VAAL UNIVERSITY
OF TECHNOLOGY

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
Eleventh Edition	2021	Twelfth Edition	2022
Thirteenth Edition	2023	Fourteenth Edition	2024
Fifteenth Edition	2025	Sixteenth Edition	2026

Copies of the Faculty Prospectus are obtainable from:
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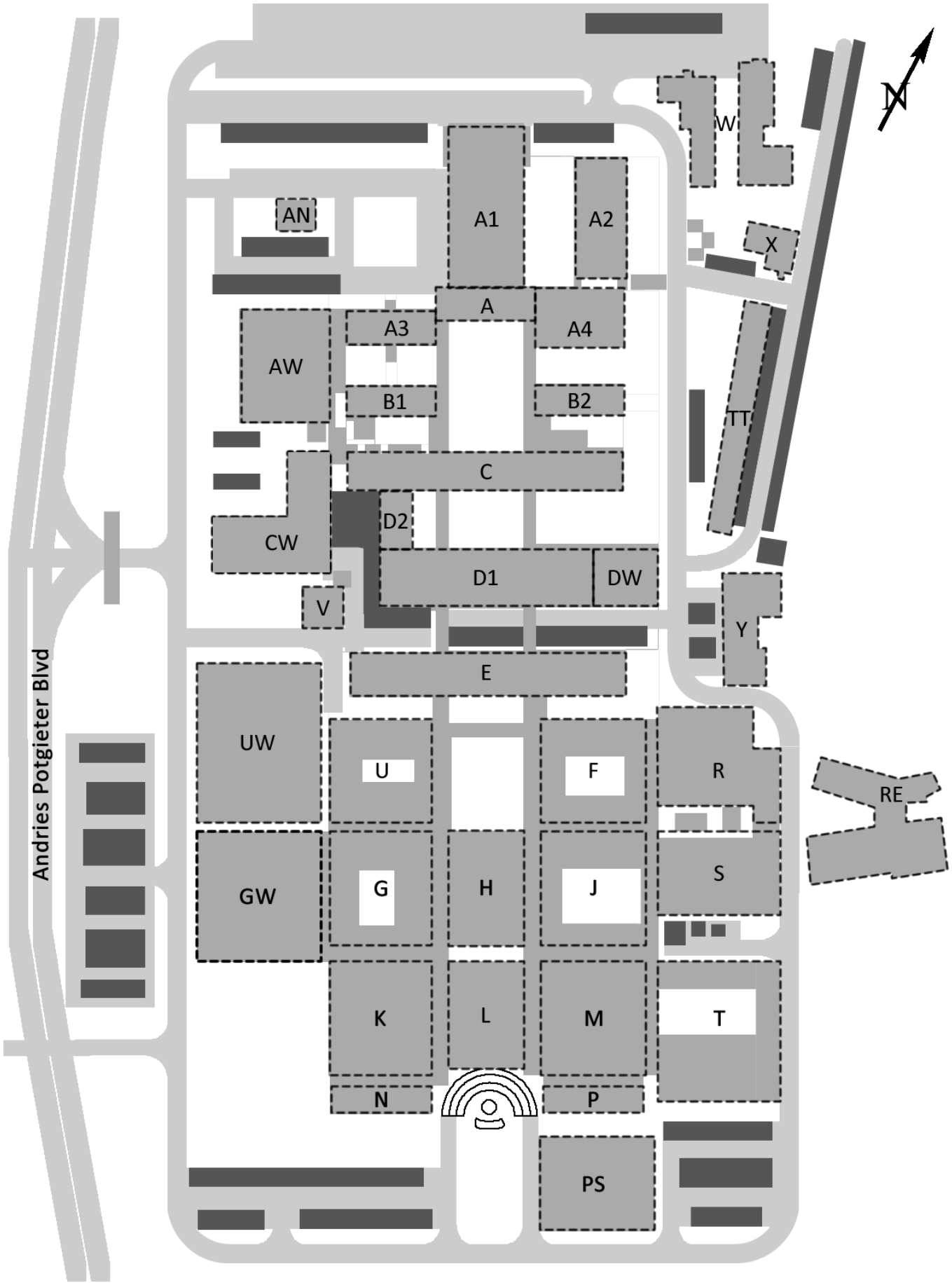
CAMPUS SITE PLAN



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1. WELCOME BY THE EXECUTIVE DEAN

As the Dean of the Faculty of Engineering and Technology (FET), I extend a warm welcome to all new engineering students at Vaal University of Technology (VUT). VUT stands as the sole University of Technology in the southern Gauteng region of South Africa, with FET leading the charge in training aspiring professional engineering technicians, technologists, and entrepreneurs.

Our faculty comprises four departments:

1. Department of Chemical and Metallurgical Engineering
2. Department of Civil Engineering
3. Department of Electrical Engineering: including Power Engineering, Electronic Engineering, Process Control, and Computer Systems Engineering
4. Department of Industrial Engineering and Operations Management, and Mechanical Engineering

Each Department is grounded in strong career-focused knowledge. Our programmes are accredited by the Engineering Council of South Africa (ECSA), ensuring that our graduates are internationally recognized upon registration with ECSA.

The faculty is dedicated to fulfilling VUT's strategic goals, which stem from its vision and mission. Our objectives include delivering quality teaching and learning, boosting research productivity, fostering innovation and commercialisation of new ideas, engaging with the community, and enhancing financial sustainability. Our aim is to leverage cutting-edge technology to tackle challenges within our environment and community.

As you engage in your studies, I encourage you to be diligent and make full use of the resources available to you. This will help you develop the skills necessary for a successful career in engineering.

To succeed, it is crucial to uphold personal values such as academic discipline, commitment to your studies, respect for others, regular class attendance, ethical behaviour, and timely completion of assignments and projects. These attributes will not only contribute to your academic success but also build a strong character that will benefit you in your professional and personal life.

Details of the engineering programmes offered by each Department, as well as staff compositions and curriculum structures, can be found in this Prospectus.

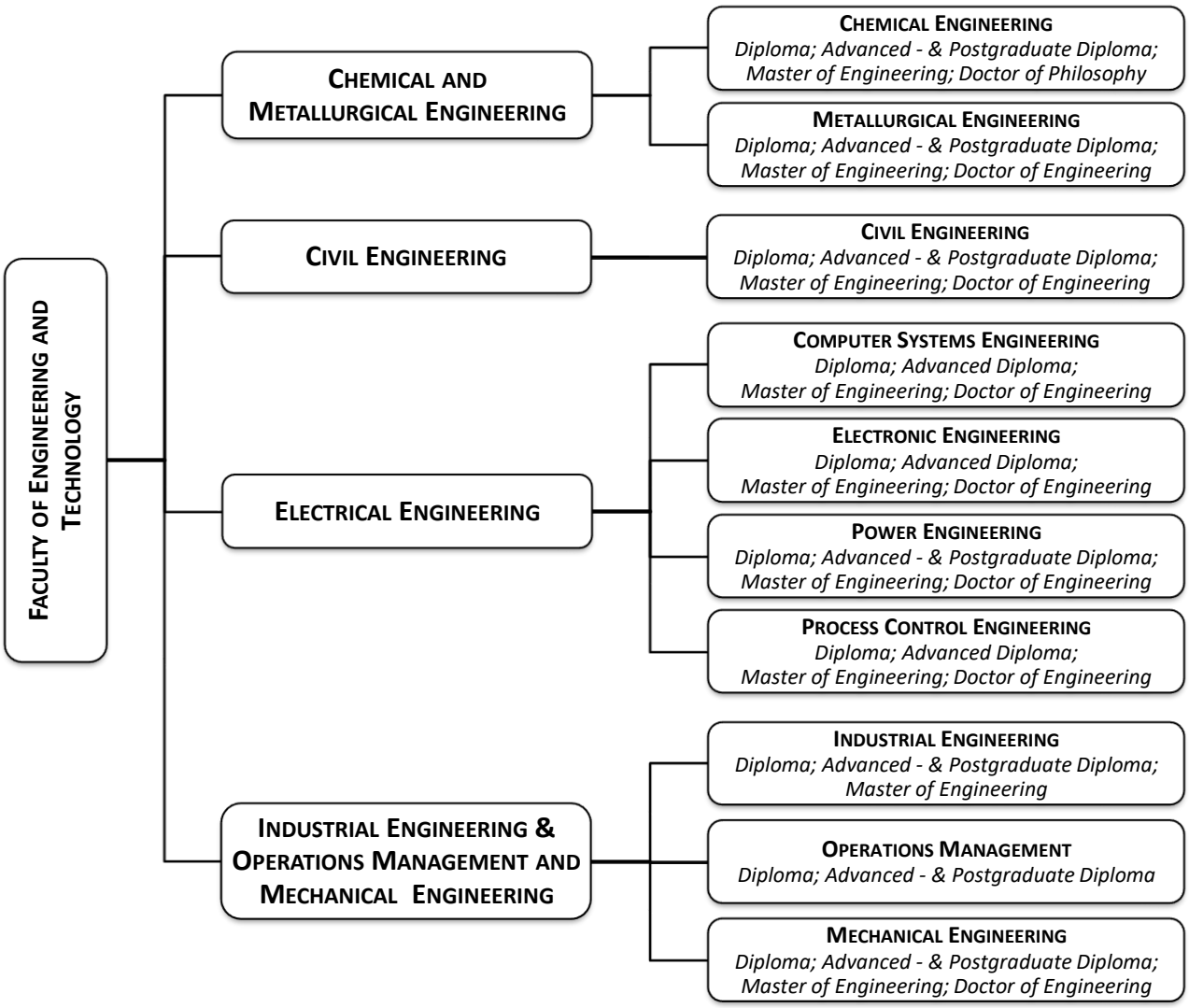
Once again, welcome to Vaal University of Technology! Enjoy your journey with us!

Prof K Abou-El-Hossein

EXECUTIVE DEAN

FACULTY OF ENGINEERING & TECHNOLOGY

2. FACULTY STRUCTURE AND QUALIFICATIONS



3. PROFESSIONAL BODY, PROGRAMME ACCREDITATION AND PROFESSIONAL REGISTRATION

The Engineering Council of South Africa (ECSA) audits all the engineering programmes offered at the Vaal University of Technology every four years. ECSA awards an accreditation status to each programme that meets the standard for the award of the qualification. The standards are designed to meet the educational requirement for registration as a Candidate or Professional Engineering Technician with ECSA 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).

ECSA is a statutory body established in 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 engineering professionals 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 to pursue its goals.

However, in pursuing its goal, ECSA has an implied responsibility to ensure that the profession's interests (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

To achieve the Act's 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/organisations and societies.
- Publication of a guideline tariff of fees for consulting work, in consultation with government, the profession and industry.
- Doing such other things may be necessary for properly performing its functions in terms of the Act.

3.2 HEQF ALIGNMENT AND PROFESSIONAL REGISTRATION WITH ECSA

The Faculty of Engineering and Technology of Vaal University of Technology (VUT),

Vanderbijlpark Campus are offering Higher Education Qualification Sub Framework (HEQSF) aligned qualifications, i.e., Diploma in Engineering and Advanced Diploma in Engineering. These programmes are a replacement for the old NATED 151 qualifications: National Diploma: Engineering and Baccalaureus Technologiae: Engineering that is 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, their education must also be aligned to the HEQSF requirements and ECSAs 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 3 illustrates the ECSA – HEQSF articulation route.

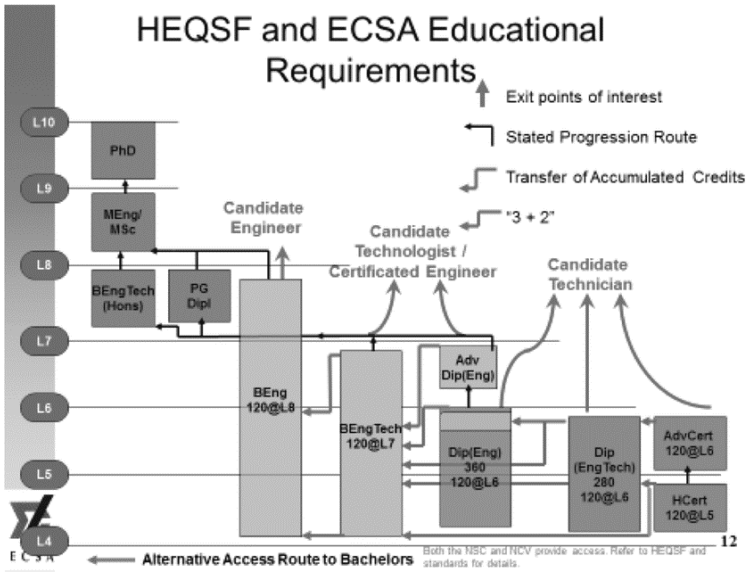


Figure 1: The HEQSF and ECSA educational requirements and progression (after ECSA) (2015)

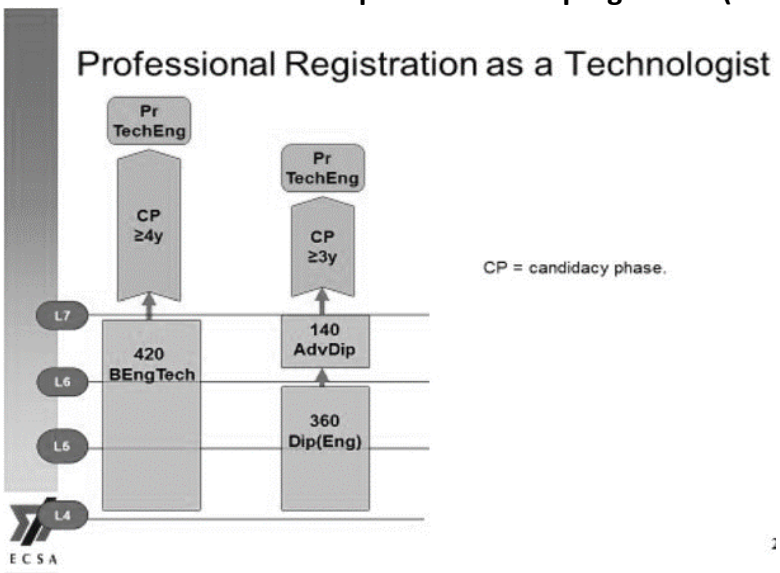


Figure 2: Professional Technologist registration (after ECSA) (2015)

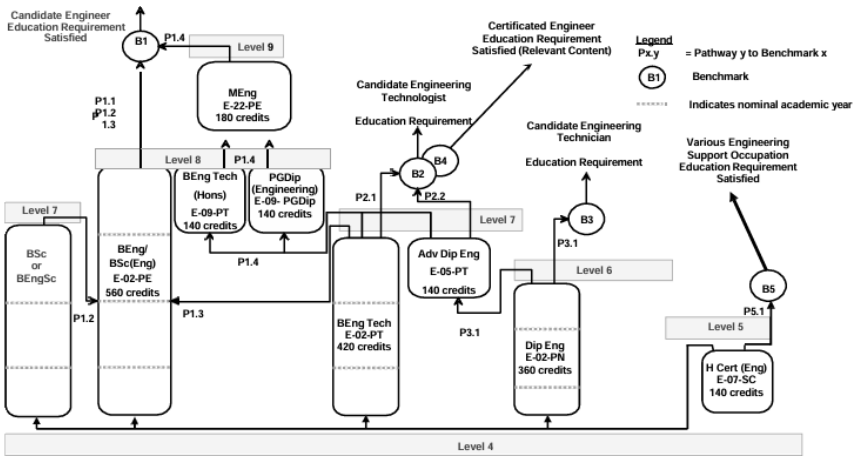


Figure 3: Graphical view of Engineering qualifications in HEQF (ECSA Doc Nr E-23-P)

The Candidacy Phase (CP) is a post-qualification practical experience period required for one to transcend from a candidate to 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)
Private Bag X691
BRUMA, 2026
Tel : +27 (0) 11 607 9500
Fax : +27 (0) 11 622 9295
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 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 contribute to the economy and national development.
- The educational requirement for 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 twelve graduate attributes (GA's) as stipulated in the ECSA Qualification Standard for Diploma in Engineering: NQF Level 6 (ECSA Document E-02-PN Revision 6).

GA 1: Problem-solving

Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity.

GA 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialisation as specified to wide, practical procedures and practices.

GA 3: Engineering design

Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs.

GA 4: Investigations, experiments and data analysis

Demonstrate competence to conduct investigations of well-defined problems; locate and search relevant codes and catalogues; and conduct standard tests and measurements.

GA 5: Use of engineering tools

Demonstrate competence to apply appropriate techniques, resources and modern computing, engineering and IT tools to well-defined engineering problems, with an awareness of the limitations.

GA 6: Professional and technical communication

Demonstrate competence to communicate effectively and inclusively on well-defined engineering activities, both orally and in writing, with the engineering community and society at large, by being able to comprehend the work of others, document own work and give and receive clear instructions.

GA 7: The engineer and the world

Demonstrate critical awareness of the sustainable development impacts on society, the economy, sustainability, health and safety, legal frameworks and the environment.

GA 8: Individual and collaborative teamwork

Demonstrate competence to function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings.

GA 9: Independent learning ability

Demonstrate competence to engage in independent learning through well-developed learning skills.

GA 10: Engineering professionalism
Understand and commit to professional ethics and norms of technician practice, including compliance with relevant laws.

GA 11: Project management and finance
Demonstrate awareness of engineering management principles.

GA 12: 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, completing this 360-credit Diploma meets the minimum entry requirement for admission to an Advanced Diploma designed to support articulation and satisfy an engineering technologist education benchmark. This Diploma provides the base for the graduate to enter training and experience toward independent practise as an engineering technician and registration as a Professional Engineering Technician.

This qualification lies in a HEQSF Vocational Pathway.

4.2 ADVANCED DIPLOMA IN ENGINEERING

This qualification is primarily industry oriented, and 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, educational programmes designed to meet this qualification aim to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practising engineering technologist or certified engineer.

This qualification provides:

- Preparation for careers in engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and contribute 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 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.

Engineering students completing this qualification will demonstrate competence in

all 11 Graduate Attributes (GA's) contained in the Qualification Standard for Advanced Diploma in Engineering: NQF Level 7 (ECSA Document E-05-PT Revision 6).

GA 1: Problem-solving

Identify, formulate, research literature and analyse broadly defined engineering problems reaching substantiated conclusions using analytical tools appropriate to the discipline or area of specialisation.

GA 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialisation to defined and applied engineering procedures, processes, systems or methodologies.

GA 3: Engineering design

Design solutions for broadly defined engineering technology problems and contribute to the design of systems, components or processes to meet identified needs.

GA 4: Investigations, experiments and data analysis

Demonstrate competence to conduct investigations of broadly defined engineering problems; locate, search and select relevant data from codes, data bases and literature, design and conduct experiments to provide valid conclusions.

GA 5: Use of engineering tools

Demonstrate competence to select and apply and recognise limitations of appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to broadly defined engineering problems.

GA 6: Professional and technical communication

Demonstrate competence to communicate effectively and inclusively on broadly defined engineering activities, both orally and in writing, with the engineering community and society at large, taking into account cultural, language and learning differences.

GA 7: The engineer and the world

Demonstrate critical awareness of the sustainable development impacts on society, the economy, sustainability, health and safety, legal frameworks and the environment.

GA 8: Individual and collaborative teamwork

Demonstrate competence to function effectively as an individual and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings.

GA 9: Independent learning ability

Demonstrate competence to engage in independent learning through well-developed learning skills.

GA 10: Engineering professionalism

Understand and commit to professional ethics and norms of engineering

technology practice, including compliance with national and international laws.

GA 11: Project management and finance

Demonstrate knowledge and understanding of engineering management principles.

4.2.1 DIFFERENTIATION OF PROFESSIONAL ENGINEERING TECHNOLOGIST AND PROFESSIONAL CERTIFICATED ENGINEER

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.
- Provide leadership in the application of technology in safety, health, engineering and commercially effective operations and have **well-developed** interpersonal skills.
- Work independently and responsibly, applying judgement to decisions arising in the application of technology and health and safety considerations to problems and associated risks.
- Have a specialized understanding of engineering sciences underlying a deep knowledge of specific technologies together with financial, commercial, legal, social, economic, health, safety and environmental matters.

Professional Certificated Engineers

- Are characterised by the ability to apply established and newly developed engineering technology to solve **broadly defined** problems and 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.
- Provide leadership in safety, health, engineering and commercially effective operations and have **well-developed** managerial skills.
- Work independently and responsibly, applying judgement to decisions arising in the application of technology and health and safety considerations to problems and associated risks.
- 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.

4.2.2 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 several

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

4.3 POSTGRADUATE DIPLOMA IN ENGINEERING

A postgraduate diploma is a postgraduate qualification characterised by the fact that it serves to strengthen and deepen the student's knowledge in a particular discipline or profession. This qualification typically follows a bachelor's degree, advanced diploma or relevant level 7 qualification and serves to consolidate and deepens the student's expertise in a particular discipline, develop competence to solve complex problems, and lays the foundation for research capacity in the methodology and techniques of that discipline.

This qualification demands an elevated level of theoretical engagement and intellectual independence, as well as the ability to relate knowledge to a range of contexts to undertake professional or highly skilled work.

This qualification provides:

- Preparation for careers in engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to contribute to the economy and national development.
- Entry to a cognate NQF level 9 master's degree, e.g. MSc/MEng.
- Access to register as a professional engineer through a relevant master's degree.

Engineering students completing this qualification will demonstrate competence in all eleven (11) Graduate Attributes (GAs) contained in the Qualification Standard for Postgraduate Diploma in Engineering: NQF Level 8 (ECSA Document E-09-PGDip Revision 3).

GA 1: Problem-solving

Identify, formulate, research literature and analyse complex problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences, with holistic considerations for sustainable development.

GA 2: Application of scientific and engineering knowledge

Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialisation to develop solutions to complex problems.

GA 3: Engineering design

Design creative solutions for complex problems and design systems, components or processes to meet identified needs.

GA 4: Investigations, experiments and data analysis

Demonstrate competence to conduct investigations of complex problems using research methods including research-based knowledge, design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

GA 5: Use of engineering tools

Demonstrate competence to create, select and apply, and recognise limitations of appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, to complex problems.

GA 6: Professional and technical communication

Demonstrate competence to communicate effectively and inclusively on complex engineering activities, both orally and in writing, with the engineering community and society at large, taking into account cultural, language and learning differences.

GA 7: The engineer and the world

Demonstrate critical awareness of the sustainable development impacts on society, the economy, sustainability, health and safety, legal frameworks and the environment.

GA 8: Individual and collaborative teamwork

Demonstrate competence to function effectively as an individual and as a member or leader in diverse and inclusive teams and in multi-disciplinary, face-to-face, remote and distributed settings.

GA 9: Independent learning ability

Demonstrate competence to engage in independent learning through well-developed learning skills.

GA 10: Engineering professionalism

Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws.

GA 11: Project management and finance

Demonstrate knowledge and understanding of engineering management principles and economic decision-making.

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 themselves and their activities responsibly, effectively, professionally and ethically, accept responsibility within their 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 performing 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 themselves 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 managerial skills.

4.5 DOCTOR OF ENGINEERING / PHD IN ENGINEERING

The purpose of the 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 themself activities responsibly, effectively, professionally and ethically, accept responsibility within their 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 experiments of an original nature by applying or developing appropriate theories and methodologies and performing data analysis and interpretation.
- Communicate effectively, both orally and in writing, with specific 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 themselves 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 managerial skills.

5. ADMISSION REQUIREMENTS

5.1 GENERIC ADMISSION

Minimum statutory requirements for tertiary education as stated by CHE 2013: The minimum admission requirements for entry to new programmes are as set out in Gazette notice number 32131 of May 2008 for candidates with a National Senior Certificate, and Government notice number 32743 of November 2009 for candidates with a National Certificate (Vocational).

NSC: A NSC endorsed with admission to tertiary education and:

One Home Language
One Home or First Additional Language
Mathematics or Mathematical Literacy
Life Orientation
3 x Other subjects
And achieved 40% in three subjects, one of which is an official language at Home Language level.

5.1.1 DIPLOMA

As stated by CHE 2013: The minimum entry requirement is the National Senior Certificate with appropriate subject combinations and levels of achievement, as defined in the Minister's policy. Minimum Admission Requirements for Higher Certificate, Diploma and Bachelor's Degree Programmes Requiring a National Senior Certificate, Government Gazette, Vol 751, No 32131 of 11 July 2008, and Minimum Admission Requirements for Higher Certificate, Diploma and Bachelor's Degree Programmes requiring a National Certificate (Vocational), published in the Government Gazette, Vol. 533, No.32743, November 2009. Alternatively, a Higher Certificate or Advanced Certificate in a cognate field will satisfy the minimum requirement.

To qualify for admission to Diploma Studies at a University, you need to pass the National Senior Certificate, with an achievement rating of 3 (moderate achievement, 40%-49%) or better in four recognised NSC 20-credit subjects, and a minimum 30% in the language of learning and teaching of the Higher Education institution

concerned.

5.1.2 BACHELORS

As stated by CHE 2013: The minimum entry requirement is the National Senior Certificate with appropriate subject combinations and levels of achievement, as defined in the Minister's policy. Minimum Admission Requirements for Higher Certificate, Diploma and Bachelor's Degree Programmes Requiring a National Senior Certificate, Government Gazette, Vol 751, No 32131 of 11 July 2008, and Minimum Admission Requirements for Higher Certificate, Diploma and Bachelor's Degree Programmes requiring a National Certificate (Vocational), published in the Government Gazette, Vol. 533, No.32743, November 2009. Alternatively, a Higher Certificate or Advanced Certificate in a cognate field will satisfy the minimum requirement.

To qualify for admission to Bachelor`s degree studies at a university, you need to pass the NSC with an achievement rating of 4 (adequate achievement, 50%-59%) or better in four subjects chosen from the designated subject list determined by Higher Education. with a minimum of 30% in the language of learning and teaching of the Higher Education institution concerned.

5.2 VAAL UNIVERSITY OF TECHNOLOGY

Admission is based on the above minimum criteria, with qualification specific additional requirements based on an admission point score (APS). The university calculates the APS as indicated in Table 1.

Table 1: Admission Points Calculation

<table>
<tr><th rowspan="2">NSC Percentages</th><th rowspan="2">NSC Achievement Score/Rating</th><th rowspan="2">SC HG</th><th rowspan="2">SC SG</th><th rowspan="2">VUT Score</th><th colspan="2">Bonus Points</th></tr>
<tr><th>Mathematics</th><th>Physical/Natural Science and English</th></tr>
<tr><td>90% - 100%</td><td rowspan="2">7</td><td rowspan="2">A</td><td rowspan="3">A</td><td>8</td><td rowspan="2">3</td><td rowspan="2">2</td></tr>
<tr><td>80% - 89%</td><td>7</td></tr>
<tr><td>70% - 79%</td><td>6</td><td>B</td><td>6</td><td>2</td><td>1</td></tr>
<tr><td>60% - 69%</td><td>5</td><td>C</td><td>B</td><td>5</td><td>1</td><td rowspan="5">0</td></tr>
<tr><td>50% - 59%</td><td>4</td><td>D</td><td>C</td><td>4</td><td rowspan="4">0</td></tr>
<tr><td>40% - 49%</td><td>3</td><td>E</td><td>D</td><td>3</td></tr>
<tr><td>30% - 39%</td><td>2</td><td>F</td><td>E</td><td>2</td></tr>
<tr><td>0% - 29%</td><td>1</td><td>G</td><td>F</td><td>0</td></tr>
</table>

Please note:

Life Orientation is excluded from all points' calculations and bonus points.

5.2.1 FACULTY OF ENGINEERING AND TECHNOLOGY: MINIMUM ENTRY REQUIREMENTS

The admission point score (APS) for the Faculty of Engineering and Technology admission requirement is shown in the tables below.

Table 2: Diploma programmes in Engineering (Mainstream Programmes)

Qualification	Compulsory Subjects	Minimum for the regular Diploma programme
Diploma: Chemical Engineering Civil Engineering Electrical Engineering: ▪ Electronic ▪ Power ▪ Process Control ▪ Computer Systems Industrial Engineering Mechanical Engineering Metallurgical Engineering	Mathematics	4
	Physical Sciences	4
	English Language	4
	Total (Excluding Life Orientation)	**24***

Table 3: Diploma programme in Operations Management

Qualification	Compulsory Subjects	Minimum
Diploma: Operations Management	Mathematics	4
	Physical Sciences	3
	English Language	4
	Total (Excluding Life Orientation)	**23**

Table 4: Diploma programmes in Engineering (Extended Programmes)

Qualification	Compulsory Subjects	Minimum for the Extended Diploma programme
Diploma: Chemical Engineering Civil Engineering Electrical Engineering: ▪ Electronic ▪ Power ▪ Process Control ▪ Computer Systems Industrial Engineering Mechanical Engineering Metallurgical Engineering	Mathematics	3
	Physical Sciences	3
	English Language	3
	Total (Excluding Life Orientation)	**22****

For admission the following should be noted:

- The prospective student's results must meet the statutory and programme admission requirement.
- Bonus points will only be used for selection purposes. In case of a tie and all other scores remaining the same use the actual percentages to differentiate.
- ***Admission requirements for any of the 3-year Diploma programmes in Engineering is a National Senior Certificate with a **minimum of 24 APS points with minimum of 4 for Mathematics, Physical Science and English** (see Table 2),

except for prospective students seeking admission into Operation Management which requires APS 23 with the minimum of 4 for Mathematics and English, and 3 for Physical Sciences (see Table 3).

- **Admission requirements for any of the 4-year extended Diploma programmes in Engineering is a National Senior Certificate with a **minimum of 22 APS points with minimum of 3 (≥40%) for Mathematics, 3 (≥40%) Physical Science and 3 (≥40%) for English** (see Table 4). *Students that need more information regarding Extended programmes should liaise with their respective HoD and/or the faculty manager. The main purpose of extended programme is to widen access and reinforce/improve success.*
- All other grade 12 or equivalent certificates will be evaluated against/according to statutory and programme requirements.
- International qualifications: All international qualifications will be evaluated by the International Office based on the Swedish scale and SAQA equivalence.
- Transfers: Applications from students to transfer from other institutions will be dealt with in terms of the Recognition of Prior Learning and CAT policies of VUT.

5.2.2 ADVANCED DIPLOMA PROGRAMMES: ALL ENGINEERING DISCIPLINES

A student with a relevant qualification on NQF level 6 (min 360 credits), can apply for admission to the Advanced Diploma in Engineering. The relevant qualification is typically a Diploma in the course applying for (e.g. a Diploma in Civil Engineering on NQF level 6 (min 360 credits) can give admission to the Advanced Diploma in Civil Engineering).

5.2.3 POSTGRADUATE DIPLOMA PROGRAMMES: ALL ENGINEERING DISCIPLINES

A student with a relevant qualification on NQF level 7 (min 120 credits), typically an Advanced Diploma, Bachelor's degree or relevant NQF level 7 qualification, can apply for admission to the Postgraduate Diploma in Engineering.

5.3 QUALIFICATION OBTAINED FROM FURTHER EDUCATION AND TRAINING (FET) OR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING (TVET) COLLEGES

5.3.1 MINIMUM STATUTORY ADMISSION REQUIREMENTS - NC(V) LEVEL 4 QUALIFICATION

Prospective candidates must meet the minimum statutory requirements for students in possession of an NC(V) 4 qualification, as laid out in the prescripts of the Government Gazette no. 32743 of 26 November 2006, to be eligible for admission to a diploma (Mainstream/extended) i.e., 50% in three fundamental subjects, one of which must be English; and 50% in three compulsory vocational modules (see Table 5 below).

Candidates must note that, according to Section 37 (i) of the Higher Education Act (Act 101 of 1997), the decision to admit a student to higher education study is the right and responsibility of the higher education institution concerned. This implies that individual institutions may set additional admission requirements for specific programmes.

5.3.2 ADMISSION REQUIREMENTS FOR STUDENTS WITH N3, N4, N5 AND N6 QUALIFICATIONS

The following admission requirements apply:

A candidate with a FET N3, N4, N5 or N6 certificate may qualify for admission to the first year of a diploma/extended diploma qualification in the Faculty of Engineering and Technology:

- Based on his or her seven best subjects for N4/N5 or N5/N6 with a minimum of 50%.
- However, a candidate must meet the minimum admission requirements, including the language requirement (50%), on VUT scoring scale (see Table 6 below).
- A candidate with an N3, N4, N5 or N6 certificate does not qualify for any subject recognition.
- Subject recognition may be granted to FET students who have successfully completed their FET N6 diplomas. Such subject recognition will only be considered for first year VUT diploma subjects and will only be based on FET N6 level diploma subjects completed successfully. These subjects must be passed at N4, N5 and N6 level with a score of 60% or above. The subject exemption must be decided by the HOD and approved by the Dean of the Faculty of Engineering and Technology.
- Programme prerequisites must be met before a candidate will be admitted to a specific programme of their choice if exemption is to be granted.

Table 5: Admission requirements for prospective students with NC(V)-4 qualification.

Qualification	Compulsory Subjects	Minimum for Diploma programme	*NC-V*
Diploma: Chemical Engineering Civil Engineering Electrical Engineering: ▪ Electronic ▪ Power ▪ Process Control ▪ Computer Systems Industrial Engineering Mechanical Engineering Metallurgical Engineering	Mathematics/Vocational/ Technical Mathematics	4	3 = 40 – 49% (Not yet competent) 4 = 50 – 59% (Competent) 5 = 60 – 69% (Competent) 6 = 70 – 79% (Highly competent) 7 = 80 – 89% (Outstanding competent) 8 = 90 – 100%
	Physical Sciences/ Engineering Sciences/ Technical/Vocational Sciences	4	
	English Language	4	
	Total	**24**	

Please note:

Vocational/Technical Sciences will be used for selection into: Electrical Engineering

Table 6: VUT scoring scale for N qualifications

Symbol achieved	N3	N4/N5/N6
A	6	8
B	5	7
C	4	6
D	3	5
E	2	4

6. ASSESSMENT IN THE FACULTY

The faculty follows the assessment strategy of formal written examinations. 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 modules follow the assessment strategies of Continuous Assessment (CASS). All marks obtained during the semester will make up the learner's final mark. Each module's Learning Guide will indicate which tests and activities will contribute, according to a pre-determined weight, to the final mark.

All CASS modules' marks will be calculated and be available on ITS in the last week of classess in the semester before the commencement of the examination. Exemption may be granted by the HoD or Dean for later calculation and availablility.

The following should be noted:

- There should be no expectation for marks of assessments submitted (or marking of assessments) of a module, if the learner was not registered in the academic year of assessment submission.
- Students must do all the practical work associated with the module.
- Should the student fail the practical component (practical mark less than 50%) of the module no admission to the final examination will be granted.

Engineering Diploma students with only one outstanding theoretical module and WIL may apply to write a special examination, scheduled within the cycle of other special examinations as per the academic calendar. Eligibility requires a valid full period mark for the outstanding module. Applications must be submitted on the prescribed form with all supporting documentation.

7. DEPARTMENT OF CHEMICAL ENGINEERING AND METALLURGICAL ENGINEERING

Head of Department and Administrator

Surname, Initials & Title	Designation	Qualification
Tshilenge, KJ (Prof)	Head of Department (Acting)	DTech
Visagie AM (Ms)	Administrator	AdvDip

7.1 CHEMICAL ENGINEERING

Discipline Staff Details

Surname, Initials & Title	Designation	Qualification
Osifo, P (Prof)	Full Professor	PhD
Seodigeng, T (Prof)	Associate Professor	PhD
Ngoy, E (Dr)	Senior Lecturer	PhD
Brink, CJ (Mrs)	Lecturer	BEng
Dube, G (Mr)	Lecturer	MTech
Khoza, CN (Mr)	Lecturer	MEng
Lerotholi, L (Dr)	Lecturer	PhD
Modiba, E (Mr)	Lecturer	MTech
Nyembe N (Mr)	Lecturer	MTech
Shoko, L (Dr)	Senior Technologist	PhD
Mathebula, G (Mr)	Technologist	MTech
Mbedzi, RM (Mr)	Technologist	MTech
Muthubi, SS (Ms)	Technologist	MTech

7.1.1 DIPLOMA IN CHEMICAL ENGINEERING (DI0800)

Purpose of the Qualification

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

The purpose of the qualification Diploma in Chemical Engineering is to develop the necessary knowledge, under a competent practicing Chemical 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. 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.

Programme Structure

Three (3) year full-time qualification:

- Two and a half years (five semesters S1 to S5) at the Vaal University of Technology.
- One semester (6 months) Workplace-Based Learning (WPBL).

See page 79 for the curriculum.

Admission Requirements

See sections 5.2.1 (page 15) and 5.3 (p 17).

Course Progression Rules

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

a. Progression Rules: POS 1 to POS 2:
   - Students must have passed a minimum of 70 credits (60%) in Year 1 to be allowed to add any Year 2 subjects. Otherwise, the student registers to repeat Year 1 subjects only.
   - All outstanding Year 1 subjects are registered first.
   - No student will be allowed to register for more than 136 credits.

b. Progression Rules: POS 2 to POS 3:
   - Students must have passed all Year 1 subjects.
   - Students must have passed a minimum of 90 credits (60%) in Year 2 to be allowed to add any Year 3 subjects. Otherwise, the student registers to repeat Year 2 subjects only.
   - All outstanding Year 2 subjects are registered first. No selection, no omissions, no exceptions.

c. Progression Rules: POS 3 – Sem 1 to POS 3 – Sem 2 (WIL):
   - Students should have completed all S4 subjects and registered for all S5 before their names are submitted to the Cooperative Education Department for assistance with WIL application.
   - Students are allowed to register for WIL if they have attained a minimum of 306 credits. This is equivalent to all Year 1 and Year 2 subjects completed and only three (3) S5 subjects outstanding.
   - Students must be competent on Graduate Attributes 1 – 11.

Workplace Based Learning (WPBL)

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.

WIL has a minimum duration of six months. Students may enter into a contract of employment of longer than six months.

