Sheet metal forming including the theoretical aspects. Additive Manufacturing and Simulation (MagmaSoft). Manufacturing processes of other Materials; Ceramics; Polymers; Composites.

Mineral Processing 3 EYMPR3A
Principles of mineral processing plant design; Material balances on complex flow diagrams; Mathematical models and their applications in mineral processing; Principles, theory and practice of industrial process control in mineral processing plants; Mineral processing plant commissioning practice; Principles and practice of cost estimating.

Physical Metallurgy 3 EYPME3A
Fracture and fracture mechanics, residual stress concentrations, Failure analysis; Corrosion processes and corrosion testing; Electrochemistry of corrosion; Passivity; Corrosion of iron and steel; Protection against corrosion; Alloying against corrosion; Non-ferrous alloys and polymers. Ternary phase diagrams Ultra low carbon steels; Low carbon steels; High strength low alloy steels; Ultra high strength steels; High alloy and heat resistant steels; Cast irons; Aluminium and Aluminium alloys; Copper and copper alloys.

Pyrometallurgy 3 EYPYR3A
Desulphurization of hot metal. Basic oxygen process and electric arc furnace process for steel making. Vacuum degassing of liquid steel. Conventional- and continuous casting of liquid steel. Söderberg paste and electrodes; Separation processes (in the furnace, after tap hole); Furnace design; Steel production calculations of typical plant problems; Production of Ferro-silicon; Production of Ferro-manganese; Production of Ferro chrome; Production of special Ferro-alloys; Pollution and pollution control. Raw materials for monolithic refractories; Manufacture and properties of monolithic refractories; Wear mechanisms of monolithic refractories; Designing; Applications; Installations.
Year 3: SEMESTER 2

Workplace Based Learning 1 EYWIL1A

The Diploma in Metallurgical Engineering has a formal six months Workplace Based Learning Component that is coordinated by the Department of Metallurgical Engineering. Companies accredited by the University will provide Workplace Based Learning. Students will spend a full six months at the workplace following an approved programme under an approved company-based mentor. The programme will include work-based exposure and activities that will cover those sub-disciplines of the qualification that provide specialisation suitable for the company providing the Workplace Based Learning. The students will be required to submit regular progress reports as indicated in the programme as well as a final report that will include suitable work-based project reports, which will be assessed by the University.
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