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 module matter of S5 courses. To ensure the effectiveness of the work integrated learning, employer and the University must co-operate as partners. The student will enrol for the module 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 module.

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.

The final WIL report must be submitted to the University on the **completion of the contract** entered with the employer.

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.

7.1.2 EXTENDED DIPLOMA IN CHEMICAL ENGINEERING (DE0801)

The department offers a 4-year Extended Diploma in Chemical Engineering. See page 88 for more information.

The curriculum of the 4-year extended diploma is on page 90.

Progression Rules for the Extended Diploma in Chemical Engineering (DE0801)

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

1. Progression from POS 0 (Year 1) to POS 1 (Year 2):
   - Passed **ALL** the Foundation modules:
   1. AAXCH1A – Foundation Chemistry 1
   2. AMXMA1A – Foundation Mathematics 1
   3. APXPH1A – Foundation Physics 1
   4. AAXCH2A – Foundation Chemistry 2
   5. AMXMA2A – Foundation Mathematics 2
   6. APXPH2A – Foundation Physics 2
   7. EMXDR1A – Foundation Drawing
   - Passed 5 of the 6 regular diploma subjects (on POS 0)
   - Meet all respective prerequisites* of POS 1 (Year 2)
8. Progression from POS 1 (Year 2) to POS 2 (Year 3):
   - Passed **ALL** modules in POS 0 (Year 1)
   - Obtained a minimum of 60 credits in POS 1 (Year 2)
   - Register first for all outstanding modules in POS 1 (Year 2)
   - Meet all respective prerequisites* of POS 2 (Year 3)
9. Progression from POS 2 (Year 3) to POS 3 (Year 4)
   - Passed **ALL** modules in POS 0 (Year 1)
   - Passed **ALL** modules in POS 1 (Year 2)
   - Obtained a minimum of 100 credits in POS 2 (Year 3)
   - Register first for all outstanding modules in POS 2 (Year 3)
   - Meet all respective prerequisites* of POS 3 (Year 4)

   ** Prerequisites are listed in the course structure on page 90.*

7.1.3 ADVANCED DIPLOMA IN CHEMICAL ENGINEERING (AD0800)

Purpose of the Qualification

The generic purpose of the qualification is spelled out in section 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 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 contribute 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 eleven (11) Graduate Attributes (GA's) contained in the Qualification Standard for Advanced Diploma in Engineering: NQF Level 7 (ECSA Document E-05-PT Revision 6).

Programme Structure

One-year, full-time qualification. See page 99 for the curriculum.

Admission Requirements

See section 5.2.2 (p 17).

All other equivalent qualifications will be considered on a case-by-case basis.

7.1.4 POSTGRADUATE DIPLOMA IN CHEMICAL ENGINEERING (PG0800)

Purpose of the Qualification

The purpose of this qualification is to strengthen and deepen students' knowledge in the chemical engineering discipline with advanced technical skills and competencies to work in industry as a professional technologist and/or to progress to do higher academic qualifications. The knowledge emphasises consolidation and deepening of discipline specific expertise and developing competence to solve complex problems as well as to lay strong foundation for research capacity in the methodology and techniques in the chemical engineering discipline. The qualification provides students with a high level of theoretical engagement and solid intellectual independence as well as the ability to apply their knowledge and skills to undertake professional and highly skilled work in the area of Chemical Engineering and related and/or specialised disciplines. 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 purpose is to build necessary knowledge content areas – specifically mathematical and natural sciences, discipline-specific advanced engineering sciences, and engineering design and synthesis have been developed meet or exceed the requirements of an NQF level 8 qualification.

This qualification provides:

1. Preparation for careers in chemical engineering, for achieving technical proficiency and to contribute to the economy and national development.
2. Entry to NQF level 9 programmes e.g., Master's Degree Programmes such as

MSc and MEng.

3. Access to register as a profession engineer through a relevant master's degree.

Engineering students completing this qualification will demonstrate competence in all eleven (11) Graduate Attributes (GAs) contained in the Qualification Standard for Postgraduate Diploma in Engineering: NQF Level 8 (ECSA Document E-09-PGDip Revision 3).

Programme Structure

One-year, full-time qualification.

See page 101 for the curriculum.

Admission Requirements

See section 5.2.3 (p 17).

All other equivalent qualifications will be considered on a case-by-case basis.

7.1.5 MASTER OF ENGINEERING (MENG) IN CHEMICAL ENGINEERING (MP0800)

Purpose of the Qualification

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 section 4.4.)

Programme Structure

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

Admission Requirements

BEng degree in Chemical Engineering or equivalent level 8 qualification including PGD in Chemical Engineering. 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.

7.1.6 DOCTOR OF PHILOSOPHY (PHD) IN CHEMICAL ENGINEERING (708001)

Admission Requirements

MEng (Chemical Engineering) or equivalent. Ad hoc cases will be treated on merit.

Programme Structure

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

7.2 METALLURGICAL ENGINEERING

Discipline Staff Details

Surname, Initials & Title	Designation	Qualification
Otunniyi, I (Prof)	Professor	PhD
Matizamhuka, W (Prof)	Associate Professor	PhD
Motsetse, K (Dr)	Senior Lecturer	DEng
Baloyi, N (Ms)	Lecturer	MTech
Kohitlhetse, I (Mr)	Lecturer	MTech
Lepule, M (Ms)	Lecturer	MTech

Surname, Initials & Title	Designation	Qualification
Maramba, B (Mr)	Lecturer	MSc
Baloyi, MF (Ms)	Technician	PGDip
Chingowo, S (Ms)	Technician	MTech
Nemavhola, K. (Ms)	Technologist	MTech
Ayo,T (Mr)	Laboratory Assistant	BSc

7.2.1 DIPLOMA IN METALLURGICAL ENGINEERING (DI0850)

Purpose of the Qualification

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

The purpose of the qualification Diploma in Metallurgical Engineering 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 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.

Programme Structure

Three-year full-time qualification:

- Five semesters, S1 to S5 at the Vaal University of Technology.
- One semester Workplace Based Learning (WPBL).

See page 88 for the curriculum.

Admission Requirements

See sections 5.2.1 (page 15) and 5.3 (p 17).

Course Progression Rules

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

a. Progression Rules: POS 1 to POS 2:
   - Students must have passed a minimum of 70 credits (60%) in Year 1 to be allowed to add any Year 2 subjects. Otherwise, the student registers to repeat Year 1 subjects only.
   - All outstanding Year 1 subjects are registered first.
   - No student will be allowed to register for more than 136 credits.

b. Progression Rules: POS 2 to POS 3:
   - Students must have passed all Year 1 subjects.
   - Students must have passed a minimum of 82 credits (60%) in Year 2 to be allowed to add any Year 3 subjects. Otherwise, the student registers to repeat Year 2 subjects only.

c. Progression Rules: POS 3 – Sem 1 to POS 3 – Sem 2 (WIL):
   - Students should have completed all S4 subjects and registered for all S5

before their names are submitted to the Cooperative Education Department for assistance with WIL application.

- Students are allowed to register for WIL if they have attained a minimum of 290 credits. This is equivalent to all Year 1 and Year 2 subjects completed and only three (3) S5 subjects outstanding.
- Students must be competent on Graduate Attributes 1 – 11.

Workplace Based Learning (WPBL)

The Diploma in Metallurgical Engineering has a formal six-month workplace-based learning component that is coordinated by the Department of Metallurgical Engineering.

WPBL has a minimum duration of six months. Students may enter into a contract of employment of longer than six months.

The final report must be submitted to the University on the **completion of the contract** entered with the employer.

7.2.2 EXTENDED DIPLOMA IN METALLURGICAL ENGINEERING (DE0851)

The department offers a 4-year Extended Diploma in Metallurgical Engineering. See page 88 for more information.

The curriculum of the 4-year Extended Diploma is on page 94.

Progression Rules for the Extended Diploma in Metallurgical Engineering (DE0851)

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

1. Progression from POS 0 (Year 1) to POS 1 (Year 2):
   - Passed **ALL** the Foundation modules:
   2. AAXCH1A – Foundation Chemistry 1
   3. AMXMA1A – Foundation Mathematics 1
   4. APXPH1A – Foundation Physics 1
   5. AAXCH2A – Foundation Chemistry 2
   6. AMXMA2A – Foundation Mathematics 2
   7. APXPH2A – Foundation Physics 2
   8. EMXDR1A – Foundation Drawing
   - Passed 6 of the 7 regular diploma subjects (on POS 0)
   - Meet all respective prerequisites of POS 1 (Year 2)
9. Progression from POS 1 (Year 2) to POS 2 (Year 3):
   - Passed **ALL** modules in POS 0 (Year 1)
   - Obtained a minimum of 60 credits in POS 1 (Year 2)
   - Register first for all outstanding modules in POS 1 (Year 2)
   - Meet all respective prerequisites of POS 2 (Year 3)
10. Progression from POS 2 (Year 3) to POS 3 (Year 4)
   - Passed **ALL** modules in POS 0 (Year 1)
   - Passed **ALL** modules in POS 1 (Year 2)
   - Obtained a minimum of 100 credits in POS 2 (Year 3)

- Register first for all outstanding modules in POS 2 (Year 3)
- Meet all respective prerequisites of POS 3 (Year 4)

** Prerequisites are listed in the course structure on page 94.*

7.2.3 ADVANCED DIPLOMA IN METALLURGICAL ENGINEERING (AD0850)

Purpose of the Qualification

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

The purpose of the qualification Advanced Diploma in Metallurgical Engineering 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 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.

Programme Structure

One-year, full-time qualification.

See page 101 for the curriculum.

Admission Requirements

See section 5.2.2 (p 17).

Career Opportunities

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

7.2.4 POSTGRADUATE DIPLOMA IN METALLURGICAL ENGINEERING (PG0850)

Programme Structure

One-year, full-time qualification.

See page 103 for the curriculum.

Admission Requirements

See section 5.2.3 (p 17).

7.2.5 MASTER OF ENGINEERING IN METALLURGICAL ENGINEERING (MENG METALLURGICAL ENGINEERING) (MP0850)

Purpose of the Qualification

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 section 4.4.)

Programme Structure

One-year, full-time qualification and the instructional programme comprises of a

dissertation only.

Admission Requirements

A BEng Degree or equivalent NQF level 8 qualification including the Postgraduate Diploma.

7.2.6 DOCTOR OF ENGINEERING IN METALLURGICAL ENGINEERING (DENG METALLURGICAL ENGINEERING) (DP0850)

Purpose of the Qualification

The purpose of the qualification is to prove that the candidate can 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 section 4.5.)

Programme Structure

Two-year, full-time qualification and the instructional programme comprises of a dissertation only.

Admission Requirements

A MEng Degree or equivalent NQF level 9 qualification.

Assessment

The thesis will be examined by two external and one internal examiner who are subject specialists. Only distinction work will qualify.

7.3 ENQUIRIES

Enquiries may be addressed to:

HoD: Chemical and Metallurgical Engineering
Faculty of Engineering & Technology
Vaal University of Technology
Private Bag X021
VANDERBIJLPARK, 1900
Tel : +27 (0)16 950 9243
Fax : +27 (0)16 950 9796
e-mail : sammyk1@vut.ac.za
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Ms N Kokoali
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Mr S Motsie
Tel : +27 (0)16 950 7639
e-mail : sehlabakam@vut.ac.za

8. DEPARTMENT OF CIVIL ENGINEERING

Head of Department and Administrator

Surname, Initials & Title	Designation	Qualification
Vacant	Head of Department	
Tlakeli, RN (Ms)	Administrator	PGDHE

Departmental Staff Details

Surname, Initials & Title	Designation	Qualification
Beer, M (Mrs)	Lecturer	MSc (Civil Eng)
Gaborone, K (Mr)	Lecturer	BSc (Hons) Eng
Mgijima, A (Mr)	Lecturer	MEng (Prof): Civil & Environmental Engineering
Mohale, L (Mr)	Lecturer	MPhil: Engineering Management
Mudau, P (Ms)	Lecturer	MEng
Nakin, O (Ms)	Lecturer	MEng: Civil Eng
Onyango, F (Mr)	Lecturer	MTech: Eng: Civil
Smit M (Mr)	Technologist	BTech: Eng: Civil
Chapinduka, M (Ms)	Laboratory Technician	BTech: Eng: Civil
Modise, GS (Mrs)	Laboratory Technician	BTech: Eng: Civil
Mokoaleli, P (Ms)	Laboratory Technician	PGD: Civil Engineering
Phakathi, S (Mr)	Laboratory Technician	BTech: ICT

8.1 DIPLOMA IN CIVIL ENGINEERING (DI0810)

Purpose of the Qualification

The generic purpose of the qualification is spelled out in section 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.

Programme Structure

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

HEQSF Qualification Type	Diploma
Variant	Vocationally oriented
NQF Exit Level	6
Minimum Total Credits	360
Minimum Credits at Exit Level	120

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 module's practical work done in laboratories or on site.

See page 80 for the curriculum.

Admission Requirements

See sections 5.2.1 (page 15) and 5.3 (p 17).

Fields Of Study

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

Workplace Based Learning (WPBL)

To qualify for the Diploma in 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.

WIL has a minimum duration of six months. Students may enter into a contract of employment of longer than six months.

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 module 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 module 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 9 & 12 (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%), and to pass with distinction the student must obtain a minimum of Level 4 (≥75%). The University acts as a moderator for the module.

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 a Semester report and Project (20 pages minimum). All reports should be ring-bounded otherwise it will not be accepted for marking.

The final WIL report must be submitted to the University on the **completion of the contract** entered with the employer.

Course Progression Rules

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

1. Progression from YEAR 1 to YEAR 2:
   - Obtained a minimum of 90 credits in YEAR 1.
   - Register first for all outstanding subjects in YEAR 1.
   - Meet all respective prerequisites.*
2. Progression from YEAR 2 to YEAR 3 (Semester 1):
   - Passed all subjects in YEAR 1.
   - Obtained a minimum of 100 credits in YEAR 2.
   - Register first for all outstanding subjects in YEAR 2.
   - Meet all respective prerequisites.*
3. Progression to YEAR 3 (Semester 2):
   - Pass all theoretical modules of Year 1, 2, and 3 (Semester 1).
   - Be competent in GA 1 to GA 11 (except GA 9, which is covered in in WIL).

   ** Prerequisites are listed in the course structure on page 80.*

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 Civil Engineering); and
- The skills and applied competence defined in section 4.1 (GA's for Diploma in Engineering – page 6).

Table: Knowledge area characteristics and credits (Diploma in Engineering)

Knowledge area	Credits
Mathematical Sciences	35
Natural Sciences	40
Engineering Sciences	140
Design and Synthesis	36
Complementary Studies	86
Work Integrated Learning	60
Total	**397**

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

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

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).

Presentation of Evidence of Assessment of Graduate Attributes

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

Table: Presenting Evidence of Assessment of GAs

ECSA Graduate Attribute
e.g., GA1: Problem Solving
Apply engineering principles to systematically diagnose and solve *well-defined* engineering problems
Where is the attribute assessed?
How is this attribute assessed?
What is satisfactory performance/achievement?
What is the consequence of unsatisfactory performance/non-achievement?

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 Geo-technician.

8.2 EXTENDED DIPLOMA IN CIVIL ENGINEERING (DE0811)

The department offers a 4-year Extended Diploma in Civil Engineering. See section 11.2 (p 88) for more information.

The curriculum of the 4-year Extended Diploma is on page 91.

Progression Rules for the Extended Diploma in Civil Engineering (DE0811)

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

1. Progression from POS 0 (Year 1) to POS 1 (Year 2):
   - Passed **ALL** the Foundation modules:
   2. AAXCH1A – Foundation Chemistry 1
   3. AMXMA1A – Foundation Mathematics 1
   4. APXPH1A – Foundation Physics 1

5. AAXCH2A – Foundation Chemistry 2
6. AMXMA2A – Foundation Mathematics 2
7. APXPH2A – Foundation Physics 2
8. EMXDR1A – Foundation Drawing

- Passed 6 of the 7 regular diploma subjects (on POS 0)
- Meet all respective prerequisites* of POS 1 (Year 2)

9. Progression from POS 1 (Year 2) to POS 2 (Year 3):
   - Passed **ALL** modules in POS 0 (Year 1)
   - Obtained a minimum of 60 credits in POS 1 (Year 2)
   - Register first for all outstanding modules in POS 1 (Year 2)
   - Meet all respective prerequisites* of POS 2 (Year 3)
10. Progression from POS 2 (Year 3) to POS 3 (Year 4)
   - Passed **ALL** modules in POS 0 (Year 1)
   - Passed **ALL** modules in POS 1 (Year 2)
   - Obtained a minimum of 100 credits in POS 2 (Year 3)
   - Register first for all outstanding modules in POS 2 (Year 3)
   - Meet all respective prerequisites* of POS 3 (Year 4)

** Prerequisites are listed in the course structure on page 91.*

8.3 ADVANCED DIPLOMA IN CIVIL ENGINEERING (AD0810)

Purpose of the Qualification

The generic purpose of the qualification is spelled out in section 4.2 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 its respective disciplines e.g., Structural, Water, Transportation, and Construction Management and the ability to apply their knowledge and skills to become 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 Master's Programmes.

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

Programme Structure

HEQSF Specification: The qualification Advanced Diploma in 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 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 module's practical work done in laboratories or on site.

See page 99 for the curriculum.

Admission Requirements: Advanced Diploma in Civil Engineering

See section 5.2.2 (p 17), or a relevant qualification (e.g. Bachelor's in Civil Engineering).

Fields of Study

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

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 modules and shall be evaluated by means of a learner having to show competence in ALL eleven (11) graduate attributes (GA's) associated with the relevant exit level modules. The exit level modules associated with particular GA's shall be made known to the learner in advance by the Lecturer concerned and the respective rules governing the measure of achievement or no 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.

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 Civil Engineering); and
- The skills and applied competence defined in section 4.2 (GA's for Advanced Diploma in Engineering – page 8).

Table: Knowledge area characteristics and credits (Advanced Diploma)

Knowledge area	Credits
Mathematical Sciences	15
Natural Sciences	7
Engineering Sciences	33
Engineering Design and Synthesis	32
Complementary Studies	53
Total	**140**

Achievement of Competence in Assessed Graduate Attributes

See p 33.

Presentation of Evidence of Assessment of Graduate Attributes

See p 34.

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.

8.4 POSTGRADUATE DIPLOMA IN CIVIL ENGINEERING (PG0810)

Purpose of the Qualification

The Postgraduate Diploma in Civil Engineering is a postgraduate qualification, exhibiting the characteristics that it prepares students for industry and research. This qualification typically follows a Bachelor's Degree, Advanced Diploma or relevant NQF level 7 qualifications and serves to consolidate and deepen the student's expertise in the field of Civil Engineering and to develop research capacity in the methodology and techniques of Civil Engineering disciplines.

This qualification demands a high level of theoretical engagement and intellectual independence. It also requires the student to have the ability to relate knowledge to a range of contexts to undertake professional or highly skilled work.

This qualification provides:

1. Preparation for a career in civil engineering itself and areas that potentially benefit from civil engineering skills, for achieving technological proficiency and to contribute to the economy and national development; and
2. Entry to NQF level 9 Master's Degree programmes in civil engineering e.g. MSc/MEng
3. Pathway for registration as a Candidate Engineer

Civil Engineering students completing this qualification will demonstrate competence in all the graduate attributes contained in the ECSA Document for the Qualification Standard for Postgraduate Diploma in Engineering Technology: NQF Level 8 (Document No.: E-09-PGDip).

Programme Structure

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

HEQSF Qualification Type	Postgraduate Diploma
Variant	Professionally oriented
NQF Exit Level	8
Minimum Total Credits	140
Minimum Credits at Exit Level	120

Qualification title: Postgraduate Diploma (PGD) in Civil Engineering

Duration: This is a one-year, full-time programme and consists of two semesters university attendance (8 modules) that includes two (2) modules on Civil Engineering Research Project. Each semester consists of approximately sixteen weeks of theoretical studies; each week consisting of lectures, tutorials and in some module's practical work done in laboratories or on site.

See page 102 for the curriculum.

Admission Requirements

See section 5.2.3 (p 17).

Fields of Study

Fields of study include transportation, water, structural, geotechnical, project and construction management and environmental engineering.

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 Projects 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 modules and shall be evaluated by means of a learner having to show competence in **ALL** eleven (11) graduate attributes (GA's) associated with the relevant exit level modules. The exit level modules associated with particular GA's shall be made known to the learner in advance by the Lecturer concerned and the respective rules governing the measure of achievement of competence, or no 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.

Standard for the award of the qualification

The qualification may be awarded when the qualification standard has been met or exceeded. The measure of this achievement is when the student has demonstrated:

- The knowledge defined in the Table below (knowledge area characteristics and credits – Postgraduate Diploma in Engineering: Civil Engineering); and
- The skills and applied competence defined in section 4.3 (GA's for Postgraduate Diploma in Engineering – page 10).

Table: Knowledge area characteristics and credits (Postgraduate Diploma)

Knowledge area	Credits
Mathematical Sciences	17
Natural Sciences	8
Engineering Sciences	43
Engineering Design & Synthesis	52
Complementary Studies	20
Total	**140**

Achievement of Competence in Assessed Graduate Attributes

See this section on page 33.

Presentation of Evidence of Assessment of Graduate Attributes

See this section on page 34.

Career Opportunities

Postgraduate Diploma in Civil Engineering prepares candidates with a stronger and deeper knowledge in the disciplines of civil engineering. The graduates could be involved in research to solve complex civil engineering problems. The structure of the programme is such that the candidates acquire competencies that meet the educational requirements for registration in the category candidate engineer. As a researcher or engineer, the graduates could be involved at a higher level, 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, and environmental engineering related works.

8.5 MASTER OF ENGINEERING (MENG) IN CIVIL ENGINEERING (MP0810)

Purpose of the Qualification

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 section 4.4)

Programme Structure

One-year, full-time qualification and the instructional programme comprises of a dissertation only.

Admission Requirements

A BEng degree or equivalent level 8 qualification including the Postgraduate Diploma in Civil Engineering.

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

Ad hoc cases will be treated on merit.

Assessment

The Master's 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.

8.6 DOCTOR OF ENGINEERING IN CIVIL ENGINEERING (DP0810)

Purpose of the Qualification

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 section 4.5.)

Programme Structure

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

Admission Requirements

Master of Engineering in Civil Engineering or equivalent level 9 qualification.

Ad hoc cases will be treated on merit.

Assessment

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

8.7 ENQUIRIES

Enquiries may be addressed to:

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Vaal University of Technology
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VANDERBIJLPARK, 1900
Tel : +27 (0)16 950 9241
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e-mail : sehlabakam@vut.ac.za

9. DEPARTMENT OF ELECTRICAL ENGINEERING

Head of Department and Administrator

Surname, Initials & Title	Designation	Qualification
Nshimba, KT (Mr)	Head of Department (Acting)	MSc
Mwale, RZ (Ms)	Administrator	PG Dip (HE)

9.1 ELECTRICAL ENGINEERING: COMPUTER SYSTEMS ENGINEERING

Discipline Staff Details (Computer Systems and Process Control)

Surname, Initials & Title	Designation	Qualification
Joubert, A (Prof)	Associate Professor	DTech Eng
Otunniyi, TO (Dr)	Senior Lecturer	PhD
Pretorius, PD (Mr)	Senior Research Technologist	MTech
Benson, MJM (Mr)	Lecturer	MTech
Khoza, MW (Mr)	Lecturer	BSc
Maloka, TV (Mr)	Lecturer	BTech
Marie, T (Mr)	Lecturer	MTech
Vosloo, AM (Ms)	Lecturer	BTech
Baxter, R (Mr)	Technician	BTech
Roos, L (Mr)	Technician	BTech
Van Tonder, Z (Ms)	Technician	BTech
Seriki, OJO (Mr)	Laboratory Assistant	M Tech

9.1.1 DIPLOMA IN ELECTRICAL ENGINEERING: COMPUTER SYSTEMS ENGINEERING (DI0822)

Purpose of the Qualification

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

The purpose of the qualification Diploma in Electrical Engineering: Computer Systems Engineering discipline 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 can apply 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.

Programme Structure

Three years qualification, min 360 credits, NQF level 6. Offered full-time, contact classes are for a period of six semesters (three years) followed by a one-year Workplace Based Learning (WPBL) (carried out through attachment to industry) component. The student will be assisted by the university to look for suitable industry opportunities (companies) to complete the required WPBL training and skills development.

See page 81 for the curriculum.

Admission Requirements

See sections 5.2.1 (p 15) and 5.3 (p 17).

Course Progression Rules

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

1. A minimum of 60 credits must be passed in any year (POS) before a student can enrol for the succeeding year.
2. Only modules for which the required prerequisite(s)* have been passed can be enrolled for in the succeeding year.
3. Students must pass all Graduate Attributes (GA's) before a module can be passed.
4. All theory modules must be passed before a student can do Workplace Based Learning (WPBL – Year 3 Semester 2).
   ** Prerequisites are listed in the course structure on page 81.*

Workplace Based Learning (WPBL)

The Diploma in Electrical Engineering: Computer Systems Engineering has a formal Workplace Based Learning (WPBL) component of 60 credits. This takes place at an accredited employer (company). A student needs to pass all the qualification required theoretical modules before applying for placement at a company to do the WPBL modules of the qualification.

WPBL has a minimum duration of six months. Students may enter into a contract of employment of longer than six months.

The student will be assisted to find suitable placement after which the student will register for the WPBL modules. The student will provide progress reports at regular intervals, in co-operation with a work-based mentor, to confirm that the necessary practical outcomes are being achieved.

The final report must be submitted to the University on the **completion of the contract** entered with the employer.

Articulation within the electrical engineering disciplines

After semester one, full articulation between the four disciplines is possible without requiring extra subjects. However, from semester two to semester five, full articulation between the four disciplines is allowed only if a student complete the outstanding subjects for the new disciplines moving towards.

9.1.2 EXTENDED DIPLOMA IN ELECTRICAL ENGINEERING: COMPUTER SYSTEMS ENGINEERING (DE0862)

The department offers a 4-year Extended Diploma in Metallurgical Engineering. See page 88 for more information.

The curriculum of the 4-year Extended Diploma is on page 95.

Progression Rules for the Extended Diploma in Electrical Engineering: Computer Systems Engineering (DE0862)

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

1. Progression from POS 0 (Year 1) to POS 1 (Year 2):
   - Passed **ALL** the Foundation modules:
   2. AAXCH1A – Foundation Chemistry 1
   3. AMXMA1A – Foundation Mathematics 1
   4. APXPH1A – Foundation Physics 1
   5. AAXCH2A – Foundation Chemistry 2
   6. AMXMA2A – Foundation Mathematics 2
   7. APXPH2A – Foundation Physics 2
   - Passed 6 of the 7 regular diploma subjects (on POS 0)
   - Meet all respective prerequisites* of POS 1 (Year 2)
8. Progression from POS 1 (Year 2) to POS 2 (Year 3):
   - Passed **ALL** modules in POS 0 (Year 1)
   - Obtained a minimum of 60 credits in POS 1 (Year 2)
   - Register first for all outstanding modules in POS 1 (Year 2)
   - Meet all respective prerequisites* of POS 2 (Year 3)
9. Progression from POS 2 (Year 3) to POS 3 (Year 4)
   - Passed **ALL** modules in POS 0 (Year 1)
   - Passed **ALL** modules in POS 1 (Year 2)
   - Obtained a minimum of 100 credits in POS 2 (Year 3)
   - Register first for all outstanding modules in POS 2 (Year 3)
   - Meet all respective prerequisites* of POS 3 (Year 4)

   ** Prerequisites are listed in the course structure on page 95.*

9.1.3 ADVANCED DIPLOMA IN ELECTRICAL ENGINEERING: COMPUTER SYSTEMS ENGINEERING (AD0822)

Purpose of the Qualification

The purpose of this qualification is to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing engineering technologist. Specifically, the qualifications provide:

- A thorough grounding in mathematics, basic sciences, engineering sciences, engineering modelling, engineering design and the abilities to enable applications in the fields of emerging knowledge together with an appreciation for the world and society in which engineering is practiced.
- Preparation for a career in engineering itself 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 Engineering Technologist with ECSA.
- For graduates with an appropriate level of achievement in the Advanced Diploma, the ability to enter a Bachelor Honours Degree or Postgraduate Diploma programme.
- For graduates with an appropriate level of achievement in the Diploma in Electrical Engineering, the ability to enter the Advanced Diploma in Electrical

Engineering: Computer Systems Engineering programme.

The qualification 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 also designed to add value to the qualifying student in terms of enrichment of the person, status and recognition.

Programme Structure

One-year, full-time qualification.

See page 99 for the curriculum.

Admission Requirements

See section 5.2.2 (p 17).

Typical Work Environment for the Computer Systems Engineering Technologist

Hardware design and development using microcontroller and mobile systems. Data communications, design, installation and maintenance of network and data management systems. Programming and data processing. Database applications. Design and development of fully engineered systems.

Career Opportunities

The computerisation and digitization of most facets of modern business and industry, together with the great demand for technical skilled manpower created a multitude of possibilities for such a career in Computer Systems Engineering.

Career Status

The Computer Systems Engineering Technologist can register for professional status with ECSA, the Control Board for Engineering Technologists.

9.1.4 POSTGRADUATE DIPLOMA IN ELECTRICAL ENGINEERING: COMPUTER SYSTEMS ENGINEERING (PG0822)

THIS POSTGRADUATE DIPLOMA IS ONLY OFFERED FROM 2027

Purpose of the Qualification

The Postgraduate Diploma in Electrical Engineering is a postgraduate qualification at NQF level 8 (Min 120 credits at level 8). The qualification is characterised by the fact that it prepares students for industry and research. This qualification typically follows a Bachelor's Degree, Advanced Diploma or relevant NQF level 7 qualification and serves to consolidate and deepen the student's expertise in Electrical Engineering and to develop research capacity in the methodology and techniques of Electrical Engineering.

The Postgraduate Diploma in Electrical Engineering is aligned with the CHE's HEQFS – document and requirements. To cope with the changing needs, developing markets and new technologies, this programme focuses on equipping students with a sound knowledge base in Electrical Engineering on NQF level 8 and the ability to develop new knowledge and skills in this field.

This qualification demands a high level of theoretical engagement and intellectual independence.

This qualification provides:

1. Preparation for careers in Electrical Engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to contribute to the economy and national development; and
2. Entry to NQF level 9 Master's programmes e.g. MSc/MEng.

Engineering students completing this qualification will demonstrate competence in all the required Exit Level Outcomes on NQF level contained in this qualification.

Students completing this qualification will have an advantage in the discipline of Electrical Engineering in that they will be prepared to conduct industry relevant research.

Programme Structure

One-year, full-time qualification.

See page 102 for the curriculum.*

**The qualification number and module codes may change.*

Admission Requirements

See section 5.2.3 (p 17).

All other equivalent qualifications will be considered on a case-by-case basis.

9.1.5 MASTER OF ENGINEERING IN ELECTRICAL ENGINEERING: COMPUTER SYSTEMS ENGINEERING (MP0820)

Purpose of the Qualification

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: Computer Systems 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 section 4.4.)

Programme Structure

At least one-year full-time research, concluded with a Master's Dissertation.

Admission Requirements

A BEng degree in Electrical Engineering: Computer Systems Engineering or equivalent level 8 qualification. Proof of successful completion of Vaal University of Technology approved course in Research Methodology. Ad hoc cases will be treated on merit.

9.1.6 DOCTOR OF ENGINEERING IN ELECTRICAL ENGINEERING: COMPUTER SYSTEMS ENGINEERING (DP0820)

Purpose of the Qualification

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 in Computer Systems Engineering and related technologies. To develop a researcher in Electrical Engineering in Computer Systems Engineering with advanced abilities, to independently apply Electrical Engineering: Computer Systems Engineering industrial based designs, synthesis, and related computer systems engineering 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 section 4.5.)

Programme Structure

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

Admission Requirements

MEng in Electrical Engineering: Computer Systems Engineering. Ad hoc cases will be treated on merit.

9.2 ELECTRICAL ENGINEERING: ELECTRONIC ENGINEERING

Discipline Staff Details (Electronic Engineering)

Surname, Initials & Title	Designation	Qualification
Sutherland, G (Dr)	Senior Lecturer	PhD
Friese, V (Mr)	Lecturer	MTech
Jansen van Rensburg, N (Mr)	Lecturer	MTech
Mafu, AN (Ms)	Lecturer	MPhil, M.A. Ed
Mokautu, EMP (Mr)	Lecturer	MSc
Moletsane, FM (Mr)	Lecturer	BTech
Schoeman, RM (Mr)	Lecturer	MTech
Akinwunmi, AT (Mr)	Technologist	MTech
Greeff, R (Mr)	Technician	BTech
Mawelele, T (Mr)	Technician	BTech

9.2.1 DIPLOMA IN ELECTRICAL ENGINEERING: ELECTRONIC ENGINEERING (DI0823)

Purpose of the Qualification

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

The purpose of the qualification Diploma in Electrical Engineering: Electronic Engineering discipline 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 can apply 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.

Programme Structure

Three years full-time qualification, min 360 credits, NQF level 6. Sixty (60) credits are allocated to Workplace Based Learning (WPBL). WIL can take various forms including simulated learning, work-directed theoretical learning, problem-based learning, project-based learning, and Workplace Based Learning. The Workplace Based Learning will take place in Industry and is currently the only form of WIL being accepted. WIL may only be attempted once all compulsory modules have been completed.

See page 82 for the curriculum.

Admission Requirements

See sections 5.2.1 (p 15) and 5.3 (p 17).

Course Progression Rules

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

a. A minimum of 60 credits must be passed in any year (POS) before a student can enrol for the succeeding year.
b. Only modules for which the required prerequisite(s)* have been passed can be enrolled for in the succeeding year.
c. Students must pass all Graduate Attributes (GA's) before a module can be passed.
d. All theory modules must be passed before a student can do Workplace Based Learning (WPBL – Year 3 Semester 2).

** Prerequisites are listed in the course structure on page 82.*

Workplace Based Learning (WPBL)

The Diploma in Electrical Engineering: Electronic Engineering has a formal Workplace Based Learning (WPBL) component of 60 credits. This takes place at an accredited employer (company). A student needs to pass all the qualification required theoretical modules before applying for placement at a company to do the WPBL modules of the qualification.

WPBL has a minimum duration of six months. Students may enter into a contract of employment of longer than six months.

The student will be assisted to find suitable placement after which the student will register for the WPBL modules. The student will provide progress reports at regular intervals, in co-operation with a work-based mentor, to confirm that the necessary practical outcomes are being achieved.

The final report must be submitted to the University on the **completion of the contract** entered with the employer.

Articulation within the electrical engineering disciplines

After semester one, full articulation between the four disciplines is possible without requiring extra subjects. However, from semester two to semester five, full articulation between the four disciplines is allowed only if a student complete the outstanding subjects for the new disciplines moving towards.

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.

9.2.2 EXTENDED DIPLOMA IN ELECTRICAL ENGINEERING: ELECTRONIC ENGINEERING (DE0863)

The department offers a 4-year Extended Diploma in Electrical Engineering: Electronic Engineering. See page 88 for more information.

The curriculum of the 4-year Extended Diploma is on page 96.

Progression Rules for the Extended Diploma in Electrical Engineering: Electronic Engineering (DE0863)

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

1. Progression from POS 0 (Year 1) to POS 1 (Year 2):
   - Passed **ALL** the Foundation modules:
   2. AAXCH1A – Foundation Chemistry 1
   3. AMXMA1A – Foundation Mathematics 1
   4. APXPH1A – Foundation Physics 1
   5. AAXCH2A – Foundation Chemistry 2
   6. AMXMA2A – Foundation Mathematics 2
   7. APXPH2A – Foundation Physics 2
   - Passed 7 of the 8 regular diploma subjects (on POS 0)
   - Meet all respective prerequisites* of POS 1 (Year 2)
8. Progression from POS 1 (Year 2) to POS 2 (Year 3):
   - Passed **ALL** modules in POS 0 (Year 1)
   - Obtained a minimum of 60 credits in POS 1 (Year 2)
   - Register first for all outstanding modules in POS 1 (Year 2)
   - Meet all respective prerequisites* of POS 2 (Year 3)
9. Progression from POS 2 (Year 3) to POS 3 (Year 4)
   - Passed **ALL** modules in POS 0 (Year 1)
   - Passed **ALL** modules in POS 1 (Year 2)
   - Obtained a minimum of 100 credits in POS 2 (Year 3)
   - Register first for all outstanding modules in POS 2 (Year 3)
   - Meet all respective prerequisites* of POS 3 (Year 4)

   ** Prerequisites are listed in the course structure on page 96.*

9.2.3 ADVANCED DIPLOMA IN ELECTRICAL ENGINEERING: ELECTRONIC ENGINEERING (AD0823)

Purpose of the Qualification

The purpose of this qualification is to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing engineering technologist. Specifically, the qualifications provide:

- A thorough grounding in mathematics, basic sciences, engineering sciences, engineering modelling, engineering design and the abilities to enable applications in the fields of emerging knowledge together with an appreciation for the world and society in which engineering is practiced.
- Preparation for a career in engineering itself 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 Engineering Technologist with ECSA.

- For graduates with an appropriate level of achievement in the Advanced Diploma, the ability to enter a Bachelor Honours Degree or Postgraduate Diploma programme.
- For graduates with an appropriate level of achievement in the Diploma in Electrical Engineering, the ability to enter the Advanced Diploma in Electrical Engineering: Electronic Engineering programme.

The qualification 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 also designed to add value to the qualifying student in terms of enrichment of the person, status and recognition.

Programme Structure

One-year, full-time qualification.

See page 100 for the curriculum.

Admission Requirements

See section 5.2.2 (p 17).

Apart from the prescribed qualification, a specified period of relevant post-qualification practical experience is a prerequisite for registration.

Course Progression Rule:

The student must complete all four compulsory modules and two elective modules in semester 1 and two elective modules in semester 2.

9.2.4 POSTGRADUATE DIPLOMA IN ELECTRICAL ENGINEERING: ALTERNATIVE ENGINEERING (PG0821)

THIS POSTGRADUATE DIPLOMA IS ONLY OFFERED FROM 2027

Purpose of the Qualification

The Postgraduate Diploma in Electrical Engineering is a postgraduate qualification at NQF level 8 (Min 120 credits at level 8). The qualification is characterised by the fact that it prepares students for industry and research. This qualification typically follows a Bachelor's Degree, Advanced Diploma or relevant NQF level 7 qualification and serves to consolidate and deepen the student's expertise in Electrical Engineering and to develop research capacity in the methodology and techniques of Electrical Engineering.

The Postgraduate Diploma in Electrical Engineering is aligned with the CHE's HEQFS – document and requirements. To cope with the changing needs, developing markets and new technologies, this programme focuses on equipping students with a sound knowledge base in Electrical Engineering on NQF level 8 and the ability to develop new knowledge and skills in this field.

This qualification demands a high level of theoretical engagement and intellectual independence.

This qualification provides:

1. Preparation for careers in Electrical Engineering itself and areas that

potentially benefit from engineering skills, for achieving technological proficiency and to contribute to the economy and national development; and
2. Entry to NQF level 9 Master's programmes e.g. MSc/MEng.

Engineering students completing this qualification will demonstrate competence in all the required Exit Level Outcomes on NQF level contained in this qualification.

Students completing this qualification will have an advantage in the discipline of Electrical Engineering in that they will be prepared to conduct industry relevant research.

Programme Structure

One-year, full-time qualification.

See page 102 for the curriculum.*

** The qualification number and module codes may change.*

Admission Requirements

See section 5.2.3 (p 17).

All other equivalent qualifications will be considered on a case-by-case basis.

9.2.5 POSTGRADUATE DIPLOMA IN ELECTRICAL ENGINEERING: ELECTRONIC ENGINEERING (PG0823)

THIS POSTGRADUATE DIPLOMA IS ONLY OFFERED FROM 2027

Purpose of the Qualification

The Postgraduate Diploma in Electrical Engineering is a postgraduate qualification at NQF level 8 (Min 120 credits at level 8). The qualification is characterised by the fact that it prepares students for industry and research. This qualification typically follows a Bachelor's Degree, Advanced Diploma or relevant NQF level 7 qualification and serves to consolidate and deepen the student's expertise in Electrical Engineering and to develop research capacity in the methodology and techniques of Electrical Engineering.

The Postgraduate Diploma in Electrical Engineering is aligned with the CHE's HEQFS – document and requirements. To cope with the changing needs, developing markets and new technologies, this programme focuses on equipping students with a sound knowledge base in Electrical Engineering on NQF level 8 and the ability to develop new knowledge and skills in this field.

This qualification demands a high level of theoretical engagement and intellectual independence.

This qualification provides:

1. Preparation for careers in Electrical Engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to contribute to the economy and national development; and
2. Entry to NQF level 9 Master's programmes e.g. MSc/MEng.

Engineering students completing this qualification will demonstrate competence in all the required Exit Level Outcomes on NQF level contained in this qualification.

Students completing this qualification will have an advantage in the discipline of

Electrical Engineering in that they will be prepared to conduct industry relevant research.

Programme Structure

One-year, full-time qualification.

See page 102 for the curriculum.*

** The qualification number and module codes may change.*

Admission Requirements

See section 5.2.3 (p 17).

All other equivalent qualifications will be considered on a case-by-case basis.

9.2.6 MASTER OF ENGINEERING IN ELECTRICAL ENGINEERING: ELECTRONIC ENGINEERING (MP0820)

Purpose of the Qualification

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: Electronic 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 section 4.4).

Programme Structure

At least one-year, full-time research, concluded with a master's dissertation.

Admission Requirements

A BEng degree or equivalent level 8 qualification including the Postgraduate Diploma. Proof of successful completion of a Vaal University of Technology approved course in Research Methodology. Ad hoc cases will be treated on merit.

9.2.7 MASTER OF ENGINEERING IN ENERGY EFFICIENCY (MENG: ENERGY EFFICIENCY) (MP0823)

Purpose of the Qualification

The MEng (Energy Efficiency) was developed under the guidance and with the support of the PEESA project (http://peesa.usz.edu.pl).

See page 104 for the curriculum.

Admission Requirements

An appropriate BEng or equivalent level 8 qualification, including a Postgraduate Diploma.

Duration of Programme

One-year, full-time or two-year part time.

See page 104 for the curriculum.

Enquiries (MEng: Energy Efficiency):

Dr G Sutherland
Tel: : +27 (0)16 950 9724
E-mail : trudys@vut.ac.za

9.2.8 DOCTOR OF ENGINEERING (DENG) IN ELECTRICAL ENGINEERING: ELECTRONIC ENGINEERING (DP0820)

Purpose of the Qualification

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: Electronic 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 section 4.5).

Programme Structure

At least two years' full-time research, concluded with a Doctoral Thesis. This qualification is offered at the Vanderbijlpark campus only.

Admission Requirements

MEng in Electrical Engineering: Electronic Engineering.

Ad hoc cases will be treated on merit.

9.3 ELECTRICAL ENGINEERING: POWER ENGINEERING

Discipline Staff Details (Power Engineering)

Surname, Initials & Title	Designation	Qualification
Thekiso, MQ (Mr)	Discipline Coordinator	BTech
Joubert, T (Ms)	Senior Lecturer	MTech
Langa, H (Dr)	Senior Lecturer	PhD
Adeniyi AO (Mr)	Lecturer	MTech
Djeumen, JS (Mr)	Lecturer	MTech
Momubaghan, PU (Mr)	Lecturer	BSc
Kaaiye, SF (Mr)	Lecturer	MSc Eng
Makhalima, AT (Mr)	Junior Lecturer	BTech
Motloung, DP (Mr)	Junior Lecturer	ND
Shittu, AM (Mr)	Junior Lecturer	BSc
Kyere, IK (Mr)	Technologist	MTech
Makgai, K (Mr)	Lab Technician	BTech
Mtambo, BA (Mr)	Laboratory Assistant	Sr Certificate

9.3.1 DIPLOMA IN ELECTRICAL ENGINEERING: POWER ENGINEERING (DI0824)

Purpose of the Qualification

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

The purpose of the qualification Diploma in Electrical Engineering: Power Engineering 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 Power

Engineering Technicians 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.

Programme Structure

Three years full-time qualification, min 360 credits, NQF level 6. Sixty credits are allocated to Workplace Based Learning (WPBL). WPBL 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.

See page 83 for the curriculum.

Admission Requirements

See sections 5.2.1 (p 15) and 5.3 (p 17).

Course Progression Rules

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

a. A minimum of 60 credits must be passed in any year (POS) before a student can enrol for the succeeding year.
b. Only modules for which the required prerequisite(s)* have been passed can be enrolled for in the succeeding year.
c. Students must pass all Graduate Attributes (GA's) before a module can be passed.
d. All theory modules must be passed before a student can do Workplace Based Learning (WPBL – Year 3 Semester 2).

** Prerequisites are listed in the course structure on page 83.*

Workplace Based Learning (WPBL)

The Diploma in Electrical Engineering: Power Engineering has a formal Workplace Based Learning (WPBL) component of 60 credits. This takes place at an accredited employer (company). A student needs to pass all the qualification required theoretical modules before applying for placement at a company to do the WPBL modules of the qualification.

WPBL has a minimum duration of six months. Students may enter into a contract of employment of longer than six months.

The student will be assisted to find suitable placement after which the student will register for the WPBL modules. The student will provide progress reports at regular intervals, in co-operation with a work-based mentor, to confirm that the necessary practical outcomes are being achieved.

The final report must be submitted to the University on the **completion of the contract** entered with the employer.

Articulation within the Electrical Engineering Disciplines

After semester one, full articulation between the four disciplines is possible without requiring extra subjects. However, from semester two to semester five, full articulation between the four disciplines is allowed only if a student complete the

outstanding subjects for the new disciplines moving towards.

Career Opportunities

A successful candidate can pursue a career as a Power Engineering 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.

9.3.2 EXTENDED DIPLOMA IN ELECTRICAL ENGINEERING: POWER ENGINEERING (DE0864)

The department offers a 4-year Extended Diploma in Electrical Engineering: Power Engineering. See page 97 for more information.

The curriculum of the 4-year Extended Diploma is on page 97.

Progression Rules for the Extended Diploma in Electrical Engineering: Power Engineering (DE0864)

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

1. Progression from POS 0 (Year 1) to POS 1 (Year 2):
   - Passed **ALL** the Foundation modules:
   2. AAXCH1A – Foundation Chemistry 1
   3. AMXMA1A – Foundation Mathematics 1
   4. APXPH1A – Foundation Physics 1
   5. AAXCH2A – Foundation Chemistry 2
   6. AMXMA2A – Foundation Mathematics 2
   7. APXPH2A – Foundation Physics 2
   - Passed 6 of the 7 regular diploma subjects (on POS 0)
   - Meet all respective prerequisites* of POS 1 (Year 2)
8. Progression from POS 1 (Year 2) to POS 2 (Year 3):
   - Passed **ALL** modules in POS 0 (Year 1)
   - Obtained a minimum of 60 credits in POS 1 (Year 2)
   - Register first for all outstanding modules in POS 1 (Year 2)
   - Meet all respective prerequisites* of POS 2 (Year 3)
9. Progression from POS 2 (Year 3) to POS 3 (Year 4)
   - Passed **ALL** modules in POS 0 (Year 1)
   - Passed **ALL** modules in POS 1 (Year 2)
   - Obtained a minimum of 100 credits in POS 2 (Year 3)
   - Register first for all outstanding modules in POS 2 (Year 3)
   - Meet all respective prerequisites* of POS 3 (Year 4)

   ** Prerequisites are listed in the course structure on page 97.*

9.3.3 ADVANCED DIPLOMA IN ELECTRICAL ENGINEERING: POWER ENGINEERING (AD0824)

Purpose of the Qualification

The purpose of this qualification is to build the necessary knowledge, understanding,

abilities and skills required for further learning towards becoming a competent practicing engineering technologist. Specifically, the qualifications provide:

- A thorough grounding in mathematics, basic sciences, engineering sciences, engineering modelling, engineering design and the abilities to enable applications in the fields of emerging knowledge together with an appreciation for the world and society in which engineering is practiced.
- Preparation for a career in engineering itself 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 Engineering Technologist with ECSA.
- For graduates with an appropriate level of achievement in the Advanced Diploma, the ability to enter a Bachelor Honours Degree or Postgraduate Diploma programme.
- For graduates with an appropriate level of achievement in the Diploma in Electrical Engineering, the ability to enter the Advanced Diploma in Electrical Engineering: Power Engineering programme.

The qualification 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 also designed to add value to the qualifying student in terms of enrichment of the person, status and recognition.

Programme Structure

One-year, full-time qualification.

See page 100 for the curriculum.

Admission Requirements

See section 5.2.2 (p 17).

Apart from the prescribed qualification, a specified period of relevant post-qualification practical experience is a prerequisite for registration.

Course Progression Rule

The student must complete all six compulsory modules and two elective modules in semester 1.

9.3.4 POSTGRADUATE DIPLOMA IN ELECTRICAL ENGINEERING: POWER ENGINEERING (PG0824)

Purpose of the Qualification

The Postgraduate Diploma in Electrical Engineering is a postgraduate qualification at NQF level 8 (Min 120 credits at level 8). The qualification is characterised by the fact that it prepares students for industry and research. This qualification typically follows a Bachelor's Degree, Advanced Diploma or relevant NQF level 7 qualification and serves to consolidate and deepen the student's expertise in Electrical Engineering and to develop research capacity in the methodology and techniques of Electrical Engineering.

The Postgraduate Diploma in Electrical Engineering is aligned with the CHE's HEQFS – document and requirements. To cope with the changing needs, developing markets and new technologies, this programme focuses on equipping students with a sound knowledge base in Electrical Engineering on NQF level 8 and the ability to develop new knowledge and skills in this field.

This qualification demands a high level of theoretical engagement and intellectual independence.

This qualification provides:

1. Preparation for careers in Electrical Engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to contribute to the economy and national development; and
2. Entry to NQF level 9 Master's programmes e.g. MSc/MEng.

Engineering students completing this qualification will demonstrate competence in all the required Exit Level Outcomes on NQF level contained in this qualification.

Students completing this qualification will have an advantage in the discipline of Electrical Engineering in that they will be prepared to conduct industry relevant research.

Programme Structure

One-year, full-time qualification.

See page 102 for the curriculum.

Admission Requirements

See section 5.2.3 (p 17).

All other equivalent qualifications will be considered on a case-by-case basis.

9.3.5 MASTER OF ENGINEERING (MENG) IN ELECTRICAL ENGINEERING: POWER ENGINEERING (MP0820)

Purpose of the MEng in Electrical Engineering: Power 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 Electrical Engineering: Power 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 section 4.4).

Programme Structure

At least one-year, full-time research, concluded with a Master's Dissertation.

Admission Requirements

BEng degree (Power) or equivalent.

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

Ad hoc cases will be treated on merit.

9.3.6 DOCTOR OF ENGINEERING (DENG) IN ELECTRICAL ENGINEERING: POWER ENGINEERING (DP0820)

Purpose of the Qualification

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: Power Engineering and technology. To develop a researcher in Electrical Engineering: Power 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 section 4.5).

Programme Structure

At least two-years' full-time research, concluded with a Doctoral thesis.

Admission Requirements

Master of Engineering in Electrical Engineering: Power Engineering. Ad hoc cases will be treated on merit.

9.4 ELECTRICAL ENGINEERING: PROCESS CONTROL ENGINEERING

Discipline Staff Details

See section 9.1, p 42

9.4.1 DIPLOMA ELECTRICAL ENGINEERING: PROCESS CONTROL ENGINEERING (DI0825)

Purpose of the Qualification

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

The purpose of the qualification is to develop the necessary knowledge, understanding and skills required for the student's further learning towards becoming a competent practicing Process Control 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 Process Control Engineering Technicians to demonstrate that they can apply 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.

Programme Structure

Offered full-time, contact classes are for a period for six semesters (three years) followed by a one-year Workplace Based Learning (WPBL) (carried out through attachment to industry) component. The student will be assisted by the university to look for suitable industry opportunities (companies) to complete the required WPBL training and skills development. Due to this component this programme is likely to take longer than 3 years to complete. This programme is presented at the Vanderbijlpark campus, and the exit level of the qualification is at NQF 6, min 360

credits.

See page 84 the curriculum.

Admission Requirements

See sections 5.2.1 (p 15) and 5.3 (p 17).

Course Progression Rules

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

a. A minimum of 60 credits must be passed in any year (POS) before a student can enrol for the succeeding year.
b. Only modules for which the required prerequisite(s)* have been passed can be enrolled for in the succeeding year.
c. Students must pass all Graduate Attributes (GA's) before a module can be passed.
d. All theory modules must be passed before a student can do Workplace Based Learning (WPBL – Year 3 Semester 2).

** Prerequisites are listed in the course structure on page 84.*

Workplace Based Learning (WPBL)

The Diploma in Electrical Engineering: Process Control Engineering has a formal Workplace Based Learning (WPBL) component of 60 credits. This takes place at an accredited employer (company). A student needs to pass all the qualification required theoretical modules before applying for placement at a company to do the WPBL modules of the qualification.

WPBL has a minimum duration of six months. Students may enter into a contract of employment of longer than six months.

The student will be assisted to find suitable placement after which the student will register for the WPBL modules. The student will provide progress reports at regular intervals, in co-operation with a work-based mentor, to confirm that the necessary practical outcomes are being achieved.

The final report must be submitted to the University on the **completion of the contract** entered with the employer.

Articulation within the Electrical Engineering Disciplines

After semester one, full articulation between the four disciplines is possible without requiring extra subjects. However, from semester two to semester five, full articulation between the four disciplines is allowed only if a student complete the outstanding subjects for the new disciplines moving towards.

9.4.2 EXTENDED DIPLOMA IN ELECTRICAL ENGINEERING: PROCESS CONTROL ENGINEERING (DE0865)

The department offers a 4-year Extended Diploma in Electrical Engineering: Process Control Engineering. See page 88 for more information.

The curriculum of the 4-year Extended Diploma is on page 98.

Progression Rules for the Extended Diploma in Electrical Engineering: Process Control Engineering (DE0865)

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

1. Progression from POS 0 (Year 1) to POS 1 (Year 2):
   - Passed **ALL** the Foundation modules:
   2. AAXCH1A – Foundation Chemistry 1
   3. AMXMA1A – Foundation Mathematics 1
   4. APXPH1A – Foundation Physics 1
   5. AAXCH2A – Foundation Chemistry 2
   6. AMXMA2A – Foundation Mathematics 2
   7. APXPH2A – Foundation Physics 2
   - Passed 6 of the 7 regular diploma subjects (on POS 0)
   - Meet all respective prerequisites* of POS 1 (Year 2)
8. Progression from POS 1 (Year 2) to POS 2 (Year 3):
   - Passed **ALL** modules in POS 0 (Year 1)
   - Obtained a minimum of 60 credits in POS 1 (Year 2)
   - Register first for all outstanding modules in POS 1 (Year 2)
   - Meet all respective prerequisites* of POS 2 (Year 3)
9. Progression from POS 2 (Year 3) to POS 3 (Year 4)
   - Passed **ALL** modules in POS 0 (Year 1)
   - Passed **ALL** modules in POS 1 (Year 2)
   - Obtained a minimum of 100 credits in POS 2 (Year 3)
   - Register first for all outstanding modules in POS 2 (Year 3)
   - Meet all respective prerequisites* of POS 3 (Year 4)

   ** Prerequisites are listed in the course structure on page 98.*

9.4.3 ADVANCED DIPLOMA IN ELECTRICAL ENGINEERING: PROCESS CONTROL ENGINEERING (AD0825)

Purpose of the Qualification

The purpose of this qualification is to build the necessary knowledge, understanding, abilities and skills required for further learning towards becoming a competent practicing engineering technologist. Specifically, the qualifications provide:

- A thorough grounding in mathematics, basic sciences, engineering sciences, engineering modelling, engineering design and the abilities to enable applications in the fields of emerging knowledge together with an appreciation for the world and society in which engineering is practiced.
- Preparation for a career in engineering itself 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 Engineering Technologist with ECSA.
- For graduates with an appropriate level of achievement in the Advanced Diploma, the ability to enter a Bachelor Honours Degree or Postgraduate

Diploma programme.

- For graduates with an appropriate level of achievement in the Diploma in Electrical Engineering, the ability to enter the Advanced Diploma in Electrical Engineering: Process Control Engineering programme.

The qualification 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 also designed to add value to the qualifying student in terms of enrichment of the person, status and recognition.

Programme Structure

One-year, full-time qualification.

See page 100 for the curriculum.

Admission Requirements

See section 5.2.2 (p 17).

Typical work environment for the Process Control Engineering Technologist

The environment where a Process Control Engineering technologist will function is in measurement and control of pressure, level, flow, and temperature parameters. The design, installation and maintenance of process control systems and instrumentation. Installation, commissioning and optimisation of various control systems, industrial networks, Safety Systems and Distributed Control Systems (DCS).

Career Opportunities

The computerisation of modern instrumentation and process control platforms in various industries, created a vacuum period in training of skills development for technicians in this modern industrial environment which led to a huge demand for technical skilled manpower in this field.

Career Status

The Instrument Technician can register for professional status with ECSA, the Control Board for Engineering Technicians. The South African Institute for Measurement and Control is another professional body.

9.4.4 POSTGRADUATE DIPLOMA IN ELECTRICAL ENGINEERING: PROCESS CONTROL AND INSTRUMENTATION ENGINEERING (PG0825)

THIS POSTGRADUATE DIPLOMA IS ONLY OFFERED FROM 2027

Purpose of the Qualification

The Postgraduate Diploma in Electrical Engineering is a postgraduate qualification at NQF level 8 (Min 120 credits at level 8). The qualification is characterised by the fact that it prepares students for industry and research. This qualification typically follows a Bachelor's degree, Advanced Diploma or relevant NQF level 7 qualification and serves to consolidate and deepen the student's expertise in Electrical Engineering and to develop research capacity in the methodology and techniques of Electrical Engineering.

The Postgraduate Diploma in Electrical Engineering is aligned with the CHE's HEQFS

– document and requirements. To cope with the changing needs, developing markets and new technologies, this programme focuses on equipping students with a sound knowledge base in Electrical Engineering on NQF level 8 and the ability to develop new knowledge and skills in this field.

This qualification demands a high level of theoretical engagement and intellectual independence.

This qualification provides:

1. Preparation for careers in Electrical Engineering itself and areas that potentially benefit from engineering skills, for achieving technological proficiency and to contribute to the economy and national development; and
2. Entry to NQF level 9 Master's programmes e.g. MSc/MEng.

Engineering students completing this qualification will demonstrate competence in all the required Exit Level Outcomes on NQF level contained in this qualification.

Students completing this qualification will have an advantage in the discipline of Electrical Engineering in that they will be prepared to conduct industry relevant research.

Programme Structure

One-year, full-time qualification.

See page 103 for the curriculum.*

** The qualification number and module codes may change.*

Admission Requirements

See section 5.2.3 (p 17).

All other equivalent qualifications will be considered on a case-by-case basis.

9.4.5 MAGISTER OF ENGINEERING IN ELECTRICAL ENGINEERING: PROCESS CONTROL ENGINEERING (MP0820)

Purpose of the Qualification

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: Process Control 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 section 4.4.)

Programme Structure

At least one-year, full-time research, concluded with a Masters dissertation.

Admission Requirements

A BEng degree in Electrical Engineering: Process Control Engineering or equivalent level 8 qualification. Proof of successful completion of Vaal University of Technology approved course in Research Methodology. Ad hoc cases will be treated on merit.

9.4.6 DOCTOR OF ENGINEERING IN ELECTRICAL ENGINEERING: PROCESS CONTROL ENGINEERING (DP0820)

Purpose of the Qualification

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 in Process Control Engineering and related technologies. To develop a researcher in Electrical Engineering in Process Control Engineering with advanced abilities, to independently apply Electrical Engineering: Process Control Engineering industrial based designs, synthesis, and related computer systems engineering 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 section 4.5.)

Programme Structure

At least two years' full-time research, concluded with a Doctoral Thesis. This qualification is offered at the Vanderbijlpark campus only.

Admission Requirements

MEng in Electrical Engineering: Process Control Engineering. Ad hoc cases will be treated on merit.

9.5 ENQUIRIES

Enquiries may be addressed to:

HoD: Electrical Engineering
Faculty of Engineering & Technology
Vaal University of Technology
Private Bag X021
VANDERBIJLPARK, 1900
Tel : +27 (0)16 950 6739/9295
Fax : +27 (0)16 950 9795
e-mail : kalala@vut.ac.za
refilwem1@vut.ac.za
Website : www.vut.ac.za or

Postgraduate Office

Ms N Kokoali
Tel : +27 (0)16 950 9288
e-mail : nomathembak@vut.ac.za

Mr S Motsie
Tel : +27 (0)16 950 7639
e-mail : sehlabakam@vut.ac.za

10. DEPARTMENT OF INDUSTRIAL ENGINEERING & OPERATIONS MANAGEMENT AND MECHANICAL ENGINEERING

Head of Department and Administrator

Surname, Initials & Title	Designation	Qualification
Tengen, TB (Prof)	Head of Department	PhD
Nakedi, LA (Ms)	Administrator	PGD

10.1 INDUSTRIAL ENGINEERING

Discipline Staff Details (Industrial Engineering and Operations Management)

Surname, Initials & Title	Designation	Qualification
Sukraj, R (Mr)	Senior Lecturer Discipline Coordinator IE	BTech
Ikome, JM, (Dr)	Senior Lecturer Discipline Coordinator OM	PhD
Van Wyk, T (Ms)	Senior Lecturer	MBL, Pr Tech Eng
Adeyemi, OS (Mr)	Lecturer	MSc
Gabara, T (Ms)	Lecturer	MTech
La Grange, JJ (Mr)	Lecturer	BTech
Maibela, PN (Mr)	Lecturer	MEng
Mallane, TM (Ms)	Lecturer	MTech
Mazibuko, M (Mr)	Lecturer	MTech
Sivambu, JC (Mr)	Technician	BTech

10.1.1 DIPLOMA IN INDUSTRIAL ENGINEERING (DI0830)

Purpose of the Qualification

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

The qualification Diploma in Industrial Engineering aims 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 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. It is also designed to add value to the qualifying student by enriching the person, status, and recognition.

The main objective of this discipline is to constantly improve methods, procedures, and practices within an organisation to increase productivity and profits. More value is added if inputs like human resources, materials, machinery, and money are converted more effectively and with sound management principles into products and services. Such a person continually engages in core aspects such as communication, cooperation, quality, planning, scheduling, cycle time, capacity, utilization, economic analysis, problem-solving, materials handling, facility layout, etc. Industrial engineering, therefore, requires people who like working with people, enjoy analysing and solving problems, developing solutions, gaining cooperation, motivating people, and always seeking better, quicker, and cheaper ways of doing

things.

Programme Structure

The Diploma in Industrial Engineering is HEQSF-aligned and vocationally oriented. It requires a minimum of 360 credits, with a minimum of 120 credits at the exit level, NQF Level 6.

This three-year course consists of five semesters of university attendance (36 modules) and one semester (6 months) of Work-Integrated Learning (WIL) in industry. The latter should be done after completing **ALL** theoretical modules, i.e., after the fifth semester (S5) of uninterrupted theoretical training at the University.

Each theoretical semester consists of approximately 15 weeks of tuition, comprising lectures, tutorials, and, in some modules, practical work in laboratories. During this time, the student's progress is evaluated through written tests, assignments (individual or group), practical evaluations, case studies, documented investigation/research, presentations, projects, computer-based assessments, simulations, and a formal examination of all work done, at the end of the semester. Continuous assessment is used for some modules, where assessments throughout the semesters contribute towards the final mark without a formal examination.

See page 85 for the curriculum.

Upon completion of the Diploma in Industrial Engineering (NQF Level 6, minimum 360 credits), the graduate meets the minimum entry requirement for admission to the Advanced Diploma in Industrial Engineering (NQF Level 7), designed to support articulation to satisfy a Professional Industrial Engineering Technologist education benchmark.

Admission Requirements

See sections 5.2.1 (p 15) and 5.3 (p 17).

Course Progression Rules

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

1. Progression from YEAR 1 to YEAR 2:
   - Obtained a minimum of 90 credits in YEAR 1.
   - Register first for all outstanding modules in YEAR 1. No selection, no omissions, no exceptions.
   - Meet all respective prerequisites.*
2. Progression from YEAR 2 to YEAR 3 (Semester 1):
   - Obtained a minimum of 90 credits in YEAR 2.
   - Passed all YEAR 1 modules
   - Register first for all outstanding YEAR 2 modules. No selection, no omissions, no exceptions.
   - Meet all respective prerequisites.*
3. Progression to YEAR 3 (Semester 2):
   - Pass all theoretical modules of Years 1, 2, and 3 (Semester 1). In special

circumstances, the student might be allowed to have one module outstanding, but must be approved by the department.

- Be competent in GA 1 to GA 11.

** Prerequisites are listed in the course structure on page 85.*

Workplace Based Learning (WPBL)

To qualify for the Diploma in Industrial Engineering, a minimum six-month period of suitable work-integrated learning (WIL) must be completed in addition to the prescribed theoretical University training. Work-integrated learning refers to that component of cooperative education that can only be conducted by the employer in the workplace.

WIL has a minimum duration of six months, but students may enter into a contract of employment lasting longer than six months.

This training allows the student 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 the industry. Work-integrated learning may be done after completing the total theoretical part of the Diploma. This will give the student enough theoretical knowledge to benefit from the training.

Employers and universities must cooperate as partners to ensure the effectiveness of work-integrated learning. The student will enrol in the Work Integrated Learning (Industrial) module. This module will be assessed and must indicate the level of competence achievement of the student in line with Graduate Attribute 12 (Workplace Practice) for the Diploma in Engineering qualification.

The final WIL report must be submitted to the University upon **completing the contract** with the employer.

Progression and Pathway

Upon completion of this Diploma in Engineering in Industrial Engineering, which is at NQF Level 6 (with a minimum of 360 Credits), the graduate meets the minimum entry requirement for admission to Advanced Diploma in Industrial Engineering at NQF Level 7 (with a minimum of 120 credits, however, ECSA requires 140 Credits) designed to support articulation to satisfy an Industrial Engineering Technologist education benchmark. This Diploma provides the base for the graduate to enter training and experience toward independent practice as an Industrial Engineering Technician candidate and, once qualified, undergo registration as a Professional Industrial Engineering Technician by the Engineering Council of South Africa (ECSA). This qualification lies in an HEQSF Vocational Pathway.

Career Opportunities

The field of Industrial Engineering has a high demand for well-trained individuals. Job opportunities are plentiful in manufacturing companies and service organizations, including roles such as advisors, industrial analysts, production personnel, planning

personnel, and line managers. It has been proven that individuals with a qualification in Industrial Engineering and a dynamic personality can quickly advance to management positions or even establish their own businesses.

10.1.2 EXTENDED DIPLOMA IN INDUSTRIAL ENGINEERING (DE0831)

The department offers a 4-year Extended Diploma in Industrial Engineering. See section 0 (p 88) for more information.

The curriculum of the 4-year Extended Diploma is on page 92.

Progression Rules for the Extended Diploma in Industrial Engineering (DE0831)

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

1. Progression from POS 0 (Year 1) to POS 1 (Year 2):
   - Passed **ALL** the Foundation modules:
   2. AAXCH1A – Foundation Chemistry 1
   3. AMXMA1A – Foundation Mathematics 1
   4. APXPH1A – Foundation Physics 1
   5. AAXCH2A – Foundation Chemistry 2
   6. AMXMA2A – Foundation Mathematics 2
   7. APXPH2A – Foundation Physics 2
   8. EMXDR1A – Foundation Drawing
   - Passed 6 of the 7 regular diploma subjects (on POS 0)
   - Meet all respective prerequisites* of POS 1 (Year 2)
9. Progression from POS 1 (Year 2) to POS 2 (Year 3):
   - Passed **ALL** modules in POS 0 (Year 1)
   - Obtained a minimum of 60 credits in POS 1 (Year 2)
   - Register first for all outstanding modules in POS 1 (Year 2)
   - Meet all respective prerequisites* of POS 2 (Year 3)
10. Progression from POS 2 (Year 3) to POS 3 (Year 4)
   - Passed **ALL** modules in POS 0 (Year 1)
   - Passed **ALL** modules in POS 1 (Year 2)
   - Obtained a minimum of 100 credits in POS 2 (Year 3)
   - Register first for all outstanding modules in POS 2 (Year 3)
   - Meet all respective prerequisites* of POS 3 (Year 4)

** Prerequisites are listed in the course structure on page 92.*

10.1.3 ADVANCED DIPLOMA IN INDUSTRIAL ENGINEERING (AD0830)

Programme Structure

The Advanced Diploma in Industrial Engineering is a minimum of a one-year, full-time course. Each semester comprises approximately 15 weeks of tuition, lectures, tutorials, and practical work in laboratories for some modules. The student's progress is evaluated through written tests, assignments (individual or group), practical evaluations, continuous assessments, case-based studies, documented investigation/research, presentations, projects, computer-based assessments, and simulations. At the end of each semester, final examinations are written on all the

work done during the semester over an approximately two-week period. Continuous assessment is used for some modules, where assessments throughout the semesters contribute towards the final mark without a formal examination.

See page 100 for the curriculum.

This is an NQF Level 7 qualification requiring a minimum of 120 credits and a maximum of 140 credits to meet ECSA requirements.

Admission Requirements

See section 5.2.2 (p 17).

All other equivalent qualifications will be treated on an ad hoc basis.

Progression and Pathway

Upon completion of the Advanced Diploma in Industrial Engineering (NQF Level 7, minimum 140 credits), the graduate meets the minimum entry requirement for admission to the Postgraduate Diploma in Industrial Engineering (NQF Level 8), designed to support articulation to satisfy a Professional Industrial Engineering Technologist education benchmark. This Advanced Diploma provides the base for the graduate to enter training and experience towards independent practice as a Professional Industrial Engineering Technologist, and once qualified, undergo registration by ECSA. This qualification lies in an HEQSF Vocational Pathway.

10.1.4 POSTGRADUATE DIPLOMA IN INDUSTRIAL ENGINEERING (PG0830)

Programme Structure

The Postgraduate Diploma in Industrial Engineering is a minimum one-year, full-time course. Each semester consists of approximately 15 weeks of tuition, comprising lectures, tutorials, and practical work done in laboratories for some modules. During this time, the student's progress is evaluated through written tests, assignments (individual or group), practical evaluations, continuous assessments, case-based studies, documented investigation/research, presentations, projects, computer-based assessments, and simulations. At the end of each semester, final examinations are written on all the work done during the semester over an approximately two-week period. Continuous assessment is used for some modules, where assessments throughout the semesters contribute towards the final mark without a formal examination.

See page 103 for the curriculum.

This is an NQF level 8 qualification with 140 credits.

Admission Requirements

See section 5.2.3 (p 17).

All other equivalent qualifications will be treated on an ad hoc basis.

Progression and Pathway

Upon completion of the Postgraduate Diploma in Industrial Engineering (NQF Level 8, 140 credits), the graduate meets the minimum entry requirement for admission to the Master of Engineering in Industrial Engineering (NQF Level 9 This qualification lies in an HEQSF Vocational Pathway.

10.1.5 MASTER OF ENGINEERING IN INDUSTRIAL ENGINEERING: MENG (INDUSTRIAL) (MP0830)

Programme Structure

The programme is equivalent to a minimum one-year of full-time study and comprises a thesis only. The main objective of this discipline is to constantly improve methods, procedures, and practices within an organisation to increase productivity and profits. Value is added if inputs like human resources, materials, machinery, and money are converted more effectively into products and services using sound management principles. An Industrial Engineer continually engages in core aspects such as communication, cooperation, quality, planning, and scheduling, as well as calculating cycle time, capacity, and utilization. Industrial Engineers should also be competent in economic analysis, problem-solving, materials handling, facility layout, etc. . Industrial engineering, therefore, requires people who like working with people and enjoy analysing and solving problems, developing solutions, gaining cooperation, and motivating people. Industrial engineers always seek better, quicker, and cheaper ways of doing things.

Admission Requirements

A valid NQF Level 8 qualification, including the Postgraduate Diploma in Industrial Engineering, with a minimum of 60% average. All other relevant qualifications will be treated on an ad hoc basis.

Career Opportunities

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

10.2 OPERATIONS MANAGEMENT

Discipline Staff Details

See section 9.1, p 64

10.2.1 DIPLOMA IN OPERATIONS MANAGEMENT (DI0400)

Purpose of the Diploma in Operations Management

Suppose you like working with people, enjoy analysing and solving problems, developing solutions, gaining cooperation, motivating people, and always seek better, quicker, and cheaper ways of doing things. In that case, this is the course for you!

Manufacturing companies employ qualified Operations managers because this qualification is most suitable for production and operations management careers. In Operations Management, you will specialise in production scheduling, material movement, inventory control, quality management, work simplification, and productivity improvement. You will also contribute to designing and implementing integrated capital, plant, human resources, and raw materials systems. Your

objective will be to constantly improve methods, procedures, and practices within an organisation to increase productivity and profits.

Programme Structure

A diploma will be issued after you complete six (6) semesters of theoretical learning, one of which is dedicated to Operations Management Practice 1 (a Project-based module, working on a project that the university or industry can provide).

Each semester comprises tuition, lectures, tutorials, and practical work done in laboratories for some modules. The student's progress is evaluated through written tests, assignments (individual or group), practical evaluations, continuous assessments, case-based studies, documented investigation/research, presentations, projects, computer-based assessments, and simulations. At the end of each semester, final examinations are written on all the work done over approximately two weeks. Continuous assessment is used for some modules, where assessments throughout the semesters contribute towards the final mark without a formal examination.

See page 78 for the curriculum.

Admission Requirements

See section 5.2.1 (p 15).

Course Progression Rules

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

1. Progression from YEAR 1 to YEAR 2:
   - Obtained a minimum of 90 credits in YEAR 1.
   - Register for all outstanding YEAR 1 modules first.
   - Meet all respective prerequisites.*

2. Progression from YEAR 2 to YEAR 3 (Semester 1):
   - Obtained a minimum of 90 credits in YEAR 2.
   - Passed all YEAR 1 modules
   - Register first for all outstanding YEAR 2 modules. No selection, no omissions, no exceptions.
   - Meet all respective prerequisites.*
3. Progression to YEAR 3 (Semester 2):
   - Pass all theoretical modules of Year 1, 2, and 3 (Semester 1).

** Prerequisites are listed in the course structure on page 78.*

Progression and Pathway

Upon completing the Diploma in Operations Management (NQF Level 6, minimum 360 credits), the graduate meets the minimum entry requirement for admission to the Advanced Diploma in Operations Management (NQF Level 7).

Career Opportunities

Operations Management offers a challenging and exciting career in the private sector. The expertise and skills they will progressively achieve will enable them to

reach their optimum applications and growth in the manufacturing industry as Production Assistant/Production Planner, Production Scheduler/Head Planner, Production Superintendent, Production Manager, and Operations Manager. People with Operations Management qualifications and experience are also well-equipped to be employed in many other industries to start their own businesses.

10.2.2 ADVANCED DIPLOMA IN OPERATIONS MANAGEMENT (AD0400)

Programme Structure

The Advanced Diploma in Operations Management is a minimum one-year, full-time course. Each semester consists of approximately 15 weeks of tuition, comprising lectures, tutorials, and practical work done in laboratories for some modules. During this time, the student's progress is evaluated through written tests, assignments (individual or group), practical evaluations, continuous assessments, case studies, documented investigation/research, presentations, projects, computer-based assessments, and simulations. At the end of each semester, final examinations are written on all the work done during the semester over approximately two weeks. Continuous assessment is used for some modules, where assessments throughout the semesters contribute towards the final mark without a formal examination.

See page 99 for the curriculum.

This is an NQF Level 7 qualification with 120 credits.

Admission Requirements

A Diploma in Operations Management (NQF level 6, 360 credits) or other engineering disciplines or equivalent (including National Diploma in Operations Management,) with a pass in Mathematics 1. All other equivalent qualifications will be treated on an ad hoc basis.

Progression and Pathway

Upon completing the Advanced Diploma in Operations Management (NQF Level 7, minimum 120 credits), the graduate meets the minimum entry requirement for admission to the Postgraduate Diploma in Operations Management (NQF Level 8).

10.2.3 POSTGRADUATE DIPLOMA IN OPERATIONS MANAGEMENT (PG0400)

Programme Structure

The Postgraduate Diploma in Operations Management is a minimum one-year, full-time course. Each semester consists of approximately 15 weeks of tuition, comprising lectures, tutorials, and practical work done in laboratories for some modules. The student's progress is evaluated through written tests, assignments (individual or group), practical evaluations, continuous assessments, case-based studies, documented investigation/research, presentations, projects, computer-based assessments, and simulations. At the end of each semester, final examinations are written on all the work done over approximately two weeks. Continuous assessment is used for some modules, where assessments throughout the semesters contribute towards the final mark without a formal examination.

See page 101 for the curriculum.

This is an NQF level 8 qualification with 120 credits.

Admission Requirements

See section 5.2.3 (p 17).

All other equivalent qualifications will be treated on an ad hoc basis.

10.3 MECHANICAL ENGINEERING

Discipline Staff Details

Surname, Initials & Title	Designation	Qualification
Alugongo, AA (Prof)	Professor	PhD
Tchomeni Kouejou, BX (Prof)	Associate Professor	DEng
Aniki, AO (Mr)	Lecturer	MEng
Ibrahim, ID (Dr)	Lecturer	PhD
Inyang, EE (Mr)	Lecturer	MTech
Koza, VS (Mr)	Lecturer	MEng
Nturanabo, F (Mr)	Lecturer	MSc Eng
Olivier, AA (Mr)	Lecturer	MTech
Tshitshonu, EK (Mr)	Lecturer	BSc Hons
Mbatha, JA (Mr)	NGap Lecturer	MEng
Mhlongo, O (Ms)	Technician	BTech
Sigonde, CV (Ms)	Technologist	MEng
Kadima, J (Mr)	Lab Technician	BTech
Greyling, M (Mr)	Workshop Assistant	Grade 12

10.3.1 DIPLOMA IN MECHANICAL ENGINEERING (DI0841 & DI0840)

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 Diploma in Mechanical Engineering is to develop the necessary knowledge, understanding, and skills required for the student to further learn and become a competent practicing Mechanical Engineering Technician. It is intended to empower candidate engineering technicians to demonstrate that they can apply their acquired knowledge, understanding, skills, attitudes, and values in South Africa's work environments. It is also designed to add value to the qualifying student by enriching the person, status, and recognition.

Programme Structure

The last FTEN (First Time Entry) intake for **DI0840** was in 2021. During 2021, the structure of the diploma was changed and the first intake for the new structure, **DI0841**, was in 2022. Subsequent intakes will be for DI0841, as DI0840 is gradually phased out. The last date for achievement of DI0840 is December 2026 and last graduation is 2027.

See page 87 for the curriculum of DI0841 and page 86 for DI0840.

The Diploma in Mechanical Engineering is HEQSF-aligned and vocationally oriented. It requires a minimum of 360 credits, with 120 credits at the exit level, NQF Level 6.

This three-year course consists of five semesters of university attendance (36 modules) and one semester (6 months) of Work-Integrated Learning (WIL) in industry. The latter should be done after completing **ALL** theoretical modules, i.e., after the fifth semester (S5) of uninterrupted theoretical training at the University.

Each theoretical semester consists of approximately 15 weeks of tuition, comprising lectures, tutorials, and, in some modules, practical work in laboratories. During this time, the student's progress is evaluated through written tests, assignments (individual or group), practical evaluations, case studies, documented investigation/research, presentations, projects, computer-based assessments, and simulations. At the end of each semester, final examinations are written on all the work done over approximately two weeks. Continuous assessment is used for some modules, where assessments throughout the semesters contribute towards the final mark without a formal examination

Admission Requirements

See sections 5.2.1 (page 15) and 5.3 (p 17).

Course Progression Rules

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

1. Progression from YEAR 1 to YEAR 2:
   - Obtained a minimum of 90 credits in YEAR 1.
   - Register first for all outstanding subjects in YEAR 1.
   - Meet all respective prerequisites.*
2. Progression from YEAR 2 to YEAR 3 (Semester 1):
   - Obtained a minimum of 90 credits in YEAR 2.
   - Passed all YEAR 1 modules
   - Register first for all outstanding YEAR 2 modules. No selection, no omissions, no exceptions.
   - Meet all respective prerequisites.*
3. Progression to YEAR 3 (Semester 2):
   - Pass all theoretical modules of Year 1, 2, and 3 (Semester 1).
   - Be competent in GA 1 to GA 11.

   ** Prerequisites are listed in the course structure on page 87.*

Workplace-Based Learning (WPBL)

The Diploma in Mechanical Engineering has a formal six months WPBL component that is coordinated by the Department of Industrial Engineering & Operations Management and Mechanical Engineering.

WPBL has a minimum duration of six months, but students may enter into a contract of employment lasting longer than six months.

The final report must be submitted to the University upon completing **the contract** entered into with the employer.

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 ensure that preventive or scheduled maintenance is performed on all machines to prevent interruptions in production. Therefore, the activities in Mechanical Engineering can be grouped into design, maintenance, electromechanical, and project work. The latter includes project planning, cost control, evaluation of tenders, negotiations with contractors, control over the project's progress, coordination of all the interested departments, and commissioning the completed project. Technicians are much sought after 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. A career in this field is lucrative and rewarding.

10.3.2 EXTENDED DIPLOMA IN MECHANICAL ENGINEERING (DE0841)

The department offers a 4-year Extended Diploma in Mechanical Engineering. See page 88 for more information.

The curriculum of the 4-year Extended Diploma is on page 93.

Progression Rules for the Extended Diploma in Industrial Engineering (DE0831)

For a student to progress from one year (Period of Study = POS) to the next, the following are important:

4. Progression from POS 0 (Year 1) to POS 1 (Year 2):
    - Passed **ALL** the Foundation modules:
    5. AAXCH1A – Foundation Chemistry 1
    6. AMXMA1A – Foundation Mathematics 1
    7. APXPH1A – Foundation Physics 1
    8. AAXCH2A – Foundation Chemistry 2
    9. AMXMA2A – Foundation Mathematics 2
    10. APXPH2A – Foundation Physics 2
    11. EMXDR1A – Foundation Drawing
    - Passed 6 of the 7 regular diploma subjects (on POS 0)
    - Meet all respective prerequisites* of POS 1 (Year 2)
12. Progression from POS 1 (Year 2) to POS 2 (Year 3):
    - Passed **ALL** modules in POS 0 (Year 1)
    - Obtained a minimum of 60 credits in POS 1 (Year 2)
    - Register first for all outstanding modules in POS 1 (Year 2)
    - Meet all respective prerequisites* of POS 2 (Year 3)
13. Progression from POS 2 (Year 3) to POS 3 (Year 4)
    - Passed **ALL** modules in POS 0 (Year 1)
    - Passed **ALL** modules in POS 1 (Year 2)
    - Obtained a minimum of 100 credits in POS 2 (Year 3)
    - Register first for all outstanding modules in POS 2 (Year 3)

- Meet all respective prerequisites* of POS 3 (Year 4)

** Prerequisites are listed in the course structure on page 93.*

10.3.3 ADVANCED DIPLOMA IN MECHANICAL ENGINEERING (AD0840)

Purpose of the Qualification

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

- Preparation for careers in Mechanical Engineering at NQF level 7 (Technologist status) to achieve technical proficiency and to contribute to the economy and national development.
- The educational base required for registration as a Professional Engineering Technologist with ECSA.
- Entry to NQF level 8 programs, e.g., bachelor's Honours and Postgraduate Diploma programs, and then to master's and doctorate programs.

Programme Structure

The Advanced Diploma in Mechanical Engineering is a minimum of a one-year, full-time course on NQF Level 7 and requires a minimum of 140 credits to meet ECSA requirements. Each semester comprises tuition, lectures, tutorials, and practical work done in laboratories for some modules. The student's progress is evaluated through written tests, assignments (individual or group), practical evaluations, continuous assessments, documented investigations, presentations, projects, computer-based assessments, and simulations. At the end of each semester, final examinations are written on all the work done over approximately two weeks. Continuous assessment is used for some modules, where assessments throughout the semesters contribute towards the final mark without a formal examination.

See page 101 for the curriculum.

Admission Requirements

See section 5.2.2 (p 17).

All other equivalent qualifications will be treated on an ad hoc basis.

10.3.4 POSTGRADUATE DIPLOMA IN MECHANICAL ENGINEERING (PG0840)

Purpose of the Qualification

This qualification is primarily industry oriented. The knowledge emphasises general principles, application, and technology transfer. The qualification provides students with a sound knowledge base in Mechanical Engineering and the ability to apply their knowledge and skills to this career in professional contexts while equipping them to undertake more specialised and intensive learning. Programs leading to this qualification tend to have a solid professional or career focus, and holders of this qualification are usually prepared to enter a specific niche in the labour market.

Specifically, this qualification aims to build the knowledge, understanding, abilities, and skills required for further learning toward becoming a competent practicing engineering technologist with research and innovation abilities. This qualification

provides:

1. Preparation for careers in Mechanical engineering to achieve technical proficiency and contribute to the economy and national development.
2. The educational base required for proceeding towards a Master's in Engineering Programme at NQF level 9.

Programme Structure

The Postgraduate Diploma in Mechanical Engineering is a minimum one-year, full-time course on NQF level 8 and 120 credits. Each semester comprises lectures, tutorials, and practical work in laboratories for some modules. The student's progress is evaluated through written tests, assignments, practical evaluations, continuous assessments, case-based studies, documented investigation/research, presentations, projects, computer-based assessments, and simulations. At the end of each semester, final examinations are written on all the work done during the semester over an approximately two-week period for those modules that were not assessed continuously.

See page 103 for the curriculum.

Admission Requirements

See sections 5.2.3 (p 17).

Progression and Pathway

Upon completion of the Postgraduate Diploma in Mechanical Engineering (NQF Level 8, 120 credits), the graduate meets the minimum entry requirement for admission to the Master of Engineering in Industrial Engineering (NQF Level 9). This qualification lies in an HEQSF Vocational Pathway.

10.3.5 MASTER OF ENGINEERING IN MECHANICAL ENGINEERING (MP0840)

Purpose of the Qualification

This qualification aims to develop a student into a researcher who can conduct independent research with minimal guidance in a chosen field of Mechanical Engineering. The research outcomes 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 4.4.)

Programme Structure

The programme is equivalent to a minimum of one year of full-time study, which is concluded with a master's dissertation.

Admission Requirements

A BEng Degree or equivalent level 8 qualification, including the Postgraduate Diploma. Ad hoc cases will be treated on merit.

Progression and Pathway

Upon completing the Master of Engineering in Mechanical Engineering (NQF Level 9), the graduate meets the minimum entry requirement for admission to the Doctor of Engineering in Mechanical Engineering (NQF Level 10). This qualification lies in an HEQSF Vocational Pathway

10.3.6 DOCTOR OF ENGINEERING IN MECHANICAL ENGINEERING (DP0840)

Purpose of the Qualification

The qualification aims 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 of 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 4.5.)

Programme Structure

The programme is equivalent to a two-year, full-time study that is concluded with a Doctoral Thesis.

Admission Requirements

Master of Engineering in Mechanical Engineering or Equivalent. Proof of successful completion of a course in Research Methodology approved by the Vaal University of Technology. Ad hoc cases will be treated on merit.

10.4 ENQUIRIES

Enquiries may be addressed to:

HoD: Industrial Engineering & Operations Management and Mechanical Engineering
Faculty of Engineering & Technology
Vaal University of Technology
Private Bag X021
VANDERBIJLPARK, 1900
Tel : +27 (0)16 950 9287 / 9441
Fax : +27 (0)16 950 9797
e-mail : thomas@vut.ac.za
lieketsengn@vut.ac.za
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Postgraduate Office

Ms N Kokoali
Tel : +27 (0)16 950 9288
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Mr S Motsie
Tel : +27 (0)16 950 7639
e-mail : sehlabakam@vut.ac.za

11. CURRICULA (PROGRAMME STRUCTURE)

11.1 DIPLOMA

All modules are compulsory to obtain the qualification, unless otherwise specified.

DI0400: DIPLOMA IN OPERATIONS MANAGEMENT

YEAR 1 *(126 credits)*

SEMESTER 1 (POS A)			**SEMESTER 2** (POS B)		
MODULE CODE	**MODULE NAME**	**CREDIT**	**MODULE CODE**	**MODULE NAME**	**CREDIT**
AMMAT1A	Mathematics 1	10	EBMFY1A	Manufacturing Technology 1.2	10
ASICT1A	ICT Skills 1	10	EBOGY1A	Organisational Effectiveness 1.2	10
EBMFX1A	Manufacturing Technology 1.1	10	EBOPY1A	Operations Management 1.2	10
EBOGX1A	Organisational Effectiveness 1.1	10	EBQMA1A	Quality Management 1	10
EBOPX1A	Operations Management 1.1	10	EBWPY1A	Workplace Dynamics 1.2	10
EBWPX1A	Workplace Dynamics 1.1	10	HKCOY1A	Applied Communication Skills 1.2	8
HKCOX1A	Applied Communication Skills 1.1	8			

YEAR 2 *(126 credits)*

SEMESTER 1 (POS C)			**SEMESTER 2** (POS D)		
ASPRG1A	Programming 1	10	ASPRG2A	Programming 2 Prerequisite: ASPRG1A	10
BACEX1A	Costing and Estimating 1.1	10	BACEY1A	Costing and Estimating 1.2 Prerequisite: BACEX1A	10
EBMAX2A	Operations Management 2.1 Prerequisite: EBOPX1A	10	EBMAT2A	Operations Management Techniques 2	10
EBOGX2A	Organisational Effectiveness 2.1 Prerequisite: EBOGX1A	10	EBMAY2A	Operations Management 2.2	10
EBQAS2A	Quality Assurance 2 Prerequisite: EBQMA1A	10	EBOGY2A	Organisational Effectiveness 2.2 Prerequisite: EBOGX1A	10
EBSTX1A	Statistics 1.1	10	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A & HKCOY1A	8
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A & HKCOY1A	8			

YEAR 3 *(110 credits)*

SEMESTER 1 (POS E)			**SEMESTER 2** (POS F)		
EBILE3A	Industrial Leadership 3	10	EBMAP1B	Operations Management Practice 1	60
EBMAT3A	Operations Management Techniques 3	10			
EBMAX3A	Operations Management 3.1 Prerequisite: EBMAX2A	10			
EBOEG3A	Organisational Effectiveness 3 Prerequisite: BACEX1A & BACEY1A	10			
EBOMG3A	Operations Management Technology 3	10			

DI0800: DIPLOMA IN CHEMICAL ENGINEERING

YEAR 1

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AAECH1A	Engineering Chemistry 1	10	AAECH2A	Engineering Chemistry 2 Prerequisite: AAECH1A	10
AMMAT1A	Mathematics 1	10	AMMAT2A	Mathematics 2 Prerequisite: AMMAT1A	10
APHYS1A	Physics 1	10	APHYP2A	Physics 2 (Practical) Prerequisite: APHYS1A	5
ASICT1A	ICT Skills 1	10	APHYT2A	Physics 2 (Theory) Prerequisite: APHYS1A	5
EEESK1A	Engineering Skills 1	5	EHITC1A	Introduction to Chemical Engineering 1	12
EESIN1A	Social Intelligence 1	3	EHSPA1A	Safety Principles and Law 1	5
HKCOX1A	Applied Communication Skills 1.1	8	EMEDR1A	Engineering Drawing 1	10
			HKCOY1A	Applied Communication Skills 1.2	8

YEAR 2

SEMESTER 1			SEMESTER 2		
AAECH3A	Engineering Chemistry 3 Prerequisite: AAECH2A	10	EHCEL1A	Chemical Engineering Laboratory 1 Prerequisite: EHMEB2A	12
AMMAT3A	Mathematics 3 Prerequisite: AMMAT1A & AMMAT2A	10	EHCET2A	Chemical Engineering Thermodynamics 1 Prerequisite: AAECH2A	12
BHMAN1A	Management 1	10	EHCOA2A	Computing Applications 2 Prerequisite: ASICT1A	7
EHCPI1A	Chemical Process Industries 1	12	EHHMT2A	Heat and Mass Transfer 1 Prerequisite: AMMAT2A	12
EHMEB2A	Material and Energy Balance 2 Prerequisite: EHITC1A	12	EHPCO2A	Process Control 1 Prerequisite: AMMAT2A, AMMAT3A	12
EHMOP1A	Mechanical Operation 1	12	EHPFD2A	Process Fluid Dynamics 1 Prerequisite: APHYT2A	12
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A & HKCOY1A	8	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A & HKCOY1A	8

YEAR 3

SEMESTER 1			SEMESTER 2 (WPBL Placement)		
EHATH3A	Applied Thermodynamics 2	12	EHEXL1A	Experiential Learning 1 (Chemical)	60
EHCEL2A	Chemical Engineering Laboratory 2 Prerequisite: EHCEL1A	12			
EHCPR3A	Chemical Process Design Prerequisite: EHCPI1A & EHMEB2A	12			
EHENE1A	Environmental Engineering 1	12			
EHRTE3A	Reactor Technology 1 Prerequisite: EHMEB2A	12			
EHSEP3A	Separation Processes 1 Prerequisite: EHHMT2A & EHMEB2A	12			

DI0810: DIPLOMA IN CIVIL ENGINEERING

YEAR 1

SEMESTER 1

MODULE CODE	MODULE NAME	CREDIT
AAECH1A	Engineering Chemistry 1	10
AMMAT1A	Mathematics 1	10
APHYS1A	Physics 1	10
ASICT1A	ICT Skills 1	10
EEESK1A	Engineering Skills 1	5
EESIN1A	Social Intelligence 1	3
HKCOX1A	Applied Communication Skills 1.1	8

SEMESTER 2

MODULE CODE	MODULE NAME	CREDIT
AAECH2A	Engineering Chemistry 2 Prerequisite: AAECH1A	10
AMMAT2A	Mathematics 2 Prerequisite: AMMAT1A	10
APHYP2A	Physics 2 (Practical) Prerequisite: APHYS1A	5
APHYT2A	Physics 2 (Theory) Prerequisite: APHYS1A	5
ECSPA1A	Safety Principles and Law 1	5
ECAME1A	Applied Mechanics 1 Prerequisite: AMMAT1A & APHYS1A	10
ECCOA2A	Computing Applications 2 Prerequisite: ASICT1A	7
ECEDR1A	Engineering Drawing 1	10
HKCOY1A	Applied Communication Skills 1.2	8

YEAR 2

SEMESTER 1

ECCOM1A	Construction Materials 1	5
ECCOS1A	Construction Methods 1	10
ECEDR2A	Engineering Drawing 2 Prerequisite: ECEDR1A	10
ECESU1A	Engineering Surveying 1	10
ECSME1A	Soil Mechanics 1	5
ECTST2A	Theory of Structures 2 Prerequisite: APHYP2A & APHYT2A & ECAME1A	10
EYEGE1A	Engineering Geology 1	10
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A, HKCOY1A	8

SEMESTER 2

ECCEM1A	Civil Engineering Management 1 Prerequisite: ECCOS1A	10
ECCOM2A	Construction Materials 2 Prerequisite: ECCOM1A	5
ECEOS2A	Elements of Structural Steel and Timber Design 2 Prerequisite: ECTST2A	10
ECESU2A	Engineering Surveying 2 Prerequisite: ECEDR2A & ECESU1A	10
ECSAN3A	Structural Analysis 3 Prerequisite: AMMAT2A & ECTST2A	10
ECTEN1A	Transportation Engineering 1 Prerequisite: AMMAT1A & ECESU1A	10
ECWEN1A	Water Engineering 1 Prerequisite: AAECH1A & AAECH2A & AMMAT1A	10
HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A, HKCOY1A	8

YEAR 3

SEMESTER 1

ECCEM2A	Civil Engineering Management 2 Prerequisite: ECCEM1A & ECCOM2A & ECCOS1A	10
ECDOC1A	Documentation 1 Prerequisite: ECCEM1A & ECCOM2A & ECCOS1A & ECEDR2A	10
ECEOR3A	Elements of Reinforced Concrete Masonry Design 3 Prerequisite: ECEOS2A	10
ECFMC2A	Fluid Mechanics 2 (Civil) Prerequisite: AMMAT2A & APHYT2A	10
ECSAN4A	Structural Analysis 4 Prerequisite: ECSAN3A	10
ECSME2A	Soil Mechanics 2 Prerequisite: ECSME1A	10
ECTEN2A	Transportation Engineering 2 Prerequisite: ECSME1A & ECTEN1A	10

SEMESTER 2 (WPBL Placement)

ECEXL1A	Experiential Learning 1 (Civil) Prerequisite: All modules of year 1,2, 3 & competent in GA 1 to 11 (except GA 9 that is covered in WIL)	60

DI0822: DIPLOMA IN ELECTRICAL ENGINEERING: COMPUTER SYSTEMS ENGINEERING

YEAR 1

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AMMAT1A	Mathematics 1	10	AMMAT2A	Mathematics 2 Prerequisite: AMMAT1A	10
APHYS1A	Physics 1	10	APHYP2A	Physics 2 (Practical) Prerequisite: APHYS1A	5
ASICT1A	ICT Skills 1	10	APHYP2A	Physics 2 (Practical) Prerequisite: APHYS1A	5
EEESK1A	Engineering Skills 1	5	EESPA1A	Safety Principles and Law 1	5
EESIN1A	Social Intelligence 1	3	EICOA2A	Computing Applications 2 Prerequisite: ASICT1A	7
EPEEN1A	Electrical Engineering 1	10	EIDSY1A	Digital Systems 1 Prerequisite: AMMAT1A	10
HKCOX1A	Applied Communication Skills 1.1	8	EPEEN2A	Electrical Engineering 2 Prerequisite: EPEEN1A	10
			HKCOY1A	Applied Communication Skills 1.2	8

YEAR 2

SEMESTER 1			SEMESTER 2		
EEELE1A	Electronics 1 Prerequisite: EPEEN1A	10	EEELE2A	Electronics 2 Prerequisite: EEELE1A	10
EIDSY2A	Digital Systems 2 Prerequisite: EIDSY1A	10	EIDSY3A	Digital Systems 3 Prerequisite: EIDSY1A & EIDSY2A	10
EIENP1A	Engineering Programming 1 Prerequisite: EICOA2A	10	EIENP2A	Engineering Programming 2 Prerequisite: EIENP1A	10
EINET1A	Networks 1 Prerequisite: EIDSY1A	10	EINET2A	Networks 2 Prerequisite: EINET1A	10
EIOSY1A	Operating Systems 1 Prerequisite: ASICT1A	10	EIOSY2A	Operating Systems 2 Prerequisite: EIOSY1A	10
EISEN1A	Software Engineering 1 Prerequisite: EICOA2A	10	EISEN2A	Software Engineering 2 Prerequisite: EISEN1A	10
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A & HKCOY1A	8	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A & HKCOY1A	8

YEAR 3

SEMESTER 1			SEMESTER 2 (WPBL Placement)		
AMMAT3A	Mathematics 3 Prerequisite: AMMAT2A	10	EIEXC1A	Experiential Learning 1A	14
EIDSY4A	Digital Systems 4 Prerequisite: EIDSY2A & EIDSY3A	10	EIEXC2A	Experiential Learning 1B	16
EIENP3A	Engineering Programming 3 Prerequisite: EIENP1A & EIENP2A	10	EIPRC4A	Engineering Project 4	30
EINET3A	Networks 3 Prerequisite: EINET1A & EINET2A	10			
EIOSY3A	Operating Systems 3 Prerequisite: EIOSY1A & EIOSY2A	10			
EISEN3A	Software Engineering 3 Prerequisite: EISEN1A & EISEN2A	10			

DI0823: DIPLOMA IN ELECTRICAL ENGINEERING: ELECTRONIC ENGINEERING

YEAR 1

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AMMAT1A	Mathematics 1	10	AMMAT2A	Mathematics 2 Prerequisite: AMMAT1A	10
APHYS1A	Physics 1	10	EECOA2A	Computing Applications 2 Prerequisite: ASICT1A	7
ASICT1A	ICT Skills 1	10	EEELE1A	Electronics 1 Prerequisite EPEEN1A	10
EEESK1A	Engineering Skills 1	5	EESPA1A	Safety Principles and Law 1	5
EESIN1A	Social Intelligence 1	3	EEWPR1A	Projects 1 (WIL - Electrical) Prerequisite: EPEEN1A	7
EPEEN1A	Electrical Engineering 1	10	EIDSY1A	Digital Systems 1 Prerequisite: AMMAT1A	10
HKCOX1A	Applied Communication Skills 1.1	8	EPEEN2A	Electrical Engineering 2 Prerequisite: EPEEN1A	10
			HKCOY1A	Applied Communication Skills 1.2	8

YEAR 2

SEMESTER 1			SEMESTER 2		
AMMAT3A	Mathematics 3 Prerequisite: AMMAT2A	10	EECAD2A	Electrical CAD 2 Prerequisite: EECAD1A	10
EECAD1A	Electrical Computer-Aided Design 1 Prerequisite: EEELE1A	10	EEDCO2A	Digital Communication 2 Prerequisite: AMMAT3A & EEECO2A	10
EEECO2A	Electronic Communication 2 Prerequisite: APHYS1A & EEELE1A & EPEEN1A	10	EEELE3A	Electronics 3 Prerequisite: EEELE1A & EEELE2A	10
EEELE2A	Electronics 2 Prerequisite: EEELE1A	10	EEMET3A	Measurement Technology 3 Prerequisite: EEELE1A & EPEEN2A	10
EEWPR2A	Projects 2 (WIL - Electrical) Prerequisite: EEWPR1A	7	EEPEL3A	Power Electronics 3 Prerequisite: EIDSY1A & EEELE2A	10
EIDSY2A	Digital Systems 2 Prerequisite: EIDSY1A	10	EEWPR3A	Projects 3 (WIL - Electrical) Prerequisite: EEWPR1A & EEWPR2A	8
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A & HKCOY1A	8	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A & HKCOY1A	8

YEAR 3

SEMESTER 1			SEMESTER 2 (WPBL Placement)		
EEMIC3A	Microwave Communication 3 Prerequisite: EEECO2A & EEELE3A	10	EEEXL1A	Experiential Learning 1 Prerequisite: EEWPR2A & EEWPR3A	14
EEOEL3A	Opto-Electronics 3 Prerequisite: EEECO2A	10	EEEXL2A	Experiential Learning 2 Prerequisite: EEWPR2A & EEWPR3A	16
EERAD3A	Radio Engineering 3 Prerequisite: EEECO2A & EEELE3A	10	EEPRJ4A	Engineering Project 4 Prerequisite: EEWPR2A & EEWPR3A	30
EETXR3A	Transmission 3 (Radio Frequency) Prerequisite: EEECO2A	10			
EEWPR4A	Projects 4 (WIL - Electrical) Prerequisite: EEWPR2A & EEWPR3A	8			

DI0824: DIPLOMA IN ELECTRICAL ENGINEERING: POWER ENGINEERING

YEAR 1

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AMMAT1A	Mathematics 1	10	AMMAT2A	Mathematics 2 Prerequisite: AMMAT1A	10
APHYS1A	Physics 1	10	EEELE1A	Electronics 1 Prerequisite: EPEEN1A	10
ASICT1A	ICT Skills 1	10	EESPA1A	Safety Principles and Law 1	5
EEESK1A	Engineering Skills 1	5	EIDSY1A	Digital Systems 1 Prerequisite: AMMAT1A & EPEEN1A	10
EESIN1A	Social Intelligence 1	3	EPCOA2A	Computing Applications 2 Prerequisite: AMMAT1A & ASICT1A & EPEEN1A	7
EPEEN1A	Electrical Engineering 1	10	EPEEN2A	Electrical Engineering 2 Prerequisite: EPEEN1A	10
HKCOX1A	Applied Communication Skills 1.1	8	HKCOY1A	Applied Communication Skills 1.2	8

YEAR 2

SEMESTER 1			SEMESTER 2		
AMMAT3A	Mathematics 3 Prerequisite: AMMAT2A	10	EEPEL3A	Power Electronics 3 Prerequisite: EIDSY1A & EEELE2A	10
BHMAN1A	Management 1	10	EPAEN2A	Alternative Energy 2 (Power) Prerequisite: EEELE2A & EPEEN1A & EPEEN2A	10
EEELE2A	Electronics 2 Prerequisite: EEELE1A	10	EPEEN4A	Electrical Engineering 4 Prerequisite: EPEEN3A	10
EPEEN3A	Electrical Engineering 3 Prerequisite: EPEEN1A & EPEEN2A	10	EPEMA3A	Electrical Machines 3 Prerequisite: EPEMA2A	10
EPEMA2A	Electrical Machines 2 Prerequisite: EPEEN1A & EPEEN2A	10	EPSYS3A	Power Systems 3 Prerequisite: EPSYS2A	10
EPSYS2A	Power Systems 2 Prerequisite: EPEEN2A	10	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A, HKCOY1A	8
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A & HKCOY1A	8			

YEAR 3

SEMESTER 1			SEMESTER 2 (WPBL Placement)		
EEPEL4A	Power Electronics 4 Prerequisite: EEELE2A	10	EPEXL1A	Experiential Learning 1A	14
EPAEN3A	Alternative Energy 3 (Power) Prerequisite: EPAEN2A	10	EPEXL2A	Experiential Learning 1B	16
EPEMA4A	Electrical Machines 4 Prerequisite: EPEMA2A, EPEMA3A	10	EPPRJ4A	Engineering Project 4	30
EPEMN2A	Energy Management 2 Prerequisite: EPAEN2A & EPEEN2A & EPSYS2A	10			
EPEPR3A	Electrical Protection 3 Prerequisite: EPEEN3A & EPEMA3A	10			
EPTXP3A	Transmission 3 (Power) Prerequisite: EPSYS2A & EPSYS3A	10			

DI0825: DIPLOMA IN ELECTRICAL ENGINEERING: PROCESS CONTROL ENGINEERING

YEAR 1

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AMMAT1A	Mathematics 1	10	AMMAT2A	Mathematics 2 Prerequisite: AMMAT1A	10
APHYS1A	Physics 1	10	APHYP2A	Physics 2 (Practical) Prerequisite: APHYS1A	5
ASICT1A	ICT Skills 1	10	APHYT2A	Physics 2 (Theory) Prerequisite: APHYS1A	5
EEESK1A	Engineering Skills 1	5	EESPA1A	Safety Principles and Law 1	5
EESIN1A	Social Intelligence 1	3	EICOA2A	Computing Applications 2 Prerequisite: ASICT1A	7
EPEEN1A	Electrical Engineering 1	10	EIDSY1A	Digital Systems 1 Prerequisite: AMMAT1A & EPEEN1A	10
HKCOX1A	Applied Communication Skills 1.1	8	EIPRI1A	Process Instrumentation 1 Prerequisite: APHYS1A	10
			HKCOY1A	Applied Communication Skills 1.2	8

YEAR 2

SEMESTER 1			SEMESTER 2		
AMMAT3A	Mathematics 3 Prerequisite: AMMAT2A	10	EEELE2A	Electronics 2 Prerequisite: EEELE1A	10
EEELE1A	Electronics 1 Prerequisite: EPEEN1A	10	EIDCS1A	Digital Control Systems 1 Prerequisite: EINET1A	10
EIENP1A	Engineering Programming 1 Prerequisite: EICOA2A	10	EIDSY2A	Digital Systems 2 Prerequisite: EIDSY1A	10
EINET1A	Networks 1 Prerequisite: EIDSY1A	10	EIENP2A	Engineering Programming 2 Prerequisite: EIENP1A	10
EIPRI2A	Process Instrumentation 2 Prerequisite: EIPRI1A	10	EINET2A	Networks 2 Prerequisite: EINET1A	10
EPEEN2A	Electrical Engineering 2 Prerequisite: EPEEN1A	10	EIPRI3A	Process Instrumentation 3 Prerequisite: EIPRI1A & EIPRI2A	10
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A & HKCOY1A	8	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A & HKCOY1A	8

YEAR 3

SEMESTER 1			SEMESTER 2 (WPBL Placement)		
EEPEL3A	Power Electronics 3 Prerequisite: EEELE2A & EIDSY1A	10	EIEXL1A	Experiential Learning	14
EICSY2A	Control Systems 2 Prerequisite: AMMAT2A & AMMAT2A	10	EIEXL2A	Experiential Learning 2	16
EIDCS2A	Digital Control Systems 2 Prerequisite: EIDCS1A	10	EIPRJ4A	Engineering Project 4	30
EIDSY3A	Digital Systems 3 Prerequisite: EIDSY1A & EIDSY2A	10			
EIENP3A	Engineering Programming 3 Prerequisite: EIENP1A & EIENP2A	10			
EINET3A	Networks 3 Prerequisite: EINET1A & EINET2A	10			

DI0830: DIPLOMA IN INDUSTRIAL ENGINEERING

YEAR 1 *(126 credits)*

SEMESTER 1 (POS A)			**SEMESTER 2** (POS B)		
MODULE CODE	**MODULE NAME**	**CREDIT**	**MODULE CODE**	**MODULE NAME**	**CREDIT**
AAECH1A	Engineering Chemistry 1	10	AAECH2A	Engineering Chemistry 2 Prerequisite: AAECH1A	10
AMMAT1A	Mathematics 1	10	AMMAT2A	Mathematics 2 Prerequisite: AMMAT1A	10
APHYS1A	Physics 1	10	APHYP2A ***and*** APHYT2A	Physics 2 (Practical) Prerequisite: APHYS1A ***and*** Physics 2 (Theory) Prerequisite: APHYS1A	5 ***plus*** 5
ASICT1A	ICT Skills 1	10			
EEESK1A	Engineering Skills 1	5	EBCOA2A	Computing Applications 2	7
EESIN1A	Social Intelligence 1	3	EBMRE2A	Manufacturing Relations 2	10
HKCOX1A	Applied Communication Skills 1.1	8	EBSPA1A	Safety Principles and Law 1	5
			EMEDR1A	Engineering Drawing 1	10
			HKCOY1A	Applied Communication Skills 1.2	8

YEAR 2 *(156 credits)*

SEMESTER 1 (POS C)			**SEMESTER 2** (POS D)		
AMMAT3A	Mathematics 3 Prerequisite: AMMAT1A & AMMAT2A	10	BACOS2A	Costing 2	10
EBEWS1A	Engineering Work Study 1	10	EBEWS2A	Engineering Work Study 2 Prerequisite: EBEWS1A	10
EBPEN1A	Production Engineering 1	10	EBFLA2A	Facility Layout and Material Handling 2	10
EBQTE1A	Qualitative Techniques 1	10	EBPEN2A	Production Engineering 2 Prerequisite: EBPEN1A	10
EMMEC1A	Mechanics 1 Prerequisite: AMMAT1A & APHYS1A	10	EBQAS2A	Quality Assurance 2 Prerequisite: EBQTE1A	10
EMMEN1A	Manufacturing Engineering 1	10	EMMEN2A	Mechanical Manufacturing Engineering 2 Prerequisite: EMMEN1A	10
EPEEN1A	Electrical Engineering 1	10	EMMAE1A	Maintenance Engineering 1 Prerequisite: EMEDR1A & EMMEN1A	10
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A & HKCOY1A	8	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A & HKCOY1A	8

YEAR 3 *(110 credits)*

SEMESTER 1 (POS E)			**SEMESTER 2 (WPBL Placement)** ***(POS F)***		
EBAUT3A	Automation 3 Prerequisite: EMMEN1A	10	EBWIL1A	Work Integrated Learning (Industrial)	60
EBEWS3A	Engineering Work Study 3	10			
EBIAC3A	Industrial Accounting 3 Prerequisite: BACOS2A	10			
EBILE3A	Industrial Leadership 3 Prerequisite: EBMRE2A	10			
EBORE3A	Operations Research 3 Prerequisite: EBQAS2A	10			

DI0840: DIPLOMA IN MECHANICAL ENGINEERING (BEING PHASED OUT)

YEAR 1

SEMESTER 1

MODULE CODE	MODULE NAME	CREDIT
AAECH1A	Engineering Chemistry 1	10
AMMAT1A	Mathematics 1	10
APHYS1A	Physics 1	10
ASICT1A	ICT Skills 1	10
EEESK1A	Engineering Skills 1	5
EESIN1A	Social Intelligence 1	3
HKCOX1A	Applied Communication Skills 1.1	8

SEMESTER 2

MODULE CODE	MODULE NAME	CREDIT
AAECH2A	Engineering Chemistry 2 Prerequisite: AAECH1A	10
AMMAT2A	Mathematics 2 Prerequisite: AMMAT1A	10
APHYP2A	Physics 2 (Practical) Prerequisite: APHYS1A	5
APHYT2A	Physics 2 (Theory) Prerequisite: APHYS1A	5
EMCOA2A	Computing Applications 2	7
EMEDR1A	Engineering Drawing 1	10
EMSPA1A	Safety Principles and Law 1	5
HKCOY1A	Applied Communication Skills 1.2	8

YEAR 2

SEMESTER 1

AMMAT3A	Mathematics 3 Prerequisite: AMMAT1A, AMMAT2A	10
EMEDR2A	Engineering Drawing 2 Prerequisite: EMEDR1A	10
EMMEC1A	Mechanics 1 Prerequisite: AMMAT1A, APHYS1A	10
EMMEN1A	Manufacturing Engineering 1 Prerequisite: EMEDR1A	10
EMPRJ1A	Project 1 (WIL Mechanical) Prerequisite: AMMAT2A	8
EPEEN1A	Electrical Engineering 1	10
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A HKCOY1A	8

SEMESTER 2

EMCAI1A	Computer Aided Draughting 1 Prerequisite: EMEDR1A	10
EMFMM2A	Fluid Mechanics 2 (Mechanics) Prerequisite: AMMAT2A APHYT2A EMMEC1A	10
EMMED2A	Mechanical Engineering Design 2 Prerequisite: AMMAT2A, APHYT2A, EMEDR2A, EMMEC1A	10
EMMOM2A	Mechanics of Machines 2 Prerequisite: EMMEC1A	10
EMPRJ2A	Project 2 (WIL Mechanical) Prerequisite: AMMAT2A EMPRJ1A	10
EMSOM2A	Strength of Materials 2 Prerequisite: EMMEC1A	10
EMTHE2A	Thermodynamics 2 Prerequisite: EMMEC1A	10
HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A, HKCOY1A	8

YEAR 3

SEMESTER 1

EMFME3A	Fluid Mechanics 3 Prerequisite: EMFMM2A	10
EMMAE1A	Maintenance Engineering 1 Prerequisite: EMEDR1A	10
EMMED3A	Mechanical Engineering Design 3 Prerequisite: EMMED2A	10
EMMEN2A	Manufacturing Engineering 2 Prerequisite: EMEDR1A, EMMEN1A	10
EMMOM3A	Mechanics of Machines 3 Prerequisite: EMMOM2A	10
EMPRJ3A	Project 3 (WIL Mechanical) Prerequisite: EMPRJ2A	10
EMSOM3A	Strength of Materials 3 Prerequisite: EMSOM2A	10
EMTHE3A	Thermodynamics 3 Prerequisite: EMTHE2A	10

SEMESTER 2

EMAOM3A	Applied Strength of Materials 3 Prerequisite: EMSOM3A	10
EMEXM1A	Experiential Learning 1 (Mechanical)	30
EMHYM3A	Hydraulic Machines 3 Prerequisite: EMFME3A	10
EMMAE2A	Maintenance Engineering 2 Prerequisite: EMMAE1A	10
EMMDE3A	Machine Design 3 Prerequisite: EMMED3A	10
EMMEC2A	Modelling and Engineering Computation 2 Prerequisite: EMCAI1A	10
EMSPL3A	Steam Plant 3 Prerequisite: EMTHE3A	10
EMTOM3A	Theory of Machines 3 Prerequisite: EMMOM3A	10

DI0841: DIPLOMA IN MECHANICAL ENGINEERING

YEAR 1 *(126 credits)*

SEMESTER 1 (POS A)

MODULE CODE	MODULE NAME	CREDIT
AAECH1A	Engineering Chemistry 1	10
AMMAT1A	Mathematics 1	10
APHYS1A	Physics 1	10
ASICT1A	ICT Skills 1	10
EEESK1A	Engineering Skills 1	5
EESIN1A	Social Intelligence 1	3
HKCOX1A	Applied Communication Skills 1.1	8

SEMESTER 2 (POS B)

MODULE CODE	MODULE NAME	CREDIT
AAECH2A	Engineering Chemistry 2 Prerequisite: AAECH1A	10
AMMAT2A	Mathematics 2 Prerequisite: AMMAT1A	10
APHYP2A	Physics 2 (Practical) Prerequisite: APHYS1A	5
APHYT2A	Physics 2 (Theory) Prerequisite: APHYS1A	5
EMCOA2A	Computing Applications 2	7
EMEDR1A	Engineering Drawing 1	10
EMMAE1A	Maintenance Engineering 1	10
EMSPA1A	Safety Principles and Law 1	5
HKCOY1A	Applied Communication Skills 1.2	8

YEAR 2 *(146 credits)*

SEMESTER 1 (POS C)

AMMAT3A	Mathematics 3 Prerequisite: AMMAT1A & AMMAT2A	10
EMEDR2A	Engineering Drawing 2 Prerequisite: EMEDR1A	10
EMFMM2A	Fluid Mechanics 2 (Mechanics)	10
EMMEC1A	Mechanics 1 Prerequisite: AMMAT1A & APHYS1A	10
EMMEN1A	Manufacturing Engineering 1 Prerequisite: EMEDR1A	10
EMTHE2A	Thermodynamics 2 Prerequisite: EMMEC1A	10
EPEEN1A	Electrical Engineering 1	10
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A, HKCOY1A	8

SEMESTER 2 (POS D)

EMFME3A	Fluid Mechanics 3 Prerequisite: EMFMM2A	10
EMMAE2A	Maintenance Engineering 2 Prerequisite: EMMAE1A	10
EMMED2A	Mechanical Engineering Design 2 Prerequisite: EMEDR2A & EMMEC1A	10
EMMOM2A	Mechanics of Machines 2 Prerequisite: EMMEC1A	10
EMSOM2A	Strength of Materials 2 Prerequisite: EMMEC1A	10
EMTHE3A	Thermodynamics 3 Prerequisite: EMTHE2A	10
HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A, HKCOY1A	8

YEAR 3 *(130 credits)*

SEMESTER 1 (POS E)

EMAOM3A	Applied Strength of Materials 3 Prerequisite: EMSOM3A	10
EMHYM3A	Hydraulic Machines 3 Prerequisite: EMFME3A	10
EMMDE3A	Machine Design 3 Prerequisite: EMMED2A	10
EMMOM3A	Mechanics of Machines 3 Prerequisite: EMMOM2A	10
EMSOM3A	Strength of Materials 3 Prerequisite: EMSOM2A	10
EMSPL3A	Steam Plant 3 Prerequisite: EMTHE3A	10
EMTOM3A	Theory of Machines 3 Prerequisite: EMMOM2A	10

SEMESTER 2 (WPBL Placement) (POS F)

EMWIL1A	Work Integrated Learning	60

DI0850: DIPLOMA IN METALLURGICAL ENGINEERING

YEAR 1

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AAECH1A	Engineering Chemistry 1	10	AAECH2A	Engineering Chemistry 2 Prerequisite: AAECH1A	10
AMMAT1A	Mathematics 1	10	AMMAT2A	Mathematics 2 Prerequisite: AMMAT1A	10
APHYS1A	Physics 1	10	APHYP2A	Physics 2 (Practical) Prerequisite: APHYS1A	5
ASICT1A	ICT Skills 1	10	APHYT2A	Physics 2 (Theory) Prerequisite: APHYS1A	5
EEESK1A	Engineering Skills 1	5	EMEDR1A	Engineering Drawing 1	10
EESIN1A	Social Intelligence 1	3	EYCOA2A	Computing Applications 2	7
HKCOX1A	Applied Communication Skills 1.1	8	EYSPA1A	Safety Principles and Law 1	5
			HKCOY1A	Applied Communication Skills 1.2	8

YEAR 2

SEMESTER 1			SEMESTER 2		
EYEGE1A	Engineering Geology 1	10	EBQCO2A	Quality Control 2 Prerequisite: AMMAT2A, APHYP2A, APHYT2A	10
EYEME1A	Extractive Metallurgy 1	10	EYHYD2A	Hydrometallurgy 2 Prerequisite: AAECH1A, EYEME1A	10
EYMAM1A	Manufacturing Metallurgy 1 Prerequisite: APHYS1A	10	EYMAM2A	Manufacturing Metallurgy 2 Prerequisite: EYMAM1A	10
EYMPR1A	Mineral Processing 1	10	EYMPR2A	Mineral Processing 2 Prerequisite: EYMPR1A	10
EYPME1A	Physical Metallurgy 1 Prerequisite: APHYS1A	10	EYPME2A	Physical Metallurgy 2 Prerequisite: EYPME1A	10
EYPTH1A	Process Thermodynamics 1 Prerequisite: AAECH2A	10	EYPYR2A	Pyrometallurgy 2 Prerequisite: EYEME1A	10
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A, HKCOY1A	8	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A, HKCOY1A	8

YEAR 3

SEMESTER 1			SEMESTER 2 (WPBL Placement)		
BHMAN1A	Management 1	10	EYWIL1A	Work Integrated Learning (Metallurgy)	60
EYENC1A	Environmental Chemistry 1 Prerequisite: AAECH2A, EYEGE1A	8			
EYHYD3A	Hydrometallurgy 3 Prerequisite: EYHYD2A	10			
EYMAM3A	Manufacturing Metallurgy 3 Prerequisite: EYMAM2A	10			
EYMPR3A	Mineral Processing 3 Prerequisite: EYMPR2A	10			
EYPME3A	Physical Metallurgy 3 Prerequisite: EYPME1A, EYPME2A	10			
EYPYR3A	Pyrometallurgy 3 Prerequisite: EYPYR2A	10			

11.2 EXTENDED 4-YEAR DIPLOMA

The Extended Diploma program aims to assist students who enter the University with an APS score of 22 by giving them more time to reach the level of competency, like those who get entrance with higher APS scores.

The programme extends the 3-year programme into 4 years by spreading the first year of study over 2 years, including some foundational modules and mainstream programme modules.

The foundation modules in the first year of study will help students improve their Mathematics, Physics, Chemistry, and Drawing competency. In the second year of study, the students will augment their foundation knowledge of these modules

(Mathematics, Physics, Chemistry, and Drawing) to reach the level of the mainstream programme.

All modules are compulsory, unless otherwise specified.

DE0801: EXTENDED DIPLOMA IN CHEMICAL ENGINEERING

YEAR 1 (POS 0)

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AAXCH1A	Foundation Chemistry 1	10 F	AAXCH2A	Foundation Chemistry 2	10 F
AMXMA1A	Foundation Mathematics 1	10 F	AMXMA2A	Foundation Mathematics 2	10 F
APXPH1A	Foundation Physics 1	10 F	APXPH2A	Foundation Physics 2	10 F
ASICT1A	ICT Skills 1	10	EHSPA1A	Safety Principles and Law 1	5
EEESK1A	Engineering Skills 1	5	EMXDR1A	Foundation Drawing 1	10 F
EESIN1A	Social Intelligence 1	3	HKCOY1A	Applied Communication Skills 1.2	8
HKCOX1A	Applied Communication Skills 1.1	8			

YEAR 2 (POS 1)

SEMESTER 1			SEMESTER 2		
AAECH1B	Engineering Chemistry 1 Prerequisite: AAXCH1A & AAXCH2A	10	AAECH2A	Engineering Chemistry 2 Prerequisite: AAECH1B	10
AMMAT1B	Mathematics 1 Prerequisite: AMXMA1A & AMXMA2A	10	AMMAT2A	Mathematics 2 Prerequisite: AMMAT1B	10
APHYS1B	Physics 1 Prerequisite: APXPH1A & APXPH2A	10	APHYP2A	Physics 2 (Practical) Prerequisite: APHYS1B	5
EHITC1B	Intro to Chemical Engineering 1	12	APHYT2A	Physics 2 (Theory) Prerequisite: APHYS1B	5
			EMEDR1B	Engineering Drawing 1 Prerequisite: EMXDR1A	10

YEAR 3 (POS 2)

SEMESTER 1			SEMESTER 2		
AAECH3A	Engineering Chemistry 3 Prerequisite: AAECH2A	10	EHCEL1A	Chemical Engineering Laboratory 1 Prerequisite: EHMEB2A	12
AMMAT3A	Mathematics 3 Prerequisite: AMMAT2A	10	EHCET2A	Chemical Engineering Thermodynamics 1 Prerequisite: AAECH2A	12
BHMAN1A	Management 1	10	EHCOA2A	Computing Applications 2 Prerequisite: ASICT1A	7
EHCPI1A	Chemical Process Industries 1	12	EHHMT2A	Heat and Mass Transfer 1 Prerequisite: AMMAT2A	12
EHMEB2A	Material and Energy Balance 2 Prerequisite: EHITC1B	12	EHPCO2A	Process Control 1 Prerequisite: AMMAT3A	12
EHMOP1A	Mechanical Operation 1	12	EHPFD2A	Process Fluid Dynamics 1 Prerequisite: APHYT2A	12
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A & HKCOY1A	8	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A & HKCOY1A	8

YEAR 4 (POS 3)

SEMESTER 1			SEMESTER 2 (WPBL Placement)		
EHATH3A	Applied Thermodynamics 2	12	EHEXL1A	Experiential Learning 1 (Chemical)	60
EHCEL2A	Chemical Engineering Laboratory 2 Prerequisite: EHCEL1A	12			
EHCPR3A	Chemical Process Design Prerequisite: EHCPI1A & EHMEB2A	12			
EHENE1A	Environmental Engineering 1	12			
EHRTE3A	Reactor Technology 1 Prerequisite: EHMEB2A	12			
EHSEP3A	Separation Processes 1 Prerequisite: EHHMT2A & EHMEB2A	12			

DE0811: EXTENDED DIPLOMA IN CIVIL ENGINEERING

YEAR 1 (POS 0)

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AAXCH1A	Foundation Chemistry 1	10 F	AAXCH2A	Foundation Chemistry 2	10 F
AMXMA1A	Foundation Mathematics 1	10 F	AMXMA2A	Foundation Mathematics 2	10 F
APXPH1A	Foundation Physics 1	10 F	APXPH2A	Foundation Physics 2	10 F
ASICT1A	ICT Skills 1	10	ECCOA2A	Computing Applications 2	7
EEESK1A	Engineering Skills 1	5	ECSPA1A	Safety Principles and Law 1	5
EESIN1A	Social Intelligence 1	3	EMXDR1A	Foundation Drawing 1	10 F
HKCOX1A	Applied Communication Skills 1.1	8	HKCOY1A	Applied Communication Skills 1.2	8

YEAR 2 (POS 1)

SEMESTER 1			SEMESTER 2		
AAECH1B	Engineering Chemistry 1 Prerequisite: AAXCH1A & AAXCH2A	10	AAECH2A	Engineering Chemistry 2 Prerequisite: AAECH1B	10
AMMAT1B	Mathematics 1 Prerequisite: AMXMA1A & AMXMA2A	10	AMMAT2A	Mathematics 2 Prerequisite: AMMAT1B	10
APHYS1B	Physics 1 Prerequisite: APXPH1A & APXPH2A	10	APHYP2A	Physics 2 (Practical) Prerequisite: APHYS1B	5
ECEDR1B	Engineering Drawing 1 Prerequisite: EMXDR1A	10	APHYT2A	Physics 2 (Theory) Prerequisite: APHYS1B	5
			ECAME1B	Applied Mechanics 1 Prerequisite: AMMAT1B & APXPH2A	10

YEAR 3 (POS 2)

SEMESTER 1			SEMESTER 2		
ECCOM1A	Construction Materials 1	5	ECCEM1A	Civil Engineering Management 1 Prerequisite: ECCOS1A	10
ECCOS1A	Construction Methods 1	10	ECCOM2A	Construction Materials 2 Prerequisite: ECCOM1A	5
ECEDR2A	Engineering Drawing 2 Prerequisite: ECEDR1B	10	ECEOS2A	Elements of Structural Steel and Timber Design 2 Prerequisite: ECTST2A	10
ECESU1A	Engineering Surveying 1	10	ECESU2A	Engineering Surveying 2 Prerequisite: ECEDR2A& ECESU1A	10
ECSME1A	Soil Mechanics 1	5	ECSAN3A	Structural Analysis 3 Prerequisite: AMMAT2A & ECTST2A	10
ECTST2A	Theory of Structures 2 Prerequisite: APHYP2A & APHYT2A & ECAME1B	10	ECTEN1A	Transportation Engineering 1 Prerequisite: AMMAT1B & ECESU1A	10
EYEGE1A	Engineering Geology 1	10	ECWEN1A	Water Engineering 1 Prerequisite: AAECH1B & AAECH2A & AMMAT1B	10
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A & HKCOY1A	8	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A & HKCOY1A	8

YEAR 4 (POS 3)

SEMESTER 1			SEMESTER 2 (WPBL Placement)		
ECCEM2A	Civil Engineering Management 2 Prerequisite: ECCEM1A & ECCOM2A & ECCOS1A	10	ECEXL1A	Experiential Learning 1 (Civil) Prerequisite: All modules of year 1,2, 3 & competent in GA 1 to 11 (except GA 9 that is covered in WIL)	60
ECDOC1A	Documentation 1 Prerequisite: ECCEM1A & ECCOM2A & ECCOS1A & ECEDR2A	10			
ECEOR3A	Elements of Reinforced Concrete Masonry Design 3 Prerequisite: ECEOS2A	10			
ECFMC2A	Fluid Mechanics 2 (Civil) Prerequisite: AMMAT2A & APHYT2A	10			
ECSAN4A	Structural Analysis 4 Prerequisite: ECSAN3A	10			
ECSME2A	Soil Mechanics 2 Prerequisite: ECSME1A	10			
ECTEN2A	Transportation Engineering 2 Prerequisite: ECSME1A & ECTEN1A	10			

DE0831: EXTENDED DIPLOMA IN INDUSTRIAL ENGINEERING

YEAR 1 (POS 0)

SEMESTER 1

MODULE CODE	MODULE NAME	CREDIT
AAXCH1A	Foundation Chemistry 1	10 F
AMXMA1A	Foundation Mathematics 1	10 F
APXPH1A	Foundation Physics 1	10 F
ASICT1A	ICT Skills 1	10
EEESK1A	Engineering Skills 1	5
EESIN1A	Social Intelligence 1	3
HKCOX1A	Applied Communication Skills 1.1	8

SEMESTER 2

MODULE CODE	MODULE NAME	CREDIT
AAXCH2A	Foundation Chemistry 2	10 F
AMXMA2A	Foundation Mathematics 2	10 F
APXPH2A	Foundation Physics 2	10 F
EBCOA2A	Computing Applications 2	7
EBSPA1A	Safety Principles and Law 1	5
EMXDR1A	Foundation Drawing 1	10 F
HKCOY1A	Applied Communication Skills 1.2	8

YEAR 2 (POS 1)

SEMESTER 1

AAECH1B	Engineering Chemistry 1 Prerequisite: AAXCH1A & AAXCH2A	10
AMMAT1B	Mathematics 1 Prerequisite: AMXMA1A & AMXMA2A	10
APHYS1B	Physics 1 Prerequisite: APXPH1A & APXPH2A	10
EMMEC1B	Mechanics 1 Prerequisite: APXPH1A & APXPH2A	10

SEMESTER 2

AAECH2A	Engineering Chemistry 2 Prerequisite: AAECH1B	10
AMMAT2A	Mathematics 2 Prerequisite: AMMAT1B	10
APHYP2A	Physics 2 (Practical) Prerequisite: APHYS1B	5
APHYT2A	Physics 2 (Theory) Prerequisite: APHYS1B	5
EBMRE2A	Manufacturing Relations 2	10
EMEDR1B	Engineering Drawing 1 Prerequisite: EMXDR1A	10

YEAR 3 (POS 2)

SEMESTER 1

AMMAT3A	Mathematics 3 Prerequisite: AMMAT1B; AMMAT2A	10
EBEWS1A	Engineering Work Study 1	10
EBPEN1A	Production Engineering 1	10
EBQTE1A	Qualitative Techniques 1	10
EMMEN1A	Manufacturing Engineering 1 Prerequisite: EMEDR1B	10
EPEEN1A	Electrical Engineering 1	10
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A, HKCOY1A	8

SEMESTER 2

BACOS2A	Costing 2	10
EBEWS2A	Engineering Work Study 2 Prerequisite: EBEWS1A	10
EBFLA2A	Facility Layout and Material Handling 2	10
EBPEN2A	Production Engineering 2 Prerequisite: EBPEN1A	10
EBQAS2A	Quality Assurance 2 Prerequisite: EBQTE1A	10
EMMEN2A	Mechanical Manufacturing Engineering 2 Prerequisite: EMMEN1A	10
EMMAE1A	Maintenance Engineering 1 Prerequisite: EMEDR1B & EMMEN1A	10
HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A & HKCOY1A	8

YEAR 4 (POS 3)

SEMESTER 1

EBAUT3A	Automation 3 Prerequisite: EMMEN1A	10
EBEWS3A	Engineering Work Study 3	10
EBIAC3A	Industrial Accounting 3 Prerequisite: BACOS2A	10
EBILE3A	Industrial Leadership 3 Prerequisite: EBMRE2A	10
EBORE3A	Operations Research 3 Prerequisite: EBQAS2A	10

SEMESTER 2 (WPBL Placement)

EBWIL1A	Work Integrated Learning (Industrial)	60

DE0841: EXTENDED DIPLOMA IN MECHANICAL ENGINEERING

YEAR 1 (POS 0)

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AAXCH1A	Foundation Chemistry 1	10 F	AAXCH2A	Foundation Chemistry 2	10 F
AMXMA1A	Foundation Mathematics 1	10 F	AMXMA2A	Foundation Mathematics 2	10 F
APXPH1A	Foundation Physics 1	10 F	APXPH2A	Foundation Physics 2	10 F
ASICT1A	ICT Skills 1	10	EMCOA2A	Computing Applications 2	7
EEESK1A	Engineering Skills 1	5	EMSPA1A	Safety Principles and Law 1	5
EESIN1A	Social Intelligence 1	3	EMXDR1A	Foundation Drawing 1	10 F
HKCOX1A	Applied Communication Skills 1.1	8	HKCOY1A	Applied Communication Skills 1.2	8

YEAR 2 (POS 1)

SEMESTER 1			SEMESTER 2		
AAECH1B	Engineering Chemistry 1 Prerequisite: AAXCH1A & AAXCH2A	10	AAECH2A	Engineering Chemistry 2 Prerequisite: AAECH1B	10
AMMAT1B	Mathematics 1 Prerequisite: AMXMA1A & AMXMA2A	10	AMMAT2A	Mathematics 2 Prerequisite: AMMAT1B	10
APHYS1B	Physics 1 Prerequisite: APXPH1A & APXPH2A	10	APHYP2A	Physics 2 (Practical) Prerequisite: APHYS1B	5
EMMEC1B	Mechanics 1 Prerequisite: APXPH1A & APXPH2A	10	APHYT2A	Physics 2 (Theory) Prerequisite: APHYS1B	5
			EMEDR1B	Engineering Drawing 1 Prerequisite: EMXDR1A	10
			EMMAE1A	Maintenance Engineering 1	10

YEAR 3 (POS 2)

SEMESTER 1			SEMESTER 2		
AMMAT3A	Mathematics 3 Prerequisite: AMMAT2A	10	EMFME3A	Fluid Mechanics 3 Prerequisite: EMFMM2A	10
EMEDR2A	Engineering Drawing 2 Prerequisite: EMEDR1B	10	EMMAE2A	Maintenance Engineering 2 Prerequisite: EMMAE1A	10
EMFMM2A	Fluid Mechanics 2 (Mechanics) Prerequisite: EMMEC1B	10	EMMED2A	Mechanical Engineering Design 2 Prerequisite: EMEDR2A & EMMEC1B	10
EMMEN1A	Manufacturing Engineering 1 Prerequisite: EMEDR1B	10	EMMOM2A	Mechanics of Machines 2 Prerequisite: EMMEC1B	10
EMTHE2A	Thermodynamics 2 Prerequisite: EMMEC1B	10	EMSOM2A	Strength of Materials 2 Prerequisite: EMMEC1B	10
EPEEN1A	Electrical Engineering 1	10	EMTHE3A	Thermodynamics 3 Prerequisite: EMTHE2A	10
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A & HKCOY1A	8	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A & HKCOY1A	8

YEAR 4 (POS 3)

SEMESTER 1			SEMESTER 2 (WPBL Placement)		
EMAOM3A	Applied Strength of Materials 3 Prerequisite: EMSOM2A	10	EMWIL1A	Work Integrated Learning (Mechanical)	60
EMHYM3A	Hydraulic Machines 3 Prerequisite: EMFME3A	10			
EMMDE3A	Machine Design 3 Prerequisite: EMMED2A	10			
EMMOM3A	Mechanics of Machines 3 Prerequisite: EMMOM2A	10			
EMSOM3A	Strength of Materials 3 Prerequisite: EMSOM2A	10			
EMSPL3A	Steam Plant 3 Prerequisite: EMTHE3A	10			
EMTOM3A	Theory of Machines 3 Prerequisite: EMMOM2A	10			

DE0851: EXTENDED DIPLOMA IN METALLURGICAL ENGINEERING

YEAR 1 (POS 0)

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AAXCH1A	Foundation Chemistry 1	10 F	AAXCH2A	Foundation Chemistry 2	10 F
AMXMA1A	Foundation Mathematics 1	10 F	AMXMA2A	Foundation Mathematics 2	10 F
APXPH1A	Foundation Physics 1	10 F	APXPH2A	Foundation Physics 2	10 F
ASICT1A	ICT Skills 1	10	EMXDR1A	Foundation Drawing 1	10 F
EEESK1A	Engineering Skills 1	5	EYCOA2A	Computing Applications 2	7
EESIN1A	Social Intelligence 1	3	EYSPA1A	Safety Principles and Law 1	5
HKCOX1A	Applied Communication Skills 1.1	8	HKCOY1A	Applied Communication Skills 1.2	8

YEAR 2 (POS 1)

SEMESTER 1			SEMESTER 2		
AAECH1B	Engineering Chemistry 1 Prerequisite: AAXCH1A & AAXCH2A	10	AAECH2A	Engineering Chemistry 2 Prerequisite: AAECH1B	10
AMMAT1B	Mathematics 1 Prerequisite: AMXMA1A & AMXMA2A	10	AMMAT2A	Mathematics 2 Prerequisite: AMMAT1B	10
APHYS1B	Physics 1 Prerequisite: APXPH1A & APXPH2A	10	APHYP2A	Physics 2 (Practical) Prerequisite: APHYS1B	5
			APHYT2A	Physics 2 (Theory) Prerequisite: APHYS1B	5
			EMEDR1B	Engineering Drawing 1 Prerequisite: EMXDR1A	10

YEAR 3 (POS 2)

SEMESTER 1			SEMESTER 2		
EYEGE1A	Engineering Geology 1	10	EBQCO2A	Quality Control 2 Prerequisite: AMMAT2A	10
EYEME1A	Extractive Metallurgy 1	10	EYHYD2A	Hydrometallurgy 2 Prerequisite: AAECH1B, EYEME1A	10
EYMAM1A	Manufacturing Metallurgy 1 Prerequisite: APHYS1B	10	EYMAM2A	Manufacturing Metallurgy 2 Prerequisite: EYMAM1A	10
EYMPR1A	Mineral Processing 1	10	EYMPR2A	Mineral Processing 2 Prerequisite: EYMPR1A	10
EYPME1A	Physical Metallurgy 1 Prerequisite: APHYS1B	10	EYPME2A	Physical Metallurgy 2 Prerequisite: EYPME1A	10
EYPTH1A	Process Thermodynamics 1 Prerequisite: AAECH2A	10	EYPYR2A	Pyrometallurgy 2 Prerequisite: EYEME1A	10
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A, HKCOY1A	8	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A, HKCOY1A	8

YEAR 4 (POS 3)

SEMESTER 1			SEMESTER 2 (WPBL Placement)		
BHMAN1A	Management 1	10	EYWIL1A	Work Integrated Learning (Metallurgy)	60
EYENC1A	Environmental Chemistry 1 Prerequisite: AAECH2A, EYEGE1A	8			
EYHYD3A	Hydrometallurgy 3 Prerequisite: EYHYD2A	10			
EYMAM3A	Manufacturing Metallurgy 3 Prerequisite: EYMAM2A	10			
EYMPR3A	Mineral Processing 3 Prerequisite: EYMPR2A	10			
EYPME3A	Physical Metallurgy 3 Prerequisite: EYPME1A, EYPME2A	10			
EYPYR3A	Pyrometallurgy 3 Prerequisite: EYPYR2A	10			

DE0862: EXTENDED DIPLOMA IN ELECTRICAL ENGINEERING: COMPUTER SYSTEMS ENGINEERING

YEAR 1 (POS 0)

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AAXCH1A	Foundation Chemistry 1	10 F	AAXCH2A	Foundation Chemistry 2	10 F
AMXMA1A	Foundation Mathematics 1	10 F	AMXMA2A	Foundation Mathematics 2	10 F
APXPH1A	Foundation Physics 1	10 F	APXPH2A	Foundation Physics 2	10 F
ASICT1A	ICT Skills 1	10	EESPA1A	Safety Principles and Law 1	5
EEESK1A	Engineering Skills 1	5	EICOA2A	Computing Applications 2 Prerequisite: ASICT1A	7
EESIN1A	Social Intelligence 1	3	HKCOY1A	Applied Communication Skills 1.2	8
HKCOX1A	Applied Communication Skills 1.1	8			

YEAR 2 (POS 1)

SEMESTER 1			SEMESTER 2		
AMMAT1B	Mathematics 1 Prerequisite: AMXMA1A & AMXMA2A	10	AMMAT2A	Mathematics 2 Prerequisite: AMMAT1B	10
APHYS1B	Physics 1 Prerequisite: APXPH1A & APXPH2A	10	APHYP2A	Physics 2 (Practical) Prerequisite: APHYS1B	5
EPEEN1A	Electrical Engineering 1	10	APHYT2A	Physics 2 (Theory) Prerequisite: APHYS1B	5
			EIDSY1A	Digital Systems 1 Prerequisite AMMAT1B, EPEEN1A	10
			EPEEN2A	Electrical Engineering 2 Prerequisite: EPEEN1A	10

YEAR 3 (POS 2)

SEMESTER 1			SEMESTER 2		
EEELE1A	Electronics 1 Prerequisite EPEEN1A	10	EEELE2A	Electronics 2 Prerequisite: EEELE1A	10
EIDSY2A	Digital Systems 2 Prerequisite: EIDSY1A	10	EIDSY3A	Digital Systems 3 Prerequisite: EIDSY1A, EIDSY2A	10
EIENP1A	Engineering Programming 1 Prerequisite: EICOA2A	10	EIENP2A	Engineering Programming 2 Prerequisite: EIENP1A	10
EINET1A	Networks 1 Prerequisite: EIDSY1A	10	EINET2A	Networks 2 Prerequisite: EINET1A	10
EIOSY1A	Operating Systems 1 Prerequisite: ASICT1A	10	EIOSY2A	Operating Systems 2 Prerequisite: EIOSY1A	10
EISEN1A	Software Engineering 1 Prerequisite: EICOA2A	10	EISEN2A	Software Engineering 2 Prerequisite: EISEN1A	10
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A, HKCOY1A	8	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A, HKCOY1A	8

YEAR 4 (POS 3)

SEMESTER 1			SEMESTER 2 (WPBL Placement)		
AMMAT3A	Mathematics 3 Prerequisite: AMMAT1B, AMMAT2A	10	EIEXC1A	Experiential Learning 1A Prerequisite: All modules of year 1,2, 3	14
EIDSY4A	Digital Systems 4 Prerequisite: EIDSY2A, EIDSY3A	10	EIEXC2A	Experiential Learning 1B Prerequisite: All modules of year 1,2, 3	16
EIENP3A	Engineering Programming 3 Prerequisite: EIENP1A, EIENP2A	10	EIPRC4A	Engineering Project 4 Prerequisite: All modules of year 1,2, 3	30
EINET3A	Networks 3 Prerequisite: EINET1A, EINET2A	10			
EIOSY3A	Operating Systems 3 Prerequisite: EIOSY1A, EIOSY2A	10			
EISEN3A	Software Engineering 3 Prerequisite: EISEN1A, EISEN2A	10			

DE0863: EXTENDED DIPLOMA IN ELECTRICAL ENGINEERING: ELECTRONIC ENGINEERING

YEAR 1 (POS 0)

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AAXCH1A	Foundation Chemistry 1	10 F	AAXCH2A	Foundation Chemistry 2	10 F
AMXMA1A	Foundation Mathematics 1	10 F	AMXMA2A	Foundation Mathematics 2	10 F
APXPH1A	Foundation Physics 1	10 F	APXPH2A	Foundation Physics 2	10 F
ASICT1A	ICT Skills 1	10	EECOA2A	Computing Applications 2	7
EEESK1A	Engineering Skills 1	5	EESPA1A	Safety Principles and Law 1	5
EESIN1A	Social Intelligence 1	3	EEWPR1A	Projects 1 (WIL -Electrical)	7
HKCOX1A	Applied Communication Skills 1.1	8	HKCOY1A	Applied Communication Skills 1.2	8

YEAR 2 (POS 1)

SEMESTER 1			SEMESTER 2		
AMMAT1B	Mathematics 1 Prerequisite: AMXMA1A & AMXMA2A	10	AMMAT2A	Mathematics 2 Prerequisite: AMMAT1B	10
APHYS1B	Physics 1 Prerequisite: APXPH1A & APXPH2A	10	EEELE1A	Electronics 1 Prerequisite: EPEEN1A	10
EPEEN1A	Electrical Engineering 1	10	EIDSY1A	Digital Systems 1 Prerequisite: EPEEN1A	10
			EPEEN2A	Electrical Engineering 2 Prerequisite: EPEEN1A	10

YEAR 3 (POS 2**)**

SEMESTER 1			SEMESTER 2		
AMMAT3A	Mathematics 3 Prerequisite: AMMAT1B, AMMAT2A	10	EECAD2A	Electrical CAD 2 Prerequisite: EECAD1A	10
EECAD1A	Electrical Computer-Aided Design 1 Prerequisite: EEELE1A	10	EEDCO2A	Digital Communication 2 Prerequisite: AMMAT3A, EEECO2A	10
EEECO2A	Electronic Communication 2 Prerequisite: APHYS1B, EEELE1A, EPEEN1A	10	EEELE3A	Electronics 3 Prerequisite: EEELE1A, EEELE2A	10
EEELE2A	Electronics 2 Prerequisite: EEELE1A	10	EEMET3A	Measurement Technology 3 Prerequisite: EEELE1A, EPEEN2A	10
EEWPR2A	Projects 2 (WIL -Electrical) Prerequisite: EEWPR1A	7	EEPEL3A	Power Electronics 3 Prerequisite: EIDSY1A, EEELE2A	10
EIDSY2A	Digital Systems 2 Prerequisite: EIDSY1A	10	EEWPR3A	Projects 3 (WIL -Electrical) Prerequisite: EEWPR1A, EEWPR2A	8
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A, HKCOY1A	8	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A, HKCOY1A	8

YEAR 4 (POS 3)

SEMESTER 1			SEMESTER 2 (WPBL Placement)		
EEMIC3A	Microwave Communication 3 Prerequisite: EEECO2A, EEELE3A	10	EEEXL1A	Experiential Learning 1 Prerequisite: All modules of year 1,2, 3	14
EEOEL3A	Opto-Electronics 3 Prerequisite: EEECO2A, EEELE3A	10	EEEXL2A	Experiential Learning 2 Prerequisite: All modules of year 1,2, 3	16
EERAD3A	Radio Engineering 3 Prerequisite: EEECO2A, EEELE3A	10	EEPRJ4A	Engineering Project 4 Prerequisite: All modules of year 1,2, 3	30
EETXR3A	Transmission 3 (Radio Frequency) Prerequisite: EEECO2A, EEELE3A	10			
EEWPR4A	Projects 4 (WIL -Electrical) Prerequisite: EEWPR2A, EEWPR3A	8			

DE0864: EXTENDED DIPLOMA IN ELECTRICAL ENGINEERING: POWER ENGINEERING

YEAR 1 (POS 0)

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AAXCH1A	Foundation Chemistry 1	10 F	AAXCH2A	Foundation Chemistry 2	10 F
AMXMA1A	Foundation Mathematics 1	10 F	AMXMA2A	Foundation Mathematics 2	10 F
APXPH1A	Foundation Physics 1	10 F	APXPH2A	Foundation Physics 2	10 F
ASICT1A	ICT Skills 1	10	EPCOA2A	Computing Applications 2	7
EEESK1A	Engineering Skills 1	5	EESPA1A	Safety Principles and Law 1	5
EESIN1A	Social Intelligence 1	3	HKCOY1A	Applied Communication Skills 1.2	8
HKCOX1A	Applied Communication Skills 1.1	8			

YEAR 2 (POS 1)

SEMESTER 1			SEMESTER 2		
AMMAT1B	Mathematics 1 Prerequisite: AMXMA1A & AMXMA2A	10	AMMAT2A	Mathematics 2 Prerequisite: AMMAT1B	10
APHYS1B	Physics 1 Prerequisite: APXPH1A & APXPH2A	10	EEELE1A	Electronics 1 Prerequisite: EPEEN1A	10
EPEEN1A	Electrical Engineering 1	10	EIDSY1A	Digital Systems 1 Prerequisite: AMMAT1B, EPEEN1A	10
			EPEEN2A	Electrical Engineering 2 Prerequisite: EPEEN1A	10

YEAR 3 (POS 2)

SEMESTER 1			SEMESTER 2		
AMMAT3A	Mathematics 3 Prerequisite: AMMAT1B, AMMAT2A	10	EEPEL3A	Power Electronics 3 Prerequisite: EIDSY1A, EEELE2A	10
BHMAN1A	Management 1	10	EPAEN2A	Alternative Energy 2 (Power) Prerequisite: EEELE2A, EPEEN1A, EPEEN2A	10
EEELE2A	Electronics 2 Prerequisite: EEELE1A	10	EPEEN4A	Electrical Engineering 4 Prerequisite: EPEEN3A	10
EPEEN3A	Electrical Engineering 3 Prerequisite: EPEEN1A, EPEEN2A	10	EPEMA3A	Electrical Machines 3 Prerequisite: EPEMA2A	10
EPEMA2A	Electrical Machines 2 Prerequisite: EPEEN1A, EPEEN2A	10	EPSYS3A	Power Systems 3 Prerequisite: EPSYS2A	10
EPSYS2A	Power Systems 2 Prerequisite: EPEEN2A	10	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A, HKCOY1A	8
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A, HKCOY1A	8			

YEAR 4 (POS 3)

SEMESTER 1			SEMESTER 2 (WPBL Placement)		
EEPEL4A	Power Electronics 4	10	EPEXL1A	Experiential Learning 1A Prerequisite: All modules of year 1,2, 3	14
EPAEN3A	Alternative Energy 3 (Power) Prerequisite: EPAEN2A	10	EPEXL2A	Experiential Learning 1B Prerequisite: All modules of year 1,2, 3	16
EPEMA4A	Electrical Machines 4 Prerequisite: EPEMA2A, EPEMA3A	10	EPPRJ4A	Engineering Project 4 Prerequisite: All modules of year 1,2, 3	30
EPEMN2A	Energy Management 2 Prerequisite: EPAEN2A, EPEEN2A, EPSYS2A	10			
EPEPR3A	Electrical Protection 3 Prerequisite: EPEEN3A, EPEMA3A	10			
EPTXP3A	Transmission 3 (Power) Prerequisite: EPSYS2A, EPSYS3A	10			

DE0865: EXTENDED DIPLOMA IN ELECTRICAL ENGINEERING: PROCESS CONTROL ENGINEERING

YEAR 1 (POS 0)

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AAXCH1A	Foundation Chemistry 1	10 F	AAXCH2A	Foundation Chemistry 2	10 F
AMXMA1A	Foundation Mathematics 1	10 F	AMXMA2A	Foundation Mathematics 2	10 F
APXPH1A	Foundation Physics 1	10 F	APXPH2A	Foundation Physics 2	10 F
ASICT1A	ICT Skills 1	10	EICOA2A	Computing Applications 2	7
EEESK1A	Engineering Skills 1	5	EESPA1A	Safety Principles and Law 1	5
EESIN1A	Social Intelligence 1	3	HKCOY1A	Applied Communication Skills 1.2	8
HKCOX1A	Applied Communication Skills 1.1	8			

YEAR 2 (POS 1)

SEMESTER 1			SEMESTER 2		
AMMAT1B	Mathematics 1 Prerequisite: AMXMA1A & AMXMA2A	10	AMMAT2A	Mathematics 2 Prerequisite: AMMAT1B	10
APHYS1B	Physics 1 Prerequisite: APXPH1A & APXPH2A	10	APHYP2A	Physics 2 (Practical) Prerequisite: APHYS1B	5
EPEEN1A	Electrical Engineering 1	10	APHYT2A	Physics 2 (Theory) Prerequisite: APHYS1B	5
			EIDSY1A	Digital Systems 1 Prerequisite: AMMAT1B, EPEEN1A	10
			EIPRI1A	Process Instrumentation 1 Prerequisite: APHYS1A	10

YEAR 3 (POS 2)

SEMESTER 1			SEMESTER 2		
AMMAT3A	Mathematics 3 Prerequisite: AMMAT1B, AMMAT2A	10	EEELE2A	Electronics 2 Prerequisite: EEELE1A	10
EEELE1A	Electronics 1 Prerequisite: EPEEN1A	10	EIDCS1A	Digital Control Systems 1 Prerequisite: EINET1A	10
EIENP1A	Engineering Programming 1 Prerequisite: EICOA2A	10	EIDSY2A	Digital Systems 2 Prerequisite: EIDSY1A	10
EINET1A	Networks 1 Prerequisite: EIDSY1A	10	EIENP2A	Engineering Programming 2 Prerequisite: EIENP1A	10
EIPRI2A	Process Instrumentation 2 Prerequisite: EIPRI1A	10	EINET2A	Networks 2 Prerequisite: EINET1A	10
EPEEN2A	Electrical Engineering 2 Prerequisite: EPEEN1A	10	EIPRI3A	Process Instrumentation 3 Prerequisite: EIPRI1A, EIPRI2A	10
HKCOX2A	Applied Communication Skills 2.1 Prerequisite: HKCOX1A, HKCOY1A	8	HKCOY2A	Applied Communication Skills 2.2 Prerequisite: HKCOX1A, HKCOY1A	8

YEAR 4 (POS 3)

SEMESTER 1			SEMESTER 2 (WPBL Placement)		
EEPEL3A	Power Electronics 3 Prerequisite: EEELE2A, EIDSY1A	10	EIEXL1A	Experiential Learning Prerequisite: All modules of year 1,2, 3	14
EICSY2A	Control Systems 2 Prerequisite: AMMAT3A, EICOA2A	10	EIEXL2A	Experiential Learning 2 Prerequisite: All modules of year 1,2, 3	16
EIDCS2A	Digital Control Systems 2 Prerequisite: EIDCS1A	10	EIPRJ4A	Engineering Project 4 Prerequisite: All modules of year 1,2, 3	30
EIDSY3A	Digital Systems 3 Prerequisite: EIDSY1A, EIDSY2A	10			
EIENP3A	Engineering Programming 3 Prerequisite: EIENP1A, EIENP2A	10			
EINET3A	Networks 3 Prerequisite: EINET1A, EINET2A	10			

11.3 ADVANCED DIPLOMA

AD0400: ADVANCED DIPLOMA IN OPERATIONS MANAGEMENT

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
EBMAS4A	Manufacturing Systems	20	EBFIM4A	Financial Management	20
EBQMA4A	Quality Management	20	EBMOM4A	Modelling in Operations Management	20
EBRMO4A	Research Methodology for Operations Management	20	EBSCM4A	Supply Chain Management	20

AD0800: ADVANCED DIPLOMA IN CHEMICAL ENGINEERING

YEAR MODULES		
MODULE CODE	MODULE NAME	CREDIT
EHAPD4A	Advanced Process Design	30
EHRMP4A	Research Methodology and Project	28

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
EHAEM4A	Advanced Engineering Mathematics	12	EHAPC4A	Advanced Process Control	12
EHARE4A	Advanced Reaction Engineering	12	EHCEL4A	Chemical Engineering Laboratory	8
EHFLM4A	Advanced Fluid Mechanics	12	EHHMY4A	Advanced Heat, Mass Transfer and Separation: Mod 2	11
EHHMX4A	Advanced Heat, Mass Transfer and Separation: Mod 1	10	EHMAN4A	Engineering Management	7

AD0810: ADVANCED DIPLOMA IN CIVIL ENGINEERING

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
ECENS4A	Environmental Studies	10	ECBDC4A	Business Development in the Civil Engineering Environment	10
ECHTE4A	Highway and Traffic Engineering	10	ECEDE4A	Earthworks Design	10
ECMAT4A	Civil Engineering Materials	10	ECMTT4A	Management Tools and Techniques	10
ECREM4A	Civil Engineering Research Methodology	15	ECRED4A	Reticulation Design	10
ECSTR4A	Structural Analysis	10	ECREP4A	Civil Engineering Research Project Prerequisite: ECREM4A	15
ECWWE4A	Water and Wastewater Engineering	10	ECRWE4A	Railway Engineering	10
			ECSRD4A	Steel and Reinforced Concrete Design	10

AD0822: ADVANCED DIPLOMA IN ELECTRICAL ENGINEERING: COMPUTER SYSTEMS ENGINEERING

YEAR MODULE		
MODULE CODE	MODULE NAME	CREDIT
EIPRE4A	Electrical Engineering Project	25

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
EIDBP4A	Database Programming	20	AMAEM4A	Advanced Engineering Mathematics	15
EIMSD4A	Micro Systems Design Prerequisite: EIDSY3A	20	BHEMN4A	Engineering Management	10
EIREM4A	Engineering Research Methods	15	EIDBA4A	Database Administration	20
			EIINT4A	Industrial Network Systems	20

AD0823: ADVANCED DIPLOMA IN ELECTRICAL ENGINEERING: ELECTRONIC ENGINEERING

YEAR MODULE		
MODULE CODE	MODULE NAME	CREDIT
EEPRO4A	Electrical Engineering Project (Electronic)	25

SEMESTER 1		
MODULE CODE	MODULE NAME	CREDIT
EIREM4A	Engineering Research Methods (Electronic)	15
EEAEL4A	Electronics	20
EERAD4A	Radio Engineering Prerequisite: EERAD3A	20

SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT
AMAEM4A	Advanced Engineering Mathematics Prerequisite: AMMAT3A	15
BHEMN4A	Engineering Management	10
EEAMI4A	Microwave Engineering Prerequisite: EEMIC3A	20
EEAOE4A	Opto-Electronics	20

AD0824: ADVANCED DIPLOMA IN ELECTRICAL ENGINEERING: POWER ENGINEERING

YEAR MODULE		
MODULE CODE	MODULE NAME	CREDIT
EPPRO4A	Electrical Engineering Project	25

SEMESTER 1		
MODULE CODE	MODULE NAME	CREDIT
EIREM4A	Engineering Research Methods	15
EPELP4A	Electrical Protection Prerequisite: EPEPR3A	20
EPHVE4A	High Voltage Engineering	20

SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT
AMAEM4A	Advanced Engineering Mathematics Prerequisite: AMMAT3A	15
BHEMN4A	Engineering Management	10
EEPOW4A	Power Electronics Prerequisite: EEPEL4A	20
EPEPS4A	Electrical Power Systems Prerequisite: EPSYS3A, EPEEN4A	20

AD0825: ADVANCED DIPLOMA IN ELECTRICAL ENGINEERING: PROCESS CONTROL ENGINEERING

YEAR MODULE		
MODULE CODE	MODULE NAME	CREDIT
EIPRI4A	Electrical Engineering Project	25

SEMESTER 1		
MODULE CODE	MODULE NAME	CREDIT
EIDSP4A	Digital Signal Processing Prerequisite: AMMAT3A	20
EIPRI4A	Process Instrumentation Prerequisite: EIPRI3A	20
EIREM4A	Engineering Research Methods	15

SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT
AMAEM4A	Advanced Engineering Mathematics Prerequisite: AMMAT3A	15
BHEMN4A	Engineering Management	10
EIDCS4A	Digital Control Systems Prerequisite: AMMAT3A	20
EIINT4A	Industrial Network Systems	20

AD0830: ADVANCED DIPLOMA IN INDUSTRIAL ENGINEERING

SEMESTER 1		
MODULE CODE	MODULE NAME	CREDIT
EBMPS4A	Manufacturing and Production Science	20
EBQCI4A	Quality Control and Improvement	20
EBRMI4A	Research Methods and Industrial Engineering Project	20

SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT
EBFPD4A	Facility Planning and Design	20
EBMOS4A	Modelling and Simulation	20
EBHFE4A	Human Factors and Ergonomics	20
EBIEM4A	Industrial Engineering Management	20

AD0840: ADVANCED DIPLOMA IN MECHANICAL ENGINEERING

YEAR MODULE		
MODULE CODE	MODULE NAME	CREDIT
EMRMD4A	Research Methods and Engineering Design Project	30

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AMMAT4B	Applied Engineering Mathematics	15	EMHMT4A	Heat and Mass Transfer	15
EMECN4A	Engineering Economics	10	EMSMS4A	Solid Mechanics and Stress Analysis	15
EMEPR4A	Engineering Professionalism	10	EMTFM4A	Thermo-Fluids and Turbo Machinery	15
EMMTS4A	Material Science	15	EMVCE4A	Vibration and Control Engineering	15

AD0850: ADVANCED DIPLOMA IN METALLURGICAL ENGINEERING

YEAR MODULES		
MODULE CODE	MODULE NAME	CREDIT
EYHYD4A	Hydrometallurgy 4	20
EYMAM4A	Manufacturing Metallurgy 4	20
EYMIP4A	Mineral Processing 4	20
EYPME4A	Physical Metallurgy 4	20
EYPRO4A	Metallurgical Research Methods and Project 4	20
EYPYR4A	Pyrometallurgy 4	20

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AMMAT3A	Mathematics 3	10	EBQCO3A	Quality Control 3	10

11.4 POSTGRADUATE DIPLOMA

PG0400: POSTGRADUATE DIPLOMA IN OPERATIONS MANAGEMENT

YEAR MODULES		
MODULE CODE	MODULE NAME	CREDIT
EBOPI5A	Operations Management Project Design and Implementation	30
EBOPP5A	Operations Management Project Planning and Design	30

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
EBAMO5A	Advanced Modelling in Operations Management	20	EBAIM5A	Advanced Industrial Management	20
			EBAMA5A	Advanced Manufacturing Systems	20

PG0800: POSTGRADUATE DIPLOMA IN CHEMICAL ENGINEERING

YEAR MODULE		
MODULE CODE	MODULE NAME	CREDIT
EHPRM5A	Research Project	40

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
EHPDX5A	Chemical Process Design I (Chemical Eng)	15	EHPDY5A	Chemical Process Design II (Chemical Eng)	15
EHPEX5A	Environmental Engineering I (Chemical Eng)	15	EHPEY5A	Environmental Engineering II (Chemical Eng)	15
EHBIX5A	Bioprocess Engineering I	10	EHBIY5A	Bioprocess Engineering II	10

PG0810: POSTGRADUATE DIPLOMA IN CIVIL ENGINEERING

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
ECEEN5A	Environmental Engineering	10	ECRPY5A	Research Project in Civil Engineering (Module 2) Prerequisite: ECRPX5A	25
ECGTE5A	Geotechnical Engineering	20	ECSTE5A	Structural Engineering	20
ECPMC5A	Project and Construction Management	10	ECTEN5A	Transportation Engineering	20
ECRPX5A	Research Project in Civil Engineering (Module 1)	15	ECWEN5A	Water Engineering	20

PG0821: POSTGRADUATE DIPLOMA IN ELECTRICAL ENGINEERING: ALTERNATIVE ENERGY

(STARTING IN 2027)

YEAR MODULE		
MODULE CODE	MODULE NAME	CREDIT
EAERP5A	Engineering Research Project	30

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
EERST5A	Research Statistics	15	EEAEF5A	Alternative Energy Feasibility	25
EAAMT5A	Advanced Measurement Technology	25	EEEMA5A	Energy Management	25
EEFMA5A	Energy Efficiency Management	25			

PG0822: POSTGRADUATE DIPLOMA IN ELECTRICAL ENGINEERING: COMPUTER SYSTEMS ENGINEERING

(STARTING IN 2027)

YEAR MODULE		
MODULE CODE	MODULE NAME	CREDIT
EISRP5A	Engineering Research Project	30

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
EERST5A	Research Statistics	15	EISIS5A	Intelligent Systems	25
EISSS5A	Computer Systems Security	25	EISES5A	Emerging Systems	25

PG0823: POSTGRADUATE DIPLOMA IN ELECTRICAL ENGINEERING: ELECTRONIC ENGINEERING

(STARTING IN 2027)

YEAR MODULE		
MODULE CODE	MODULE NAME	CREDIT
EEERP5A	Engineering Research Project	30

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
EERST5A	Research Statistics	15	EEAEF5A	Alternative Energy Feasibility	25
EAAMT5A	Advanced Measurement Technology	25	EEEMA5A	Energy Management	25

PG0824: POSTGRADUATE DIPLOMA IN ELECTRICAL ENGINEERING: POWER ENGINEERING

YEAR MODULE		
MODULE CODE	MODULE NAME	CREDIT
EPERP5A	Engineering Research Project	30

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
EERST5A	Research Statistics	15	EEAEF5A	Alternative Energy Feasibility	25
EEPOS5A	Power Systems	25	EEEMA5A	Energy Management	25

PG0825: POSTGRADUATE DIPLOMA IN ELECTRICAL ENGINEERING: PROCESS CONTROL AND INSTRUMENTATION ENGINEERING

(STARTING IN 2027)

YEAR MODULE		
MODULE CODE	MODULE NAME	CREDIT
EICRP5A	Engineering Research Project	30

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
EICPI5A	Advanced Process Instrumentation Systems	25	EICSD5A	Process Control System Design and Development	25
EICDD5A	Advanced DCS and Safety Systems Engineering	25	EICNC5A	Smart Industrial Network Control	25

PG0830: POSTGRADUATE DIPLOMA IN INDUSTRIAL ENGINEERING

YEAR MODULES		
MODULE CODE	MODULE NAME	CREDIT
EBIPI5A	Industrial Engineering Project Design and Implementation	30
EBIPP5A	Industrial Engineering Project Planning and Design	30

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
EBADA5A	Advanced Decision Analysis	20	EBMPE5A	Manufacturing and Production Engineering	20
EBAMS5A	Advanced Modelling and Simulation	20	EBPRE5A	Project Engineering	20

PG0840: POSTGRADUATE DIPLOMA IN MECHANICAL ENGINEERING

YEAR MODULE		
MODULE CODE	MODULE NAME	CREDIT
EMARM5A	Applied Research Methodology in Mechanical Engineering	30

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
AMMAT5B	Advanced Engineering Mathematics	15	EMCME5A	Continuum Mechanics	15
EMEMX5A	Engineering Modelling and Simulations Module 1	15	EMEMY5A	Engineering Modelling and Simulations Module 2	15
EMMAM5A	Maintenance Management	7	EMENS5A	Energy Systems	15
			EMPME5A	Production and Manufacturing	8

PG0850: POSTGRADUATE DIPLOMA IN METALLURGICAL ENGINEERING

*Group A and B are different specialization fields. A choice must be made between either Group A or B for the year.

YEAR MODULES		
MODULE CODE	MODULE NAME	CREDIT
EYMAS5A	Advanced Modelling and Simulation	20
	Group A (Physical Metallurgy)	
EYMAE5A	Materials Engineering	20
EYMAM5A	Manufacturing Metallurgy	20
EYPME5A	Physical Metallurgy	20
EYMRP5A	Physical Metallurgy Research Project	30
	Group B (Extractive Metallurgy)	
EYHYD5A	Hydrometallurgy	20
EYMIP5A	Mineral Processing	20
EYMRE5A	Extractive Metallurgy Research Project	30
EYPYR5A	Pyrometallurgy	20

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
EYMKR5A	Corrosion Engineering	10	EYHMT5A	Heat and Mass Transfer	10
EYPTH5A	Process Thermodynamics	10			

11.5 MASTER DEGREE

MP0823: MENG: ENERGY EFFICIENCY

YEAR MODULE		
MODULE CODE	MODULE NAME	CREDIT
EERPE6A/ EPRPE6A	Research Project	90

SEMESTER 1			SEMESTER 2		
MODULE CODE	MODULE NAME	CREDIT	MODULE CODE	MODULE NAME	CREDIT
EEACC6A	Energy Accounting & Economics	20	EERNE6A	Renewable Energy	25
EPPEM6A	Process Energy Management	25	EPESS6A	Electrical Systems	20

12. SYLLABI (MODULE CONTENT)

12.1 DIPLOMA MODULES: ALPHABETICAL LIST

Course Code	Course Name
DI0400	Operations Management
DI0800	Chemical Engineering
DI0810	Civil Engineering
DI0822	Computer Systems Engineering
DI0823	Electronic Engineering
DI0824	Power Engineering
DI0825	Process Control Engineering
DI0830	Industrial Engineering
DI0840	Mechanical Engineering (Being phased out)
DI0841	Mechanical Engineering
DI0850	Metallurgical Engineering

Module Code **Module Name** **Courses**
Module Description

AAECH1A **Engineering Chemistry 1** *DI0400 DI0800 DI0810 DI0830 DI0840 DI0841 DI0850*
NQF Level: *5* ***Credits:*** *10*

Matter and measurement; Atoms, molecules and ions; Mass relationships in chemical reactions; Reactions in aqueous solution; Periodicity and electronic structure of atoms; Ionic compounds; Covalent bonding and electron-dot structures; Molecular shapes: VSEPR model; Chemical equilibrium; Aqueous equilibria: Acids and bases.

AAECH2A **Engineering Chemistry 2** *DI0400 DI0800 DI0810 DI0830 DI0840 DI0841 DI0850*
NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *AAECH1A*

Thermochemistry: Chemical energy; Chemical Kinetics; Solutions and their properties; Acid-base equilibria; Electrochemistry.

AAECH3A **Engineering Chemistry 3** *DI0800*
NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *AAECH2A*

Structure and Bonding; Acids and Bases: Atomic hybridization; Predicting the geometry and polarity of organic compounds; Identify Brønsted-Lowry and Lewis acids and bases. The nature of organic molecules: Functional groups; IUPAC naming organic compounds; Alkyl groups; Classes of carbon atoms; *Cis-Trans* isomerism. The nature of organic reactions: Kinds of organic reactions (Homolytic, Heterolytic, Homogenic, Heterogenic, Polar and Radical reactions); Reaction energy diagrams. ; Alkenes; Alkynes; Aromatic compounds; Alkyl halides; Alcohols; Ethers and Epoxides; Thiols and Sulphides; Aldehydes and Ketones; Carboxylic Acids; Carboxylic acid derivatives and nitriles; Amines; Mechanisms of different organic reactions.

AMMAT1A **Mathematics 1** *DI0400 DI0800 DI0810 DI0822 DI0823 DI0824 DI0825 DI0830 DI0840 DI0841 DI0850*
NQF Level: *5* ***Credits:*** *10*

Binomial expansion, radian measure and limits of functions; Differentiation techniques; Integration techniques; Vectors; Complex numbers.

AMMAT2A **Mathematics 2** *DI0800 DI0810 DI0822 DI0823 DI0824 DI0825 DI0830 DI0840 DI0841 DI0850*
NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *AMMAT1A*

Differentiation: Derivatives of inverse trig functions; Definitions of hyperbolic functions, hyperbolic identities; Derivatives of hyperbolic functions, inverse hyperbolic functions; Differentiation of parametric equations; Maxima and minima (optimisation) problems; Partial differentiation; Application of partial differentiation. Integration: Integration of inverse

functions; Integration: by completing the square; Integration by partial fractions; Integration by parts; Integration by trigonometric and hyperbolic substitution; Application of integration. Differential equations: Terminology; Separation of variables; First order linear differential equations; Second order linear homogeneous ODE's with constant coefficients. Matrix Algebra: Terminology; Operations with matrices, Inverse Matrices; Solution of Systems of Linear Equations; Eigenvalues and Eigenvectors. Probability and Statistics: Data presentation, Data summaries, Normal distribution, Confidence intervals; Hypothesis testing.

AMMAT3A **Mathematics 3** *DI0800 DI0822 DI0823 DI0824 DI0825 DI0830 DI0840 DI0841*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *AMMAT2A*

Application of Integration: Volumes of solids of revolution, Length of Curves, Double Integration. First Order Differentiation Equations: Exact DE, Homogeneous DE, Bernoulli DE, Applications.; Numerical Solutions of First Order Differential Equations: Euler's method, Runge-Kutta order 2, Runge-Kutta order 4. D-Operator Methods: complementary function; Complementary function higher than second order; D-operator & inverse, binomial or long division method; Theorem 1; Theorem 2; Theorem 3; Special cases; General solutions; Applications. Laplace Transforms: Table of transforms; First shifting property; Transforms of step functions: Heaviside; Inverse Laplace Transforms using tables; Solution of differential equations; Application to mechanics; Application to electric circuits; Application to beams. Fourier Series: Periodic functions and harmonics, sketching of graphs; Important integrals; Formulae for series with period 2π; Formulae for series with period $2l$; Even and odd; half-range; Numerical harmonic analysis.

APHYS1A **Physics 1** *DI0400 DI0800 DI0810 DI0822 DI0823 DI0824 DI0825 DI0830 DI0840 DI0841 DI0850*

NQF Level: *5* ***Credits:*** *10*

Vectors, Forces & Newton's laws; Kinematics in 1 & 2 dimensions; Work-Energy & Impulse-Momentum; Fluids; Temperature & Heat; Waves & Sound; Principle of linear superposition & Interference phenomena; Interference wave nature of light; Reflection and refraction of light in mirror & lenses; Electric Force & Electric Fields; Electric potential & circuits; Nuclear physics and radioactivity.

APHYP2A **Physics 2 (Practical)** *DI0400 DI0800 DI0810 DI0822 DI0825 DI0830 DI0840 DI0841 DI0850*

NQF Level: *5* ***Credits:*** *5* ***Prerequisite:*** *APHYS1A*

Experiments are in-line with the theoretical content.

Torque experiment; Hooke's law experiment; Ideal gas law experiment; Viscosity experiment; Kirchhoff's rules experiment; RC-circuit experiment.

APHYT2A **Physics 2 (Theory)** *DI0400 DI0800 DI0810 DI0822 DI0825 DI0830 DI0840 DI0841 DI0850*

NQF Level: *5* ***Credits:*** *5* ***Prerequisite:*** *APHYS1A*

Uniform circular motion and rotational kinematics; Rotational dynamics; Simple harmonic motion and elasticity; The ideal gas and kinetic theory; Thermodynamics; Kirchoff's rules, capacitors and RC circuits; LRC circuits; Magnetic force and magnetic fields; Electromagnetic induction; Nuclear physics

ASICT1A **ICT Skills 1** *DI0400 DI0800 DI0810 DI0822 DI0823 DI0824 DI0825 DI0830 DI0840 DI0841 DI0850*

NQF Level: *5* ***Credits:*** *10*

Introduction to Computers; Managing Files and Folders; Common Elements; MS Word 365/2021; MS Excel 365/2021; Microsoft PowerPoint 365/2021; MS Outlook 365/2021; Internet Explorer.

ASPRG1A **Programming 1** *DI0400*

NQF Level: *5* ***Credits:*** *10*

This module introduces the student practically to the fundamentals of programming. Aspects covered include the basics of programming techniques and principles. The sequence, selection

and repetition programming structures are examined and discussed. Method creation and parameter passing are introduced.

ASPRG2A **Programming 2** *DI0400*
NQF Level: *6* ***Credits:*** *10*

This module builds upon the first module and covers additional fundamentals of programming. Aspects covered include arrays, object-oriented programming, files and MDI Windows applications.

BACEX1A **Costing and Estimating 1.1** *DI0400*
NQF Level: *5* ***Credits:*** *10*

Elements of cost; Introduction to elementary accounts; Absorption costing; Marginal costing; Cost-volume-profit analysis; Budgeting; Profitability of new projects; Just-in-time accounting.

BACEY1A **Costing and Estimating 1.2** *DI0400*
NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *BACEX1A*

Elements of cost; Introduction to elementary accounts; Absorption costing; Marginal costing; Cost-volume-profit analysis; Budgeting; Profitability of new projects; Just-in-time accounting.

BACOS2A **Costing2** *DI0830*
NQF Level: *6* ***Credits:*** *10*

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

BHMAN1A **Management** *DI0800 DI0823 DI0850*
NQF Level: *5* ***Credits:*** *10*

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.

EBAUT3A **Automation 3** *DI0830*
NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EMMEN1A*

Introduction: What is production? What is automation? What is a system? Automation considerations; Levels of automation; Jigs and figures and their 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, economy and other); Laboratory project; Associated operations: Automatic feeding and orientation: Electronic detection of size, colour and proximity, Pneumatic auto-sizing; Project: Design of an automotive system; Design a workstation; Design an automated workstation or selected standard production machines or design a transfer machine for this application.

EBCOA2A **Computing Applications 2** *DI0830*
NQF Level: *5* ***Credits:*** *7*

The module: Computing Applications 2, will introduce the student to the basic knowledge of the circuit simulation software Simetrix. Using ICT skills, the student will learn how to correctly use and apply Excel charts to create Engineering graphs from simulation measurement results. The knowledge obtained in this module will enable the student to apply it in other modules where circuits are involved, and simulation can be used. This module is based on blended-learning principles.

EBEWS1A **Engineering Work Study 1** *DI0830*

NQF Level: *5* ***Credits:*** *10*

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.

EBEWS2A **Engineering Work Study 2** *DI0830*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EBEWS1A*

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.

EBEWS3A **Engineering Work Study 3** *DI0830*

NQF Level: *6* ***Credits:*** *10*

Information systems analysis and design; Performance improvement programmes; Entrepreneurship theory; Financial plan; Marketing plan and Business plan.

EBFLA2A **Facility Layout and Material Handling 2** *DI0830*

NQF Level: *6* ***Credits:*** *10*

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.

EBIAC3A **Industrial Accounting 3** *DI0830*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *BACOS2A*

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.

EBILE3A **Industrial Leadership 3** *DI0400 DI0830*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EBMRE2A (DI0830)*

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.

EBMAT2A **Operations Management Techniques 2** *DI0400*

NQF Level: *6* ***Credits:*** *10*

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.

EBMAT3A **Operations Management Techniques 3** *DI0400*

NQF Level: *6* ***Credits:*** *10*

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.

EBMAX2A **Operations Management 2.1** *DI0400*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EBOPX1A*

Management functions; Business functions; Inventory management; Master production schedule; Material requirements planning.

EBMAY2A **Operations Management 2.2** *DI0400*

NQF Level: *6* ***Credits:*** *10*

Just-in-time systems; Scheduling of operations; Quality management; Decision-making; Linear programming; transportation module; Supply chain management; Project management.

EBMAX3A **Operations Management 3.1** *DI0400*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EBMAX2A*

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.

EBMFX1A **Manufacturing Technology 1.1** *DI0400*

NQF Level: *5* ***Credits:*** *10*

Safety and safety legislation; Manufacturing methods, techniques and processes; Hand tools; Power tools; Marking out; Cutting tools and cutting fluids; Drilling machines; Centre Lathe; Pedestal grinder and sawing machines; Joining.

EBMFY1A **Manufacturing Technology 1.2** *DI0400*

NQF Level: *5* ***Credits:*** *10*

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.

EBMRE2A **Manufacturing Relations 2** *DI08300*

NQF Level: *6* ***Credits:*** *10*

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.

EBOEG3A **Organisational Effectiveness 3** *DI0400*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *BACEX1A; EBOGY2A*

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.

EBOGX1A **Organisational Effectiveness 1.1** *DI0400*

NQF Level: *5* ***Credits:*** *10*

Introduction to Work Study; Productivity; Method study; Work measurement (time study); Human factors in work-study; Ergonomics; Working conditions and environment; Jigs and fixtures.

EBOGY1A **Organisational Effectiveness 1.2** *DI0400*

NQF Level: *5* ***Credits:*** *10*

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.

EBOGX2A **Organisational Effectiveness 2.1** *DI0400*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EBOGX1A*

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.

EBOGY2A **Organisational Effectiveness 2.2** *DI0400*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EBOGX1A*

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.

EBOMG3A **Operations Management Technology 3** *DI0400*

NQF Level: *6* ***Credits:*** *10*

Fundamentals of Manufacturing; Fundamentals of Systems; Fundamentals of Manufacturing Systems; Integrated Manufacturing and Management Systems; Material and Technological Information Flows in Manufacturing Systems; Product Planning and Design; Process Planning and Design; Quality Engineering; Capital Investment for Manufacturing; Principles of Computer-integrated Manufacturing (CIM); Factory Automation (FA), Computer-aided Manufacturing (CAM) and Computer-integrated Manufacturing (CIM) Systems; Fundamentals of Information Technology; Computer-based Production Management Systems; Manufacturing Strategy; Global Manufacturing; Industrial Structure and Manufacturing Efficiency; Industrial Input-Output Relations; Manufacturing Excellence for Future Production Perspectives.

EBOPX1A **Operations Management 1.1 (Industrial)** *DI0400*

NQF Level: *5* ***Credits:*** *10*

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 planning.

EBOPY1A **Operations Management 1.2 (Industrial)** *DI0400*

NQF Level: *6* ***Credits:*** *10*

Introduction to reliability-centred maintenance; Functions; Functional failure; Failure modes and effects analysis; Consequences; Proactive maintenance; Default action; Implementing reliability-centred maintenance; Applying the reliability-centred maintenance process; What reliability-centred maintenance achieves.

EBORE3A **Operations Research 3** *DI0830*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EBQAS2A*

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.

EBPEN1A **Production Engineering 1** *DI0830*

NQF Level: *5* ***Credits:*** *10*

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.

EBPEN2A **Production Engineering 2** *DI0830*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EBPEN1A*

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.

EBQAS2A **Quality Assurance 2** *DI0400 DI0830*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EBQMA1A (DI0400) EBQTE1A (DI0830)*

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.

EBQCO2A **Quality Control 2** *DI0850*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *AMMAT2A*

Fundamentals of statistics; Statistical process control; Product acceptance (sampling); Quality engineering; Quality and economy and Computers and quality.

EBQMA1A **Quality Management 1** *DI0400*

NQF Level: *5* ***Credits:*** *10*

Introduction; Descriptive techniques; Probability and probability distributions; Sample selection and sampling theory; Statistical process control; Hypothesis testing; Regression analysis and Acceptance sampling.

EBQTE1A **Qualitative Techniques 1** *DI0830*

NQF Level: *5* ***Credits:*** *10*

and sampling theory; Statistical process control; Hypothesis testing; Regression analysis and Acceptance sampling.

EBSPA1A **Safety Principles and Law 1** *DI0830*

NQF Level: *5* ***Credits:*** *5*

Importance of health and safety: What is safety and health concepts as indicated in the OHS Act, Fundamental safety concepts and terms: Fundamental safety terms, legal appointments as per the OHS Act, duties of the legal appointees as per the OHS Act, safety awareness and fire training, What is hazards and risk in the workplace: What is a hazard, what is a risk, what is the difference between a hazard and a risk, identification of main six hazards in the workplace, occupational hazards, difference between an accident and an incident: general principles of control and risk reduction, safe systems of work, permit-to-work systems, emergency procedures and first-aid, Principles of hazard and risk control: What is a risk assessment, why do a risk assessment, how to conduct a risk assessment, Risk assessment and risk management, Tools and Machinery: Tool and machine hazards, Principles of safeguarding powered and driven machines, point of operation safeguards, controls for hand toll hazards, portable power tool controls, Electrical safety: What do I need to know about electricity, what kind of injuries result from electrical current, electrical shock hazards, arc flash, control of electrical hazards, electrical safety-related work practices, Noise and vibration: Sound and noise, hearing, hazards of noise, exposure standard for noise, engineering controls for noise, noise measurement, vibrations of the human body or parts of the human body.

EBSTX1A **Statistics 1.1** *DI0400*

NQF Level: *6* ***Credits:*** *10*

Introduction to statistics; Presenting data; Measuring data; Probability; Probability distribution; Sampling distribution; Estimation; Hypothesis testing; Comparing populations; Regressions.

EBWPX1A **Workplace Dynamics 1.1** *DI0400*

NQF Level: *5* ***Credits:*** *10*

Production environment; Human behaviour; Group behaviour; Communication skills; Legal aspects; Negotiation skills and the application of these skills; Performance expectations.

EBWPY1A **Workplace Dynamics 1.2** *DI0400*

NQF Level: *5* ***Credits:*** *10*

Evaluate and implement personnel administration procedures; Personnel and the personnel function; Job design, analysis and evaluation; Interviewing; Human relations; Labour.

ECAME1A **Applied Mechanics 1** *DI0810*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *AMMAT1A; APHYS1A*

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

ECCEM1A **Civil Engineering Management 1** *DI0810*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EECOS1A*

Overview of civil engineering works; Contracts; Tendering; Office and site administration; Work study; Quality control and assurance.

ECCEM2A **Civil Engineering Management 2** *DI0810*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *ECCEM1A; ECCOM2A; EECOS1A*

Project management; Contract planning; Planning techniques; Financial planning techniques; Labour law; Pricing and cost planning; Basic computer software application.

ECCOA2A **Computing Applications 2** *DI0810*

NQF Level: *5* ***Credits:*** *7* ***Prerequisite:*** *ASICT1A*

Introduction to Excel. Basic Operations in Excel, such as Mathematical Operators Using Functions and Conditional Functions. Data mining: Importing Data, Frequency distribution, Pivot and Excel Tables. Knowledge of Chart types and uses and elements. Regression analysis: Functions used in analysing simple graphs. Using the analysis toolpack. Using the Solver toolpack Statistics for Experiments. VBA Subroutines: Recording a simple Macro and Creating simple algorithms. VBA User Defined Functions: VBA editor, Programming structures, Variables and Data types.

ECCOM1A **Construction Materials 1** *DI0810*

NQF Level: *5* ***Credits:*** *5*

Overview of construction materials; Aggregates; Concrete, Structural steel, Plastics, Clay products, Timber; Laboratory work.

ECCOM2A **Construction Materials 2** *DI0810*

NQF Level: *5* ***Credits:*** *5* ***Prerequisite:*** *EECOM1A*

Overview of highway construction materials: Bitumen, Lime, Binders and Asphalt, Quality control of construction materials; Laboratory work.

ECCOS1A **Construction Methods 1** *DI0810*

NQF Level: *5* ***Credits:*** *10*

Construction plant; Safety; Construction methods: Foundations, structures; Major civil engineering structures: Roads, bridges, tunnels, dams; Drainage; Infrastructures: Harbours, airport, railways; Labour-Enhanced Construction (LEC).

ECDOC1A **Documentation 1** *DI0810*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *ECCEM1A; ECCOM2A; ECCO21A; ECEDR2A*

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

ECEDR1A **Engineering Drawing 1** *DI0810*

NQF Level: *5* ***Credits:*** *10*

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

ECEDR2A **Engineering Drawing 2** *DI0810*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *ECEDR1A*

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.

ECEOR3A **Elements of Reinforced Concrete Masonry Design 3** *DI0810*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *ECEOS2A*

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.

ECEOS2A **Elements of Structural Steel and Timber Design 2** *DI0810*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *ECTST2A*

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.

ECESU1A **Engineering Surveying 1** *DI0810*

NQF Level: *5* ***Credits:*** *10*

Basic principles; Coordinates (Traversing); Levelling; Tacheometry; Areas and volumes; Map projections; Practical.

ECESU2A **Engineering Surveying 2** *DI0810*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *ECEDR2A; ECESU1A*

Levelling; Traversing; Tacheometry; Setting out of Civil structures; Triangulation, Geographic information system; Practical work.

ECEXL1A **Experiential Learning 1 (Civil)** *DI0810*

NQF Level: *6* ***Credits:*** *60* ***Prerequisites:*** *All Year 1, 2 and 3 modules*

Giving 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.

ECFMC2A **Fluid Mechanics 2 (Civil)** *DI0810*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *AMMAT2A; APHYT2A*

Fluid properties; Fluid statics; Fluid flow; Flow in pipes; Flow measurement; Open channel flow; Introduction to pumps.

ECSAN3A **Structural Analysis 3** *DI0810*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *AMMAT2A; ECTST2A*

Shear stress; Momentary area theorems; Influence lines for statically determinant beams and frames; Struts; Combined stresses; Laboratory work.

ECSAN4A **Structural Analysis 4** *DI0810*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *ECSAN3A*

Slope deflection; Clapeyron's three moment theorem; Bending moment distribution; Plastic collapse mechanisms; Strain energy (Virtual work); Laboratory work and computer applications.

ECSME1A **Soil Mechanics 1** *DI0810*

NQF Level: *5* ***Credits:*** *10*

Engineering soils; Soil composition; Soil classification; Classification system for soils; Compactions; Laboratory work.

ECSME2A **Soil Mechanics 2**

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *ECSME1A*

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.

ECSPA1A **Safety Principles and Law 1** *DI0810*

NQF Level: *5* ***Credits:*** *5*

Importance of health and safety: What is safety and health concepts as indicated in the OHS Act, Fundamental safety concepts and terms: Fundamental safety terms, legal appointments as per the OHS Act, duties of the legal appointees as per the OHS Act, safety awareness and fire training, What is hazards and risk in the workplace: What is a hazard, what is a risk, what is the difference between a hazard and a risk, identification of main six hazards in the workplace, occupational hazards, difference between an accident and an incident: general principles of control and risk reduction, safe systems of work, permit-to-work systems, emergency procedures and first-aid, Principles of hazard and risk control: What is a risk assessment, why do a risk assessment, how to conduct a risk assessment, Risk assessment and risk management, Tools and Machinery: Tool and machine hazards, Principles of safeguarding powered and driven machines, point of operation safeguards, controls for hand toll hazards, portable power tool controls, Electrical safety: What do I need to know about electricity, what kind of injuries result from electrical current, electrical shock hazards, arc flash, control of electrical hazards, electrical safety-related work practices, Noise and vibration: Sound and noise, hearing, hazards of noise, exposure standard for noise, engineering controls for noise, noise measurement, vibrations of the human body or parts of the human body.

ECTEN1A **Transportation Engineering 1** *DI0810*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *AMMAT1A; ECESU1A*

Analysis of traffic flow of major highways and arterials; Traffic impact assessment; Geometric design of road infrastructure; Transportation planning.

ECTEN2A **Transportation Engineering 2** *DI0810*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *ECSME1A; ECTEN1A*

Earthworks design; Pavement materials, Asphalt and Bitumen, pavement materials; Pavement design and management; Surfacing; Drainage.

ECTST2A **Theory of Structures 2** *DI0810*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *APHYP2A; APHYT2A; ECAME1A*

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.

ECWEN1A **Water Engineering 1** *DI0810*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *AAECH1A; AAECH2A; AMMAT1A*

Hydrology: Hydrological cycle, Meteorology, Infiltration, Runoff, Ground water, Stormwater; Water and wastewater treatment: Water treatment, Sewerage and wastewater treatment.

EECAD1A **Electrical Computer-Aided Design 1** *DI0823*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EEELE1A*

Introduction to Computer-Aided Design (CAD) concepts, KiCad origins and current environment, project structure, file locations, creation of industry standard schematic diagrams, PCB creation, component placement and routing. The use custom libraries, output file generation for manufacture.

EECAD2A **Electrical Computer-Aided Design 2** *DI0823*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *EECAD1A*

Creating of advanced hierarchal schematic sheets in KiCad. Creating custom PCB footprints and symbols. Advanced layout and routing techniques. Converting through-hole KiCad components into SMD components.

EECOA2A **Computing Applications 2** *DI0823*

NQF Level: *5* ***Credits:*** *7* ***Prerequisite:*** *AMMAT1A; ASICT1A; EPEEN1A*

The module: Computing Applications 2, will introduce the student to the basic knowledge of the circuit simulation software Simetrix. Using ICT skills, the student will learn how to correctly use and apply Excel charts to create Engineering graphs from simulation measurement results. The knowledge obtained in this module will enable the student to apply it in other modules where circuits are involved, and simulation can be used. This module is based on blended-learning principles.

EEDCO2A **Digital Communication 2** *DI0823*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *AMMAT3A; EEECO2A*

Differentiation between analogue and digital signals, spread spectrum systems, digital modulation, noise and interference, compression and error detection and communication networks and protocols. Waveform and frequency principles: Differentiation between digital and analogue signals, calculation of typical signal level indications in terms of different decibel referencing figures. Modulation principles: Ascertain the difference between analogue and digital modulation methodologies. Spread spectrum systems: Random numbers, data scrambling and frequency hopping. Digital modulation techniques: 8PSK Modulator,8PSK differential modulator and demodulator. Frequency and Time Division Multiplexing systems: Differentiate between FDM and TDM systems, introduction of TDMS 30/32 standards and calculations of Frame duration, Slot duration, Bit duration, Frame duration and Gross line Bit Rate. Coding systems and error detection: Introduction to ASCII and Huffman coding, Error detection systems and Parity check bits. Transmission standards: Serial coding standards, decoding of simple RS232 asynchronous techniques, RS 485 Standard, Introduction to ISO standards and TCP/IP model.

EEECO2A **Electronic Communication 2** *DI0823*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *APHYS1A; EEELE1A; EPEEN1A*

Introduction to communication: Decibels, Communication Introduction, Elements of communication systems, Time and frequency domains, Noise in communication systems, Frequency spectrum analysis concepts. Radio frequency components: RF wires, RF resistors, RF capacitor, RF inductors, RF toroidal inductors, RF toroidal inductor design, Practical winding. Resonant circuits: Definitions, Resonant lossless components, Quality factor, Insertion loss. Amplitude Modulation: Introduction, Full carrier amplitude modulation (Time domain), Full carrier amplitude modulation (Frequency domain). Angle Modulation: Introduction, Frequency modulation, Phase modulation, Angle modulation spectrum, frequency modulation and noise. Receivers: Introduction, Receiver tropology, Receiver characteristics, Demodulation. Radio wave propagation: Introduction, Electromagnetic waves, Free space propagation, Reflection refraction and diffraction, Ground wave propagation, Ionospheric propagation, Line of sight

propagation, Propagation in mobile environments, other propagation modes. Antennae: Introduction; Simple antennae; Antenna characteristics; Other antennae.

EEELE1A **Electronics 1** *DI0822 DI0823 DI0824 DI0825*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EPEEN1A*

Introduction to Electronics: The Atom, Materials Used in Electronics, Current in Semiconductors, N-Type and P-Type Semiconductors, the PN Junction. Diodes and Applications: Diode Operation, Voltage-Current (V-I) Characteristics of a diode, Diode Models, Half-Wave Rectifiers, Full-Wave Rectifiers, Power Supply Filters and Regulators, Diode Limiters and Clampers, Voltage Multipliers, The Diode Datasheet, Troubleshooting. Special- Purpose Diodes: The Zener Diode, Zener Diode Applications, The Varactor Diode, Optical Diodes, Other Types of Diodes, Troubleshooting. Bipolar Junction Transistors: BJT Structure, Basic BJT Operation, BJT Characteristics and Parameters, The BJT as an Amplifier, The BJT as a Switch, The Phototransistor, Transistor Categories and Packaging, Troubleshooting. Transistor Bias Circuits: The DC Operating Point, Voltage-Divider Bias, Other Bias Methods, Troubleshooting.

EEELE2A **Electronics 2** *DI0822 DI0823 DI0824 DI0825*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EEELE1A*

BJT Amplifiers: Amplifier Operation, Transistor Models, the Common-Emitter Amplifier, the Common-Collector Amplifier, the Common-Base Amplifier, Multistage Amplifiers, the Differential Amplifier. Power Amplifiers: The Class A Power Amplifier, The Class B and Class AB Push-Pull Amplifiers, The Class C Power Amplifier. Field Effect Transistors: The JFET, JFET Characteristics and Parameters, JFET Biasing, The Ohmic Region, The MOSFET, MOSFET Characteristics and Parameters, MOSFET Biasing, The IGBT. FET Amplifiers and Switching Circuits: The Common-Source Amplifier, The Common-Drain Amplifier, The Common-Gate Amplifier, The Class D Amplifier, MOSFET Analog Switching, MOSFET Digital Switching. Amplifier Frequency Response: Basic Concepts, The Decibel, Low-Frequency Amplifier Response, High-Frequency Amplifier Response, Total Amplifier Frequency Response. Thyristors: The Four-Layer Diode, The Silicon- Controlled Rectifier (SCR), SCR, Applications, the Diac and Triac, The Silicon-Controlled Switch (SCS), Programmable Uni-junction Transistor (PUT).

EEELE3A **Electronics 3** *DI0823*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EEELE1A; EEELE2A*

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

EEESK1A **Engineering Skills 1** *DI0800 DI0810 DI0822 DI0823 DI0824 DI0825 DI0830 DI0840 DI0841 DI0850*

NQF Level: *5* ***Credits:*** *5*

Different types of engineering skills: Stem skills and soft skills relevant in various engineering fields. Theories on engineering and engineering professions: Different types of theories on engineering. Different kinds of engineering fields: Mechanical, electrical, civil, chemical, computer etc. The engineering team: artisans, technicians, technologists, and engineers. Engineering and the environment: social responsibility, environmental impact, natural resources, sustainability of the engineering activity. Legal and safety considerations. Engineering teamwork: Engineering design. Teamwork versus group-work. Basic principles of engineering project management (plan, organise, lead and control), project costing, budgeting, and resource management. What is a business plan? Ethics in Engineering: professional ethics, responsibility, engineering norms, ECSA and their function.

EEEXL1A **Experiential Learning 1 (Electronics)** *DI0823*

NQF Level: *5* ***Credits:*** *14* ***Prerequisites:*** *EEWPR3A; EEWPR4A*

Safety, company procedures, tools, components.

EEEXL2A **Experiential Learning 2 (Electronics)** *DI0823*

NQF Level: *6* ***Credits:*** *16* ***Prerequisites:*** *EEWPR3A; EEWPR4A*

Measurement procedures, calibration methods and procedures, installation and commissioning procedures and methods

EEMET3A **Measurement Technology 3** *DI0823*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EEELE1A*

Definitions Measurement; Units Standards and Concepts Data analysis; Instrument selection; DC measurements; AC measurement; Signal sources; Oscilloscopes; Frequency measurement; Frequency domain instruments; Logic analysers; Null balanced instruments.

EEMIC3A **Microwave Communication 3** *DI0823*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EEECO2A; EEELE3A*

An Overview to Microwave applications, Bandwidth, Electromagnetic microwave noise, Antenna size and reflections from Targets, Microwave interactions with materials. Stable oscillations frequencies, Microwave circuits. Circuit model of a transmission line: Wave propagation constant, Characteristic impedance Z0; Physical significance of the propagation constant equations; Propagation factor and the characteristic impedance of transmission Lines; Waveform Distortions. The open two-wire line; the coaxial line; Q (Quality Factor – Goodness) of resonant lines; Quarter – wave line; Impedance measurement Using transmission Lines; The Smith chart for the transmission line; Application of Smith chart. Determination of unknown impedance; Impedance matching, Stub-matching using Smith chart, The normalized impedance and admittance Smith chart. The Normalized Z-Y Smith chart; Impedance matching networks, Waveguides: Solution of wave equation. Transverse electric mode. Transverse magnetic Mode. Power flow in rectangular waveguides. Circular waveguides. TM wave equation; TE modes in circular waveguides. Resonant cavities. Rectangular cavity. Quality factor of a Cavity. Dielectric resonators (DRs). Material properties.

EEOEL3A **Opto-Electronics 3** *DI0823*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EEECO2A; EEEELE3A*

Principals of Opto-Electronics, Advantages, Disadvantages, Practical Applications, Structure of Fiber, Single Mode Fiber, Multimode Fiber, Manufacturing Processes and Techniques, Plastic Optic Fiber cables, Types, Construction and Characteristics of Cables, Types of Ducted Cables, Installation Possibilities, Light Sources, Conversions, LEDs, Laser Diodes, Gain-guided and Index-guided, Conversions, Optical Receiver, Fiber Amplifiers, Connectors, Couplers, Fiber Joining, Techniques, Splicing, Local and Long-Distance Networks, Telephone Networks, Data Networks, Design Optic Fiber Cable System, Optical Path Loss Budget, Installation Techniques, Testing Optic Fiber, Test Equipment, OTDR, Lasers and Amplifiers, Fiber Cables, Transmission Systems, Industry, Military, Government, Medicine.

EEPEL3A **Power Electronics 3** *DI0824 DI0825*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EIDSY1A; EEELE2A*

Industrial Control Elements: The Elements of Logic Control, switches as Input Devices, Relays as Logic Devices, Solid State Logic Gates. Designing Logic Control Systems Using Relays and Solid-state devices: Classification Control System. Programmable Logic Controllers: Introducing the PLC, Input-Output Section, Input Cards, Output Cards, Input-Output Racks, Addressing Method, the processor, Input Image File (IIF), Output Image File (OIF), The User Program Memory, The Variable Data Memory, The Central Processing Unit (CPU). Programmable Logic Controllers (PLC) Instructions I: Examine-On/Off Instruction, Output-Energize instruction, Rung Definition, Decision Logic of the CPU. Programmable Logic Controllers (PLC) Instructions II: Counters, Up-Down Counters, Timers, Timer-On-Delay (TON) operation, Timer-Off-Delay (TOF) operation. Programmable Logic Controllers (PLC) Instructions III: Latch and Unlatch Instructions, Immediate

Input and Output instructions, Immediate Input Instruction, Immediate Input Instruction, Master Control Reset Instruction.

EEPEL4A **Power Electronics 4** *DI0824*
NQF Level: *7* ***Credits:*** *10*

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

EEPRJ4A **Engineering Project 4 (Electronics)** *DI0823*
NQF Level: *6* ***Credits:*** *30* ***Prerequisites:*** *EEWPR3A; EEWPR4A*

Industrial problem solving and documentation.

EERAD3A **Radio Engineering 3** *DI0823*
NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EEECO2A; EEELE3A*

Angle Modulation: Introduction to Angle Modulation; Frequency Modulation; Phase Modulation; The Angle Modulation Spectrum; FM and Noise; FM Stereo; FM Measurements. Receivers: Introduction to Receivers; Receiver Topologies; Receiver Characteristics; Demodulators; Communication Receivers; Transceivers; Receiver Measurements. Antennas: Introduction to Antennas; Simple Antennas; Antenna Characteristics; Other Simple Antennas; Antenna Matching; Antenna Arrays; Reflectors; Cellular and PCS (Personal Communication System) Antennas; Antenna Test Equipment. Cellular Radio: Introduction to Cellular Radio; Advanced Mobile Phones; AMPS Control Systems; Security and Privacy; Cellular Phones; Cell Site Equipment.

EESIN1A **Social Intelligence 1** *DI0800 DI0810 DI0822 DI0823 DI0824 DI0825 DI0830 DI0840 DI0841 DI0850*
NQF Level: *5* ***Credits:*** *3*

Leadership styles: Democratic, Autocratic, Consensus etc. Economic systems of governance: Capitalism, Socialism and Communism. Etiquette in society and the workplace. Soft skills, Cultural influences. Success in Engineering: Professionalism, Ethics, Responsibility, Discipline, Time management, Acquiring information and independent learning.

EESPA1A **Safety Principles and Law 1** *DI0822 DI0823 DI0824 DI0825*
NQF Level: *5* ***Credits:*** *5*

Importance of health and safety: What is safety and health concepts as indicated in the OHS Act, Fundamental safety concepts and terms: Fundamental safety terms, legal appointments as per the OHS Act, duties of the legal appointees as per the OHS Act, safety awareness and fire training, What is hazards and risk in the workplace: What is a hazard, what is a risk, what is the difference between a hazard and a risk, identification of main six hazards in the workplace, occupational hazards, difference between an accident and an incident: general principles of control and risk reduction, safe systems of work, permit-to-work systems, emergency procedures and first-aid, Principles of hazard and risk control: What is a risk assessment, why do a risk assessment, how to conduct a risk assessment, Risk assessment and risk management, Tools and Machinery: Tool and machine hazards, Principles of safeguarding powered and driven machines, point of operation safeguards, controls for hand toll hazards, portable power tool controls, Electrical safety: What do I need to know about electricity, what kind of injuries result from electrical current, electrical shock hazards, arc flash, control of electrical hazards, electrical safety-related work practices, Noise and vibration: Sound and noise, hearing, hazards of noise, exposure standard for noise, engineering controls for noise, noise measurement, vibrations of the human body or parts of the human body.

EETXR3A **Transmission 3 (Radio Frequency)** *DI0823*
NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EEECO2A; EEELE3A*

Radio Frequency Circuits: Introduction to Radio Frequency Circuits; High-Frequency Effects; Tuned Radio-Frequency Amplifiers; Single-Tuned Class A (Transformer Coupled with Tuned Primary) Amplifiers; Single-Tuned Class A (Transformer Coupled with Tuned Secondary)

Amplifiers; Double-Tuned Transformer-Coupled Amplifiers; Neutralization. Transmitters: Introduction to Transmitters; Transmitter Requirements; Transmitter Topologies; FM Transmitters; Transmitter Power Measurements. Transmission Lines: Introduction to Transmission Lines; Characteristic Impedance; Velocity Factor; Reflections; EM Propagation on Transmission Lines; Standing Waves; Variation of Impedance Along a Transmission Line; Characteristics of Open and Shorted Transmission Lines; Transmission Line Losses. Satellites & Radio Frequency Propagation: Electromagnetic waves; Free-space propagation; Mobile / portable communication; Repeaters & Cellular systems; Introduction to Satellites; Satellite Orbits; Geostationary Satellites; Application of Geostationary Satellites; Satellites in Low- and Medium Earth Orbits.

EEWPR1A **Projects 1 (WIL - Electrical)** *DI0822 DI0823 DI0825*

NQF Level: *5* ***Credits:*** *7* ***Prerequisite:*** *EPEEN1A*

Rules and safety principles that apply in laboratories, including relevance and adherence to the OHS act. General theory on soldering including wetting, flux, solder chemistry, soldering iron types and usage and soldering technique. Preparing, drilling, de- burring and cleaning of pre-set solder course PCB. Insert and solder components too specification. Use of high-speed drilling machines, pliers, cutters, strippers, de-soldering equipment to produce quality workmanship on own project. Design and plan circuit layout on stripboard for given circuits. Plan the cutting, linking and layout for neatness, efficiency, and reliable use. Build, test, and resolve problems for this project before presentation. Use laser toner transfer method to reproduce CAD designed image onto PCB copper. Etch using Ferric Chloride and clean surface features. Drill holes. Bend and place components before soldering. Test and calibrate circuit including resolution of faults. Install electrical board into product enclosure with heatsink attached and finalise for use and presentation.

EEWPR2A **Projects 2 (WIL - Electrical)** *DI0822 DI0823 DI0825*

NQF Level: *5* ***Credits:*** *7* ***Prerequisite:*** *EEWPR1A*

Introduction to microcontrollers in general and their pervasive use in industry and commercial environments. Introduction to the Arduino development board, Arduino IDE and the C programming language used for the Arduino. Possible usage scenarios using examples from hobbyists, experimenters, and professional applications. Schematic connection diagrams and simulations using TinkerCad. Multiple projects to program, simulate and execute on hardware given with time constraints. Building the project on breadboard.

EEWPR3A **Projects 3 (WIL - Electrical)** *DI0823*

NQF Level: *6* ***Credits:*** *8* ***Prerequisites:*** *EEWPR1A; EEWPR2A*

This module introduces students to basic principles of project management, with a focus on compiling a structured project scope of work report and developing a functional prototype within an engineering context. The module emphasizes problem-solving using Arduino platforms, integrated with sensors commonly found in industrial and commercial applications. Core project management topics include project origin, scope, framework, report structure, planning, design, and test a proof of concept for a real-world industry-related project.

EEWPR4A **Projects 4 (WIL - Electrical)** *DI0823*

NQF Level: *7* ***Credits:*** *8* ***Prerequisites:*** *EEWPR2A; EEWPR3A*

Peculiarities of a project management; Preparing yourself for doing a project; Project Planning; Project Goals; Project Schedule; Project Deliverables; Properties of a good project report; Human Resource Plan; Communications Plan; Risk Management Plan.

EHATH3A **Applied Thermodynamics 2** *DI0800*

NQF Level: *6* ***Credits:*** *12*

Steam/Vapour; Steam Condensers; Boiler; Turbines and Steam Cycles; Refrigeration.

EHCEL1A **Chemical Engineering Laboratory 1** *DI0800*

NQF Level: *6* ***Credits:*** *12* ***Prerequisite:*** *EHMEB2A*

Projects such as: 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.

EHCEL2A **Chemical Engineering Laboratory 2** *DI0800*

NQF Level: *6* ***Credits:*** *12* ***Prerequisite:*** *EHCEL1A*

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.

EHCET2A **Chemical Eng. Thermodynamics 1** *DI0800*

NQF Level: *6* ***Credits:*** *12* ***Prerequisite:*** *AAECH2A*

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.

EHCOA2A **Computing Applications 2** *DI0800*

NQF Level: *5* ***Credits:*** *7* ***Prerequisite:*** *ASICT1A*

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.

EHCPI1A **Chemical Process Industries 1** *DI0800*

NQF Level: *6* ***Credits:*** *12*

Industrial gases and heavy chemicals, Cryogenic air separation, Ammonia manufacture, Chloro-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.

EHCPR3A **Chemical Process Design** *DI0800*

NQF Level: *6* ***Credits:*** *12* ***Prerequisite:*** *EHCPI1A*

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.

EHENE1A **Environmental Engineering 1** *DI0800*

NQF Level: *6* ***Credits:*** *12*

Material & Energy balances and Separations; Reactors and Reactions; Water Quality & Water Treatment; Wastewater Treatment; Air Quality and Control; Solid Waste; Hazardous Waste; Types Pollution.

EHHMT2A **Heat and Mass Transfer 1** *DI0800*

NQF Level: *6* ***Credits:*** *12* ***Prerequisite:*** *AMMAT2A*

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)

EHITC1A **Introduction to Chemical Engineering 1** *DI0800*

NQF Level: *5* ***Credits:*** *12*

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.

EHMEB2A **Material and Energy Balance 2** *DI0800*

NQF Level: *6* ***Credits:*** *12* ***Prerequisite:*** *EHITC1A*

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.

EHMOP1A **Mechanical Operation 1** *DI0800*

NQF Level: *6* ***Credits:*** *12*

Particulate solids; Screening; Transportation and storage of solids; Comminution (Size Reduction); Size reduction equipment; Separation based on properties; Mixing; Froth Flotation.

EHPCO2A **Process Control 1** *DI0800*

NQF Level: *6* ***Credits:*** *12* ***Prerequisite:*** *AMMAT3A*

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.

EHPFD2A **Process Fluid Dynamics 1** *DI0800*

NQF Level: *6* ***Credits:*** *12* ***Prerequisite:*** *APHYT2A*

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-crcullum conduits, Flow measuring devices.

EHRTE3A **Reactor Technology 1** *DI0800*

NQF Level: *6* ***Credits:*** *12* ***Prerequisite:*** *EHMEB2A*

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.

EHSEP3A **Separation Processes 1** *DI0800*

NQF Level: *6* ***Credits:*** *12* ***Prerequisite:*** *EHHMT2A*

Introduction to processes separations; Distillation (binary system); Absorption; Evaporation; Drying; Crystallization.

EHSPA1A **Safety Principles and Law 1** *DI0800*

NQF Level: *5* ***Credits:*** *5*

Importance of health and safety: What is safety and health concepts as indicated in the OHS Act, Fundamental safety concepts and terms: Fundamental safety terms, legal appointments as per the OHS Act, duties of the legal appointees as per the OHS Act, safety awareness and fire training, What is hazards and risk in the workplace: What is a hazard, what is a risk, what is the difference between a hazard and a risk, identification of main six hazards in the workplace, occupational hazards, difference between an accident and an incident: general principles of control and risk reduction, safe systems of work, permit-to-work systems, emergency procedures and first-aid, Principles of hazard and risk control: What is a risk assessment, why do a risk assessment, how to conduct a risk assessment, Risk assessment and risk management, Tools and Machinery: Tool and machine hazards, Principles of safeguarding powered and driven machines, point of operation safeguards, controls for hand toll hazards, portable power tool controls, Electrical safety: What do I need to know about electricity, what kind of injuries result from electrical current, electrical shock hazards, arc flash, control of electrical hazards, electrical safety-related work practices, Noise and vibration: Sound and noise, hearing, hazards of noise, exposure standard for noise, engineering controls for noise, noise measurement, vibrations of the human body or parts of the human body.

EICOA2A **Computing Applications 2** *DI0822 DI0825*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *AMMAT1A; ASICT1A; EPEEN1A*

Introduction: steps of program development, program design methodology, basic input, processing and output, introducing algorithms and pseudo code. Constants, Variables, and Arithmetic Operators: meaningful names, defining the problem, designing the algorithm, pseudo code, general integer division and modulus operators. Scope of variables: data types, variable naming, declarations and assignments, scope of variables. Modularization: steps of modularization, procedures, functions and passing variables. Selection structures: arithmetic operators, comparison operators, logic operators, messages, simple compound and nested structures, case structures. Repetition structures: counters and accumulators, do-while structure, for-loop, nested structures. Arrays: One dimensional arrays, defining arrays, saving displaying and searching arrays, multidimensional arrays.

EICSY2A **Control Systems 2** *DI0825*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *AMMAT3A; EICOA2A*

Mathematical Foundation: Basic control system concepts, open- loop and closed-loop system, Block Diagrams: Block diagram terminologies, Block diagram reduction rules, Modelling: Derive the differential equation of RLC circuits, Stability: Define the stability criteria of control systems, Time Domain Analysis: Define Test signals and their transfer functions, Derive the steady state error for unity feedback system, Frequency Domain Analysis: Define frequency domain analysis of linear control systems.

EIDCS1A **Digital Control Systems 1** *DI0825*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EINET1A*

Introduction to Networks: Introduction, Analogue Communication Systems, Instrumentation and Control Systems, Digital Communication Systems, Serial and Parallel Communication, Classifying Communication. Communication Mediums: Optical Fibers for Data Transmission, Radio/Wireless Communication, and Wireless Ethernet. Communication Protocols: Introduction, Packet-Switching vs Circuit-Switching, Data transfer path - ISO/OSI 7-layer model,

Ethernet, Ethernet & the 7-layer ISO/OSI model, and transmission control protocol/internet protocol (TCP/IP). Industrial Networks or Field busses: Introduction, Industrial applications, Predecessors of the modern Fieldbus, Digital Communication Plus 4 - 20 mA, Highway Addressable Remote Transmitter (HART), Operation of HART, Modbus for Factory Automation, Current Fieldbus Standards, Fieldbus. Profinet: Introduction, Redundant Profibus/Ethernet, and Profisafe. Foundation Fieldbus: Introduction, H1 Level, Foundation Fieldbus H1 Level Topology, Foundation Fieldbus Model, Producer/Consumer Model (Publish/Subscribe), Standard Function Blocks in FF Devices. Devicenet & Controlnet: History and development of Devicenet, Topology and Connectors, Connections, Installation rules, Power Supplies, Potential Power Supply Problems, Bus Operation, Data Structure. Interbus & AS-I Bus: Interbus Protocol Efficiency, Interbus Shift Registers, Interbus System Performance, Interbus Sub-Buses, Redundancy with Interbus, The Actuator-Sensor Interface (AS-I BUS), AS-I Physical Layer.

EIDCS2A **Digital Control Systems 2** *DI0825*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EIDCS1A*

HART: network topologies, communication modes, protocol stack, Benefits of HART communication, Installation and intrinsic safety barriers, Wireless-HART. MODBUS: network topologies, network physical media and wiring, registers, Query-response messaging, Application of Modbus serial and exceptional responses. Modbus –TCP, Interoperability of variants. FOUNDATION FIELDBUS: basics, protocol stack and physical media, Operation of the LAS in FF, Application layer, application, function blocks and scheduling. PROFIBUS: Profibus physical media and termination, Fieldbus Data-link layer; addressing and arbitration, Profibus slave redundancy and MBP wiring verification. PROFINET: Devices and device classes, Physical media and Profinet-IO topologies, Data-link layer. CAN, DEVICENET and CAN_OPEN: Physical layer in CAN, CAN data-link layer, DeviceNet, protocols, networks, communication and hardware, CAN-Open.

EIDSY1A **Digital Systems 1** *DI0822 DI0823 DI0824 DI0825*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *AMMAT1A; EPEEN1A*

Digital and Analogue Quantities: Binary Digits, Logic Levels, Digital Waveforms Basic Logic Functions. Number Systems, Operations and Codes: Decimal Numbers, Binary Numbers, Decimal-to- Binary Conversion, Binary Arithmetic, Compliments of Binary Numbers, Signed Numbers, Arithmetic Operations with Signed Numbers, Hexadecimal Numbers, Octal Numbers, Binary Coded Decimal (BCD), Digital Codes, Error Codes. Logic Gates: The inverter, The AND gate, The OR gate, The NAND gate, The NOR gate and the Exclusive-OR and Exclusive-NOR gate, Fixed-Function Logic Gates. Boolean Algebra and Logic Simplifications: Boolean Operations and Expressions, Laws and Rules of Boolean Algebra, DeMorgan's Theorems, Boolean Analysis of Logic Circuits, Logic Simplifications using Boolean Algebra, Standard Forms of Boolean Expressions, Boolean Expressions and Truth Tables, The Karnaugh Map, Karnaugh Map SOP Minimization, Karnaugh Map POS Minimization. Combinational Logic Analysis: Basic Combinational Logic Circuits, Implementing Combinational Logic, The Universal Property of NAND and NOR gates, Combinational Logic using NAND and NOR gates, Pulse Waveform Operation. Functions of Combinational Logic: Half and Full Adders, Parallel Binary Adders, Ripple Carry and Look-Ahead Carry Adders, Comparators, Decoders, Encoders, Code Converters, Multiplexers (Data Selectors), De-multiplexers, Parity Generators/Checkers.

EIDSY2A **Digital Systems 2** *DI0822 DI0823 DI0825*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EIDSY1A*

Latches Flip-Flops and Timers: Latches, Flip-Flops, Flip-Flop Operating Characteristics, Flip-Flop Applications, One-Shots, the a-stable multi-vibrator. Shift Registers: Shift Register Operation, Types of Shift Register, Bidirectional Shift Registers, Shift Register Counters, Shift Register Applications. Counters: Finite State Machines, Asynchronous Counter Operation, Synchronous Counter Operation, Up/Down Synchronous Counters, Design of Synchronous Counters,

Cascaded Counters, Counter Decoding, Counter Applications. Data Storage: Semiconductor Memory Basics, The Random-Access Memory (RAM), Read-Only Memory (ROM), Programmable Rom, The Flash Memory, Memory Expansion, Special Types of Memories, Magnetic and Optical Storage, Memory Hierarchy, Cloud Storage. Signal Conversion and Processing: Analogue-to-Digital Conversion, Methods of analogue-to-Digital Conversion, Methods of Digital -to- analogue Conversion, Digital Signal Processing, The Digital Signal Processor (DSP).

EIDSY3A **Digital Systems 3** *DI0822 DI0825*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EIDSY1A; EIDSY2A*

The 8051 Microcontroller: The discussion of the role of microcontrollers in everyday life, criteria for choosing microcontroller and various members of the 8051-microcontroller family. 8051 Assembly programming: The listing and discussion of 8051 registers, assemble and run 8051 programmes, discuss RAM memory space allocation in 8051 and understand the RISC and CISC architecture. Jump, Loop and Call Instructions: Code 8051 Assembly language instructions using loops, conditional and unconditional jump instructions and subroutines. Calculates the target address for jump instructions, describe precaution in using stack in subroutines and discuss crystal frequency VS machine cycle in 8051. I/O Port Programming: List four I/O ports of the 8051, explain the role of each port, code Assembly language to use ports as input and output, instruction for handling I/O and code I/O bit manipulation programs. 8051 Addressing Modes: List and explain the five addressing modes of the 8051 microcontroller, stack manipulation using direct addressing mode and accessing RAM, I/O and ports using bit addressing. Arithmetic Logic Instructions and Programs: Define the range of numbers possible in 8051 unsigned numbers of data, code addition, subtraction, multiplications and divisions for unsigned numbers. Code logic instructions AND, OR, XOR and use logic instruction for bit manipulation. Use compare and jump for program control. Compare and contrast packed and unpacked BCD data. Code programs for ASCII and BCD conversion. 8051 Programming in C: Code C programs for time delay and I/O operations and BIT manipulation. Code C programs logic and arithmetic operations, ASCII and BCD conversions, and binary (hex) to decimal conversion.

EIDSY4A **Digital Systems 4** *DI0822*

NQF Level: *7* ***Credits:*** *10* ***Prerequisites:*** *EIDSY2A; EIDSY3A*

8051 Timer Programming in C, Programming 8051 Timers, Counter Programming, Programming Timers 0 and 1 in 8051 C. 8051 Serial Port PROGRAMMING in C, Basic Serial Communication, 8051 connection to RS232, 8051 serial port programming in C. Interrupt Programming in C, 8051 Interrupts, Programming Timer interrupts, Programming External Hardware interrupts, Programming the Serial Communication interrupt, Interrupt Priority in 8051/8052, Interrupt Programming in C. LCD and Keyboard interfacing, LCD Interfacing, Keyboard interfacing, ADC, DAC and Sensor interfacing, Parallel and serial ADC, DAC interfacing, Sensor interfacing and signal conditioning. Relay, Opto-isolator and Stepper motor, Relay and Opto-Isolator, Stepper Motor interfacing. DC Motor Control and PWM, DC Motor interfacing and PWM SPI and I2C Protocols, SPI BUS Protocol, I2C BUS Protocol.

EIENP1A **Engineering Programming 1** *DI0822 DI0823 DI0825*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EICOA2A*

Introduction to programming: different languages, first program, integer variables, numbers and operators, characters, flow control, input and output. Advanced Flow Control and Data Aggregates: if and else, more types, loops, Boolean algebra, vectors, initiators: simple arrays, multidimensional arrays, structures and why we need them. Extending Expressive Power: pointers, functions and memory. Accessing Different kinds of Data: arrays of pointers, conversions, strings, and namespaces. Object Programming Essentials: basic concepts, a class, static components, and objects vs pointers inside objects. Inheritance: class hierarchy, inheritance and type compatibility, polymorphism and virtual methods, objects as parameters and dynamic casting, various supplements, constant keyword. Exceptions: to errors in human,

throw statement, categorizing exceptions, catching exceptions. Operators and Enumerated types: overloading operators, enumerated types.

EIENP2A **Engineering Programming 2** *DI0822 DI0825*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EIENP1A*

The Analysis Model of a system: selection of an appropriate model. Iterative System Build: Select and prepare a use case for design and/or code; 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: The Logical Data model is transformed into a physical Data Base.

EIENP3A **Engineering Programming 3** *DI0822 DI0825*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EIENP1A; EIENP2A*

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.

EINET1A **Networks 1** *DI0822 DI0825*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EIDSY1A*

Introduction – Exploring the Network: Global Connectivity, Networking Today, LANs, WANs, and the Internet, Components of a Network, The Network as a data communications platform, The changing Network Environment. Configuring a Network Operating System: The IOS, Basic Configurations, Network Addressing Schemes. Network Protocols and Communications: The Rules of Communications, Protocols and Standards, How Data moves in a Network. Network Access: Physical layer Protocols, Network Media, Data Link Layer Protocols, Media Access Control. Ethernet: Ethernet Protocol, Address Resolution Protocol, LAN Switches Network Layer: Network Layer Protocols, Routing Principles, what is a Router, Configuring Routers. IP Addressing: IPV4 and IPV6 Addressing, Connectivity, ICMP. Sub netting IP Networks: Sub netting of IPV4 Networks, Addressing Schemes, Structured Design, Design Considerations for IPV6. Transport Layer: Transport layer Protocols, TCP and UDP Characteristics and Operation. Application layer: Application layer Protocols, Well-known Application Layer Protocols and Services, HTTP, DHCP, DNS, SMTP etc. Build a Small Network: Network Design, Network Security, Network performance, Troubleshooting.

EINET2A **Networks 2** *DI0822 DI0825*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EINET1A*

Routing Concepts: Configuration, Decisions, Operation. Static Routing: Implementation, Configuration of Static and Default Routes, Summary and Floating Static Routes, Troubleshooting Static and Default Rotes. Routing Dynamically: Dynamic Routing Protocols, Distance Vector Routing, RIP and RIPng, The Routing Table. Switched Networks: LAN Design, The Switched Environment, General Concepts of Switching, Switching Configuration: Configuration, Security, Management and Implementation. VLANS: Segmentation, VLAN Implementation, Trunks, Inter-VLAN Routing, Troubleshooting, Access Control Lists: IP ACL Operation, Standard and Extended ACLs for IPv4, Troubleshooting, IPv6 ACLs. DHCP Protocol IPv4 and IPv6: Principles, Configuration and Troubleshooting. Network Address Translation, NAT Operation, Configuration and troubleshooting. Managing the Network: IOS Management, Maintenance, Backups.

EINET3A **Networks 3** *DI0822 DI0825*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EINET1A; EINET2A*

LAN Design – Introduction to LAN Design, Campus Wired LAN designs, Selecting Network Devices. Scaling VLANs – VTP, Extended VLAN's and DTP, Troubleshooting, Layer 3 Switching.

STP – LAN Redundancy, Spanning Tree Concepts, Spanning Tree Configuration. Ether Channel and HSRP – Link Aggregation Concepts and Configuration, First Hop Redundancy Protocols. Dynamic Routing – Dynamic Routing Protocols, Distance Vector Routing, Links State Routing. EIGRP – EIGRP Characteristics, EIGRP Operation, Implementing EIGRP for IPv4 and IPv6. EIGRP Tuning and Troubleshooting – Tune EIGRP, Troubleshoot EIGRP. Single-Area OSPF – OSPF Characteristics, Single Area OSPF v2 and v3. Multi-Area OSPF – Multi-Area OSPF Operation, and Configuration. OSPF Tuning and Troubleshooting – Advanced Single-Area OSPF Configuration, Troubleshooting Single – Area OSPF Implementations.

EIOSY1A **Operating Systems 1** *DI0822*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *ASICT1A*

Introduction to operating systems: Overview of Hardware and Operating system concepts, components. Role of Operating systems, View of Operating systems. Operating systems structure: Operating systems structures: OPS Services, System calls, Device management, Design goals, Overview of the booting process using LINUX architecture. Process concept: Process concept, Process state, Process scheduling, Inter process communication. Multithreading programming: Overview of threads, types of threads, operations, benefits, multithreading. Process scheduling: CPU Scheduling: basic concepts, scheduling criteria and algorithms (FCFS, PS, RR, SJF). Synchronization: Process Synchronization: Basic process interactions: Critical section problem. Cooperation, Semaphores. Deadlocks: System model, deadlock characterization, methods of handling deadlocks, deadlocks prevention, deadlocks detection, deadlock avoidance, deadlocks recovery.

EIOSY2A **Operating Systems 2** *DI0822*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EIOSY1A*

Main Memory: Contiguous Memory Allocation, Paging, Swapping. Virtual Memory: Demand Paging, Page Replacement, Frame Allocation. Mass Storage System: Overview of Mass Storage Structure, HDD Scheduling, NVM Scheduling, Error Detection and Correction, Storage Device Management, Swap- Space Management, RAID Structure. I/O Systems: I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations. File System Interface: File Concept, Access Methods, Disk and Directory Structure, File- System Mounting, File Sharing, Protection. File System implementation: File-System Structure, File-System Operations, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance. File System Internals: File Systems, File-System Mounting, Partitions and Mounting, File Sharing, Virtual File Systems, Remote File Systems, NFS. Security: Program Threats, System and Network Threats, Cryptography as a Security, User Authentication, Implementing Security Defences, Firewalling to Protect Systems and Networks, Computer-Security Classifications. Virtual Machines: Benefits and Features, Building Blocks, Types of Virtual Machines and Their Implementations, Virtualization and Operating-System Components. Network and Distributed Systems: Advantages of Distributed Systems, Network Structure, Communication Structure, Network and Distributed Operating Systems, Design Issues of Distributed Systems, Distributed File Systems.

EIOSY3A **Operating Systems 3** *DI0822*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EISOY1A; EIOSY2A*

Domain Controllers. Active Directory. Authentication and Account Policies. Complex Enterprise Environments. Group Policy Objects, processing, settings and preferences (GPOs). Certificate Services (AD CS). Digital Certificates. Active Directory Federation Services (AD FS). Web Application Proxy (WAP). Active Directory Rights Management (AD RMS). Samba on Linux server. Apache web server on Linux server. Linux clients to access Windows- based services.

EIPRC4A **Engineering Project 4** *DI0822*

NQF Level: *6* ***Credits:*** *30* ***Prerequisites:*** *All Year 1, 2 and 3 modules*

Industrial problem solving and documentation.

EIPRI1A **Process Instrumentation 1** *DI0825*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *APHYS1A*

Introduction: Measurement Standards, Functional elements of Instruments, Static characteristics of instruments, Instrument errors, Industrial instrumentation schematics. Pressure Measurement: Introduction and definitions, Pressure in a Liquid, Pressure measurement with manometers, measuring pressure with elastic structures, measuring pressure with force balance gauges, Measuring pressure with DP-cell, Strain gauges. Flow Measurement: Introduction, Derivation of the flow equation, Differential pressure method of measuring flow, other flow meters. Level Measurement: Direct methods, indirect methods. Temperature Measurement: Introduction, Expansion and pressure thermometers, Resistance thermometers, Thermocouple thermometers, Thermistor thermometers. Process Control: Introduction, Control schemas, PID controllers, Pneumatic control valves.

EIPRI2A **Process Instrumentation 2** *DI0825*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EIPRI1A*

High and medium vacuum measurement, Introduction, Ionization gauges, Hot- filament ionization vacuum gauge, Undesirable feature, Cold cathode ionization vacuum gauge Electronic pressure detectors and transmitters, Introduction, Resistance strain gauge, Theory, Gauge factor “S”, Construction of strain gauges, Fine wire gauge cemented on a paper backing Flow measurement, Introduction, Types of flow, Streamlined flow, Turbulent flow, Helical-turbulent flow, Pulsating flow, Planning a flow installation, The flow equation, Modification of the flow formula level measurement, Introduction, Selection of a measurement system, Capacitive level measurement system, Operation of capacitive system, Factors which determine the di- electric constant, Installation requirements and practical consideration, temperature measure, Temperature measurement: Introduction, Resistance thermometer measuring method, Measurement circuits, Application notes, Potentiometer circuits, Operating principles, programmable controllers, Introduction to programmable controllers, Definition of a programmable controllers, Components of a programmable controller, Power supply, Control unit, Read-only memory (ROM), Random access memory, Central processing unit, Internal operation of the control unit, Input modules, controllers and control elements Introduction to Practical controllers and elements, Control stations, Remote-set stations, Cascade stations, Ratio-stations, Computer-set stations, Integral saturation, Control valves.

EIPRI3A **Process Instrumentation 3** *DI0825*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EIPRI1A; EIPRI2A*

Automatic control methods & distributed control systems, telemetering, intrinsically safe equipment, control systems, measurement with radio-active sources & non-destructive testing, analysers, SCADA systems and PLC systems.

EIPRJ4A **Engineering Project 4 (Process Control)** *DI0825*

NQF Level: *6* ***Credits:*** *30* ***Prerequisites:*** *All Year 1, 2 and 3 modules*

Industrial problem solving and documentation.

EISEN1A **Software Engineering 1** *DI0822*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EICOA2A*

This module introduces students to the foundational phases of software development—requirements and analysis—using object-oriented analysis techniques. Students learn to define system functionality through use case diagrams, activity diagrams, and specifications, and translate requirements into analysis models using class and state machine diagrams. Emphasis

is placed on visual modelling with UML, preparing students to model embedded systems in engineering environments.

EISEN2A **Software Engineering 2** *DI0822*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EISEN1A*

This module focuses on the design and implementation phases of software development. Students explore software architecture, human-computer interaction, system components, and advanced object-oriented design. Through refining use case models and applying design patterns, students gain experience designing system structures and documenting class and sequence diagrams. The module prepares students to translate analysis into well-structured, efficient solutions for embedded and enterprise-level applications.

EISEN3A **Software Engineering 3** *DI0822*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EISEN1A; EISEN2A*

This module focuses on database design and implementation within the context of an IoT system. Students learn to develop logical and physical database models, apply object-oriented analysis and design to a well-defined IoT problem, and implement database structures using SQL. Emphasis is placed on relational modelling, advanced queries, and integrating database solutions with embedded systems, preparing students for real-world development of intelligent, connected applications.

EMAOM3A **Applied Strength of Materials 3** *DI0840 DI0841*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EMSOM2A*

Slope and deflection of beams; Leaf springs; Struts; Complex stress and complex strain and Thick cylinders.

EMCAI1A **Computer Aided Draughting 1** *DI0840 DI0841*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EMEDR1A*

Introduction to a 3D parametric software interface; Creating sections, parts, assemblies and drawings.

EMCOA2A **Computing Applications 2** *DI0840 DI0841*

NQF Level: *5* ***Credits:*** *10*

Provides basics of computing applications, integrates computation and visualization into a flexible computing environment, and offers a diverse family of built-in functions that will give background in a straightforward manner to the basics of program language and ability of student to write their own simple programs to solve typical problems encountered in a variety of modules and in engineering practice. The subject covers elementary programming concepts that include, Variables and built-in Symbolic Math functions, Solving equation and system of linear equations, Range variables, 2D Plots of Functions, 3D Plots of Functions, Programming algorithm syntax, Programming – Loops.

EMEDR1A **Engineering Drawing 1** *DI0800 DI0830 DI0840 DI0841 DI0850*

NQF Level: *5* ***Credits:*** *10*

Drawing instruments; Drawing skills; Object visualization and drawing; sketching and drawing of chemical engineering process equipment's using computer software.

EMEDR2A **Engineering Drawing 2** *DI0840 DI0841*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EMEDR1A*

Advance constructions; Orthographic projection of true planes; Isometric; Interpenetration and development; Machine drawing and Assemblies.

EMFME3A **Fluid Mechanics 3** *DI0840 DI0841*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EMFMM2A*

Pipe flow; Viscous **Fluid Mechanics 3**flow; Flow under varying head; Fluid friction in oiled bearings, Channel Flow; Wetted Perimeter and Positive displacement piston pumps.

EMFMM2A Fluid Mechanics 2 (Mechanical) *DI0840 DI0841*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *AMMAT2A; APHYT2A*

Hydrostatics; Fluid dynamics; Fluid power circuit elements; Hydraulic and Pneumatic systems.

EMHYM3A Hydraulic Machines 3 *DI0840 DI0841*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EMFME3A*

Channel flow and Wetted perimeter. Centrifugal pump, single pump, series pump, parallel pump, pump system characteristics equations (operating point of a pump), radia Flow, axial flow, mixed flow, best operating speed, best impeller size, Cavitations in pump, Thomas cavitations, velocity triangle (velocity vector, Euler head and manonetric head). Turbines (impulse turbine: Pelton wheel, reaction turbine and velocity triangle). Fluid system (hydraulic system, hydraulic accumulator, hydraulic intensifier, hydraulic ram, hydraulic lift, hydraulic crane, hydraulic coupling, hydraulic torque converter, air lift pump and gear wheel pump.

EMMAE1A Maintenance Engineering 1 *DI0840 DI0841*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *EMEDR1A*

Maintenance organisation, Work execution, Parts and materials, Maintenance systems and documentation, Maintenance planning and scheduling, Preventive and corrective maintenance, Computerized maintenance systems, Maintenance safety and efficiency, Reliability centred maintenance and Evaluation of a maintenance program.

EMMAE2A Maintenance Engineering 2

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EBOPY1A; EMMAE1A (DI0400) EMMAE1A (DI0841)* *DI0400 DI0840 DI0841*

Condition Monitoring; Failure analysis; Vibration Analysis; Fault detection techniques and tools: Thermography Analysis, Oil Analysis, Ultrasound Analysis.

EMMDE3A Machine Design 3 *DI0840 DI0841*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EMMED2A*

Shaft Design, Belt Design and Selection, Gear Design (Spur and Helical) Fatigue, Machine Screws and Fastener Design, Limits and Fits (Tolerances); Machine Design project to be written in the Harvard Style; Problem Statement, Literature Review, Evaluation of Preliminary Ideas, Component design (calculations), CAD of components and assembly, Summary and Conclusion.

EMMEC1A Mechanics 1 *DI0830 DI0840 DI0841*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *AMMAT1A; APHYS1A*

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.

EMMEC2A Modelling and Engineering Computation 2 *DI0840 DI0841*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EMCOA2A*

In this module, the students develop specific skills to program and use computational techniques to solve engineering problems. The module introduces Numerical methods relevant to Mechanical systems, including integration, solution of linear equations, and ordinary differential equations. Presents simulation approaches use for examples in Mechanical Engineering, particularly from dynamics, and structural analysis using MATLAB programming.

EMMED2A Mechanical Engineering Design 2 *DI0830 DI0840 DI0841*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *EMEDR2A; EMMEC1A*

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.

EMMED3A Mechanical Engineering Design 3 *DI0840 DI0841*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EMMED2A*

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.

EMMEN1A Manufacturing Engineering 1 *DI0830 DI0840 DI0841*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EMEDR1A*

Safety and safety legislation; Identification and application of materials; Elementary measuring equipment and Elementary hand and Machine tools.

EMMEN2A Mechanical Manufacturing Engineering 2 *DI0830 DI0840*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EMMEN1A (DI0830 & DI0841)*

Fault diagnosis; Failure analysis and measuring equipment; Test methods; Interpretation and action; Powder metallurgy; Metal forming; Erosion; Casting; Plastics-moulding and machining; Welding and joining and Obtaining finish and accuracy.

EMMOM2A Mechanics of Machines 2 *DI0830 DI0840 DI0841*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EMMEC1A*

Torque acceleration; Vehicle dynamics; Simple lifting machines; Hoists and haulages; Moment of inertia; Simple harmonic motions and Power transmission.

EMMOM3A Mechanics of Machines 3 *DI0840 DI0841*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EMMOM2A*

Kinematics; Balancing and Gears.

EMPRJ1A Project 1 (WIL Mechanical) *DI0840*

NQF Level: *5* ***Credits:*** *7* ***Prerequisite:*** *AMMAT2A*

The module is intended to offer hands-on workshop exposure to students. It shapes the behaviour of graduates to the mechanical and general manufacturing environment and develop safety awareness in campus-controlled environment in preparation for future workplace-based learning.

EMPRJ2A Project 2 (WIL Mechanical) *DI0840*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *AMMAT2A; EMPRJ1A*

This module builds on and enhances attributes enquired during Project 1 (WIL Mechanical).

EMPRJ3A Project 3 (WIL Mechanical) *DI0840*

NQF Level: *6* ***Credits:*** *15* ***Prerequisite:*** *EMPRJ2A*

The module is a practical component of typical maintenance experienced in industry. It is supporting the subject Maintenance Engineering 2 covers the machine failure and analytical methods to monitor the condition of machines. It shapes the behaviour of graduates to the mechanical maintenance environment and prepares the student for future workplace-based learning.

EMSOM2A Strength of Materials 2 *DI0830 DI0840 DI0841*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EMMEC1A*

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.

EMSOM3A Strength of Materials 3 *DI0840 DI0841*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EMSOM2A*

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.

EMSPA1A **Safety Principles and Law 1** *DI0840 DI0841*

NQF Level: *5* ***Credits:*** *5*

Importance of health and safety: What is safety and health concepts as indicated in the OHS Act, Fundamental safety concepts and terms: Fundamental safety terms, legal appointments as per the OHS Act, duties of the legal appointees as per the OHS Act, safety awareness and fire training, What is hazards and risk in the workplace: What is a hazard, what is a risk, what is the difference between a hazard and a risk, identification of main six hazards in the workplace, occupational hazards, difference between an accident and an incident: general principles of control and risk reduction, safe systems of work, permit-to-work systems, emergency procedures and first-aid, Principles of hazard and risk control: What is a risk assessment, why do a risk assessment, how to conduct a risk assessment, Risk assessment and risk management, Tools and Machinery: Tool and machine hazards, Principles of safeguarding powered and driven machines, point of operation safeguards, controls for hand toll hazards, portable power tool controls, Electrical safety: What do I need to know about electricity, what kind of injuries result from electrical current, electrical shock hazards, arc flash, control of electrical hazards, electrical safety-related work practices, Noise and vibration: Sound and noise, hearing, hazards of noise, exposure standard for noise, engineering controls for noise, noise measurement, vibrations of the human body or parts of the human body.

EMSPL3A **Steam Plant 3** *DI0840 DI0841*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EMTHE3A*

Steam plant; Psychrometry; Rotary compressors; Heat transfer; Gas turbines; Cooling towers and Legislation and Forced convection.

EMTHE2A **Thermodynamics 2** *DI0840 DI0841*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EMMEC1A*

Introduction to thermodynamics; The First Law of thermodynamics; Working fluid; Solving thermodynamics systems; The Second Law; The gas cycles; Mixtures fundamentals.

EMTHE3A **Thermodynamics 3** *DI0840 DI0841*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EMTHE2A*

General thermodynamics; Ideal cycles; Internal combustion engines; Steam turbines; Refrigeration; Air compressors and Natural flow heat transfer.

EMTOM3A **Theory of Machines 3** *DI0840 DI0841*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EMMOM2A*

Introduction to the dynamics and vibrations of mechanical systems; Free and forced vibration of linear one and two-degree of freedom models of mechanical systems; Work-energy concepts; Unbalance and base excitation of systems.

EPAEN2A **Alternative Energy 2 (Power)** *DI0824*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *EEELE2A; EPEEN1A; EPEEN2A*

Principles of Solar, Wind, Geothermal, Hydro, Bio energy, Micro Generation.

EPAEN3A **Alternative Energy 3 (Power)** *DI0824*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EPAEN2A*

Theory and calculations of types of Alternative Energy: Solar Energy, Wind Energy, Biomass Energy.

EPCOA2A **Computing Applications 2** *DI0824*

NQF Level: *5* ***Credits:*** *7* ***Prerequisite:*** *AMMAT1A; ASICT1A; EPEEN1A*

Navigating EPCOA2A on VUTela, Laboratory rules & guidelines. MATLAB Software: Different windows in MATLAB: Work in the command window, do simple arithmetic operations, display formats, use simple built-in functions, write script. Defining variables and use them in mathematical equations. Using the colon operator to manipulate elements in arrays. Creating,

saving, inputting data, and running a script, function: Mathematical operation with arrays, BODMAS, element by element operations, using built in function in arrays, use of MATLAB in application problems. To create and format two types of two-dimensional plots using MATLAB: use the plotting functions, plotting multiple graphs, formatting plots, Create and use user define functions and introduction to programming: The Conditional Statements; Switch case and Loops.

EPEEN1A **Electrical Engineering 1** *DI0822 DI0823 DI0824 DI0825 DI0830 DI0840 DI0841*

NQF Level: *5* ***Credits:*** *10*

Electrical Principles: The electron theory, Heat, Magnetism, Friction, Pressure, Light, Chemical Action, Batteries, International system of measurement. Basic Electrical Concepts: The electrical circuit, Electrical current flow, Electrical current, Electromotive force and voltage, Definitions of electric, magnetic, and other SI units, Resistance, Resistors. Network Theorems in Direct Current Circuits: Kirchhoff's laws, Superposition theorem, Thevenin theorem, Norton's Theorem, Star-Delta, and delta conversion, Delta-Star conversion, Star-delta conversion. Electromagnetism: The magnetic field, Electromagnetic Force on a current-carrying conductor, Electromagnetic induction, Lenz's law, Faraday's law. Inductance in Direct Current Circuits: Inductive circuits, Inductance, Current growth in an inductive circuit, Current decay in an inductive circuit, Energy stored in an inductor, Types of inductors. Capacitance in Direct Current Circuits: Capacitors, Capacitance, Series capacitor circuit, Parallel capacitor circuits. Parallel Magnetic Cores: Parallel magnetic circuits, electrical analogy, series and parallel in magnetic circuits.

EPEEN2A **Electrical Engineering 2** *DI0822 DI0823 DI0824 DI0825 DI0830*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EPEEN1A*

Single Phase AC Circuits: Series Impedance Circuits, AC Voltage Diver, Components of current, Admittance, Parallel impedance circuits, Current divider. Power and Power Factor Correction: Active (Real) power, Power in a resistive ac circuit, Power in an active ac circuit, Power in a capacitive ac circuit, Peak and average power, the complex power triangle, Complex power, Reactive power, Power factor, Disadvantage of a low power factor, causes of low power, Power factor correction, Equipment used for power factor improvement, Importance of power factor improvement, Calculations on power factor improvement. Network Theorems in AC Circuits: Kirchhoff's laws, Superposition theorem, Thevenin theorem, Norton's Theorem, Star-Delta and delta conversion, Delta-Star conversion, Star-delta conversion, Maximum power transfer theorem. Resonance: Effect of varying frequency in series ac circuits, Frequency effect on the circuit impedance, Current at resonance, Resonance rise in voltage, Energy transfer between the inductor and capacitor, Resonant frequency in series ac circuits, Tuning for resonance, Q-factor of a series resonant circuit, Practical parallel resonant circuit. Complex Waves and Harmonics: Integration of waveforms, Production of harmonics, Effect of reactance in complex circuits, Composition of complex waves, Power and power factor of non-sinusoidal waves, Resonance because of non-sinusoidal waves, Addition and subtraction of non-sinusoidal waveforms.

EPEEN3A **Electrical Engineering 3** *DI0824*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EPEEN1A; EPEEN2A*

Advanced Three Phase circuits analysis, Interconnected Systems, Symmetrical Components, Per unit systems.

EPEEN4A **Electrical Engineering 4** *DI0824*

NQF Level: *7* ***Credits:*** *10* ***Prerequisite:*** *EPEEN3A*

Electrical Lighting: Different types of illumination. Economics of Power Generations, Transmission and Distributions. Theory and calculation of AC Distributions.

EPEMA2A **Electrical Machines 2** *DI0824*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *EPEEN1A; EPEEN2A*

Basic Principles of Magnetic circuits, Direct Current Generators, Induced emf in a coil, Separately Excited Generators, Self-Excited Generators, Armature reaction, DC Motors, Efficiency of Machines and Faults and Failures.

EPEMA3A **Electrical Machines 3** *DI0824*

NQF Level: *7* ***Credits:*** *10* ***Prerequisite:*** *EPEMA2A*

Single-phase transformers: Construction, principle of operations, Phasor diagram, Polarity, Open and Closed-circuit tests on transformer. Three phase transformers: construction, types of cores, winding connections. Parallel operation of transformer, All day efficiency. Scott-connection, Temperature rise. Faults and failures.

EPEMN2A **Energy Management 2** *DI0824*

NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *EPAEN2A; EPEEN2A; EPSYS2A*

Energy Accounting, Monitoring, Targeting and Reporting. Energy Audit Process. Energy Bills: Electric rate structures, Bill Analysis, Rebates, Tariffs. Economic Analysis and Life Costing Cycle. Lighting.

EPEPR3A **Electrical Protection 3** *DI0824*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EPEEN3A; EPEMA3A*

Introduction to basic of Electrical Protection, Symmetrical fault calculations, Application of Current interrupting devices: Fuses and Circuit Breakers, Current and Voltage transformers. Time grade Over current protection.

EPEXL1A **Experiential Learning 1 (Power)** *DI0824*

NQF Level: *5* ***Credits:*** *14* ***Prerequisite:*** *All Year 1, 2 and 3 modules*

Measurement. Build a more meaningful understanding of the practical application base on the previous theory done at the University.

EPEXL2A **Experiential Learning 2 (Power)** *DI0824*

NQF Level: *6* ***Credits:*** *16* ***Prerequisite:*** *All Year 1, 2 and 3 modules*

Interact with the broader workplace community through attentive reading and engagement of workplace policy and documentation.

EPPRJ4A **Engineering Project 4 (Power)** *DI0824*

NQF Level: *6* ***Credits:*** *30* ***Prerequisite:*** *All Year 1, 2 and 3 modules*

Do and present an industrial based project.

EPSYS2A **Power Systems 2** *DI0824*

NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EPEEN2A*

Generation of Electricity – Theory of different types of Power Stations. Classifications of Sub-Stations-Outdoor and Indoor. Types of Electrical Supply System. Mechanical Design of Overhead Lines. Electrical Design of Overhead lines.

EPSYS3A **Power Systems 3** *DI0824*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EPSYS2A*

Performance of Transmission Lines, Line Insulators for High Voltages, Theory of Corona. Sag calculation of Overhead Transmission Lines. Theory of and calculation of Underground cables. Construction, Testing and Commissioning of Overhead Distribution Lines, DC Distribution Systems, Variable load Curves on Power Stations. Economics of Power Generations.

EPTXP3A **Transmission 3 (Power)** *DI0824*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *EPSYS2A; EPSYS3A*

Performance of Long Transmission Lines. Transients in Transmission Lines. Interference of Power Line with Neighbouring Communication Lines. Flexible AC Transmission Systems. Extra High Voltage AC Transmission. High Voltage DC Transmission.

EYCOA2A **Computing Applications 2** *DI0850*

NQF Level: *5* ***Credits:*** *7* ***Prerequisite:*** *ASICT1A*

The module: Computing Applications 2, will introduce the student to the basic knowledge of the circuit simulation software Simetrix. Using ICT skills, the student will learn how to correctly use and apply Excel charts to create Engineering graphs from simulation measurement results. The knowledge obtained in this module will enable the student to apply it in other modules where circuits are involved, and simulation can be used. This module is based on blended-learning principles.

EYEGE1A **Engineering Geology 1** *DI0810 DI0850*

NQF Level: *5* ***Credits:*** *10*

Earth: surface, structure and age; Mineralogy; Petrology; Structural geology; Surface processes; Stratigraphy; Ore deposits; Industrial minerals; Practical work.

EYEME1A **Extractive Metallurgy 1** *DI0850*

NQF Level: *6* ***Credits:*** *10*

Physical and Chemical Characteristics of Ore Minerals; Production of non- ferrous metals; Production of iron and steel; Pollution and pollution control; Refractories; The concept of distribution functions.

EYENC1A **Environmental Chemistry 1** *DI0850*

NQF Level: *6* ***Credits:*** *8* ***Prerequisites:*** *AAECH2A; EYEGE1A*

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.

EYHYD2A **Hydrometallurgy 2** *DI0850*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *AAECH1A; EYEME1A*

Solution chemistry and process thermodynamics; leaching reagents and processes; influence of pH and potential; leaching methods; application in leaching of oxide, sulphide and native minerals; design of a leaching plant; quantitative analysis (calculations); laboratory work.

EYHYD3A **Hydrometallurgy 3** *DI0850*

NQF Level: *7* ***Credits:*** *10* ***Prerequisite:*** *EYHYD2A*

Winning and recovery processes: adsorption on activated coal; Ion exchange processes; Solvent extraction; Applications in gold, PGM and uranium leaching and treatment of the leach solution.

EYMAM1A **Manufacturing Metallurgy 1** *DI0850*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *APHYS1A*

Solidification of metals; casting technologies; design of Runners and gating systems; Casting construction and pattern design; Moulding materials; Moulding boxes; Cores and core making; 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; Introduction to Additive Manufacturing.

EYMAM2A **Manufacturing Metallurgy 2** *DI0850*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EYMAM1A*

Welding processes; Manual and automated 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.

EYMAM3A Manufacturing Metallurgy 3 *DI0850*

NQF Level: *7* ***Credits:*** *10* ***Prerequisite:*** *EYMAM2A*

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.

EYMPR1A Mineral Processing 1 *DI0850*

NQF Level: *6* ***Credits:*** *10*

Ore deposits; Mining and mining methods; Ore handling; Ore preparation; Principles of comminution; Economic considerations.

EYMPR2A Mineral Processing 2 *DI0850*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EYMPR1A*

Application of distribution functions to selection; Sampling and material balance; Mineral separation methods based on physical properties; Dewatering.

EYMPR3A Mineral Processing 3 *DI0850*

NQF Level: *7* ***Credits:*** *10* ***Prerequisite:*** *EYMPR2A*

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.

EYPME1A Physical Metallurgy 1 *DI0850*

NQF Level: *6* ***Credits:*** *10* ***Prerequisites:*** *APHYS1A*

Electron configuration in metals; Crystallography; Solidification of metals; Introduction to plastic deformation; Constitution of alloys; Phases and phase diagrams; Heat treatment; Alloy specification.

EYPME2A Physical Metallurgy 2 *DI0850*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EYPME1A*

Mechanical metallurgy; Strengthening mechanisms; Phase transformations; Diffusion; The tension test; The torsion test; Hardness; Fatigue; Creep and stress rupture; Brittle fracture and Impact testing. Fracture and fracture mechanics, residual stress concentrations, Failure analysis.

EYPME3A Physical Metallurgy 3 *DI0850*

NQF Level: *7* ***Credits:*** *10* ***Prerequisites:*** *EYPME1A; EYPME2A*

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; Titanium and Titanium alloys, Aluminium and Aluminium alloys or Copper and copper alloys.

EYPTH1A Process Thermodynamics 1 *DI0850*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *AAECH2A*

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; Construction binary phase diagrams and application of Gibbs phase rule.

EYPYR2A Pyrometallurgy 2 *DI0850*

NQF Level: *6* ***Credits:*** *10* ***Prerequisite:*** *EYEME1A*

Mining and iron ore preparation. Iron blast furnace process and alternative iron making processes. Principles of direct reduction processes and comparisons of different processes.

Corex process for iron making. Classification of refractory materials and testing methods. Types of refractory materials and identification of different basic, acid and neutral materials for manufacturing. Design- and installation methods in the refractory industry. Differentiation between different industries applying refractory material with special reference to the iron and steel and ferro-alloy production processes.

EYPYR3A **Pyrometallurgy 3** *DI0850*

NQF Level: *7* ***Credits:*** *10* ***Prerequisite:*** *EYPYR2A*

Desulphurization of hot metal. Basic oxygen process for steel making. Production of Ferrosilicon; Production of Ferro-manganese; Production of Ferro chrome; Production of special Ferro-alloys; Pollution and pollution control. Pyrometallurgy of copper ores roasting and smelting. Pyrometallurgy of zinc smelting. Pyrometallurgy for lead ore roasting, and smelting.

EYSPA1A **Safety Principles and Law 1** *DI0850*

NQF Level: *5* ***Credits:*** *5*

Importance of health and safety: What is safety and health concepts as indicated in the OHS Act, Fundamental safety concepts and terms: Fundamental safety terms, legal appointments as per the OHS Act, duties of the legal appointees as per the OHS Act, safety awareness and fire training, What is hazards and risk in the workplace: What is a hazard, what is a risk, what is the difference between a hazard and a risk, identification of main six hazards in the workplace, occupational hazards, difference between an accident and an incident: general principles of control and risk reduction, safe systems of work, permit-to-work systems, emergency procedures and first-aid, Principles of hazard and risk control: What is a risk assessment, why do a risk assessment, how to conduct a risk assessment, Risk assessment and risk management, Tools and Machinery: Tool and machine hazards, Principles of safeguarding powered and driven machines, point of operation safeguards, controls for hand toll hazards, portable power tool controls, Electrical safety: What do I need to know about electricity, what kind of injuries result from electrical current, electrical shock hazards, arc flash, control of electrical hazards, electrical safety-related work practices, Noise and vibration: Sound and noise, hearing, hazards of noise, exposure standard for noise, engineering controls for noise, noise measurement, vibrations of the human body or parts of the human body.

EYWIL1A **Work Integrated Learning (Metallurgy)** *DI0850*

NQF Level: *6* ***Credits:*** *60*

The Diploma in Metallurgical Engineering has a formal six-month 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-disciples 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.

HKCOX1A **Applied Communication Skills 1.1** *DI0400 DI0800 DI0810 DI0822 DI0823 DI0824 DI0825 DI0830 DI0840 DI0841 DI0850*

NQF Level: *5* ***Credits:*** *8*

This module covers spoken language's origin, diversity, and modern human communication via social media, augmented reality, and AI, distinguishing five communication forms. It explores Jacobsen and transactional models, discusses listening process, skills, barriers, and types. It also covers varied reading techniques, instructions, 5 steps to boost critical thinking, SCAMPER for creative thinking, and De Bonos' thinking hats. The analysis includes authenticating websites, assessing reliability, accessing academic online journals, applying 7 C's of concise

communication. Lastly, it aids writing improvement by addressing misused words, punctuation, 12 verb tenses, capitalisation, and avoiding misplaced pronouns.

HKCOY1A **Applied Communication Skills 1.2** *DI0400 DI0800 DI0810 DI0822 DI0823 DI0824 DI0825 DI0830 DI0840 DI0841 DI0850*

NQF Level: *5* ***Credits:*** *8*

This module focusses on developing social and emotional intelligence for effective interpersonal interactions. This includes demonstrating ethical behaviour by upholding honesty and respect in communication. It also includes structuring written communication with clear and coherent paragraphing, mastering the skill of paraphrasing to convey ideas using your own words, creating concise summaries that capture the main points of longer content and producing well-organised reports to present information and research findings. Students will learn to understand how perception shapes the interpretation of information and experiences, to differentiate between objective facts and subjective opinions in communication, to recognise the distinction between subjective and objective perspectives, and to interpret the literal and implied meanings of words and symbols. Students will also be able to identify and address biases that can affect communication and understanding and analyse and challenge stereotypes to promote unbiased communication. Furthermore, this module will focus on utilising graphics to enhance the visual impact of your communication, critically evaluating persuasive techniques in advertisements, and interpreting the messages and satire conveyed in cartoons effectively.

HKCOX2A **Applied Communication Skills 2.1** *DI0400 DI0800 DI0810 DI0822 DI0823 DI0824 DI0825 DI0830 DI0840 DI0841 DI0850*

NQF Level: *6* ***Credits:*** *8* ***Prerequisites:*** *HKCOX1A; HKCOY1A*

In this module students apply communication models to PowerPoint presentations, distinguish active listening from hearing, overcome barriers, and use non-verbal communication in public speaking with intercultural awareness. They should understand unique group traits, differentiate leadership styles, and apply problem-solving within groups. Participants will excel in technology use, differentiate quality in presentation design, and deliver confidently with non-verbal cues, considering analysis, research, structure, and venue prep. They'll recognize complex communication, address barriers, and respect diverse needs. Acquiring logic skills, constructing arguments, and mastering formal meetings, interviews, and document compilation for business success are also emphasized.

HKCOY2A **Applied Communication Skills 2.2** *DI0400 DI0800 DI0810 DI0822 DI0823 DI0824 DI0825 DI0830 DI0840 DI0841 DI0850*

NQF Level: *6* ***Credits:*** *8* ***Prerequisites:*** *HKCOX1A; HKCOY1A*

In this module students examine group dynamics in order to be able to apply related theory on conflict resolution, persuasion, negotiation and mediation to group situations and interactions, thereby improving interpersonal skills in the workplace. They become familiar with disability communication, how it applies to workplace interactions and use respectful language when communication with persons with disabilities. Students learn to analyse a job advertisement and compile a professional curriculum vitae and letter of application, while using appropriate language, format and tone in written business communication. This module also aims to explain the use of social media in a business context and apply good social media etiquette and ethics in a professional context.

12.2 EXTENDED 4-YEAR DIPLOMA MODULES

Course Code	Course Name
DE0801	Chemical Engineering
DE0811	Civil Engineering
DE0831	Industrial Engineering
DE0841	Mechanical Engineering
DE0851	Metallurgical Engineering
DE0862	Computer Systems Engineering
DE0863	Electronic Engineering
DE0864	Power Engineering
DE0865	Process Control Engineering

NB: Modules indicated with "F" in the credits column of the and modules with a "B" at the end of the module code in the curricula (p 90 - 98) are shown here. All other subjects can be found in the Diploma Modules list.

Module Code	Module Name	Courses
Module Description		
AAXCH1A	**Foundation Chemistry 1**	*DE0801 DE0811 DE0831 DE0841 DE0851 DE0862 DE0863 DE0864 DE0865*
NQF Level: *5*	***Credits:*** *10 F*	
Atoms, molecules & ions; Stoichiometry; Reactions in aqueous solution; Rate and extent of reactions; Chemical equilibrium; Acids, bases and salts; Electrochemistry.		
AAXCH2A	**Foundation Chemistry 2**	*DE0801 DE0811 DE0831 DE0841 DE0851 DE0862 DE0863 DE0864 DE0865*
NQF Level: *5*	***Credits*** *10 F*	
Structure of organic molecules; Physical properties; Reactions of organic compounds		
AAECH1B	**Engineering Chemistry 1**	*DE0801 DE0811 DE0831 DE0841 DE0851*
NQF Level: *5*	***Credits:*** *10* ***Prerequisites:*** *AAXCH1A; AAXCH2A*	
Matter and measurement; Atoms, molecules and ions; Mass relationships in chemical reactions; Reactions in aqueous solution; Periodicity and electronic structure of atoms; Ionic compounds; Covalent bonding and electron-dot structures; Molecular shapes: VSEPR model; Chemical equilibrium; Aqueous equilibria: Acids and bases.		
AMXMA1A	**Foundation Mathematics 1**	*DE0801 DE0811 DE0831 DE0841 DE0851 DE0862 DE0863 DE0864 DE0865*
NQF Level: *5*	***Credits:*** *10 F*	
Linear, quadratic and cubic polynomial functions, exponential and logarithmic functions, inverse functions, problem solving and graph work. Number Patterns, Sequences and Series. Algebra.		
AMXMA2A	**Foundation Mathematics 2**	*DE0801 DE0811 DE0831 DE0841 DE0851 DE0862 DE0863 DE0864 DE0865*
NQF Level: *5*	***Credits*** *10 F*	
Differential Calculus. Probability. Euclidean Geometry. Trigonometry. Analytical Geometry, Statistics.		
AMMAT1B	**Mathematics 1**	*DE0801 DE0811 DE0831 DE0841 DE0851*
NQF Level: *5*	***Credits:*** *10* ***Prerequisites:*** *AMXMA1A; AMXMA2A*	*DE0862 DE0863 DE0864 DE0865*
Binomial expansion, radian measure and limits of functions; Differentiation techniques; Integration techniques; Vectors; Complex numbers.		
APXPH1A	**Foundation Physics 1**	*DE0801 DE0811 DE0831 DE0841 DE0851 DE0862 DE0863 DE0864 DE0865*
NQF Level: *5*	***Credits:*** *10 F*	
Mechanics: Force and Newton's laws; Momentum and impulse; Vertical projectile motion in one dimension; Work, Energy & Power; Doppler effect.		

APXPH2A **Foundation Physics 2** *DE0801 DE0811 DE0831 DE0841 DE0851 DE0862 DE0863 DE0864 DE0865*
NQF Level: *5* ***Credits:*** *10 F*

Electrostatics; Electric circuits; Electrodynamics; Optical phenomena; Properties of materials; Emission and absorption spectra.

APHYS1B **Physics 1** *DE0801 DE0811 DE0831 DE0841 DE0851 DE0862 DE0863 DE0864 DE0865*
NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *APXPH1A; APXPH2A*

Vectors, Forces & Newton's laws; Kinematics in 1 & 2 dimensions; Work-Energy & Impulse-Momentum; Fluids; Temperature & Heat; Waves & Sound; Principle of linear superposition & Interference phenomena; Interference wave nature of light; Reflection and refraction of light in mirror & lenses; Electric Force & Electric Fields; Electric potential & circuits; Nuclear physics and radioactivity.

ECAME1B **Applied Mechanics 1** *DE0811*
NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *AMMAT1B; APHYS1B*

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

ECEDR1B **Engineering Drawing 1** *DE0811*
NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *AMXMA2A; EMXDR1A*

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

EHITC1B **Introduction to Chemical Engineering 1** *DE0801*
NQF Level: *5* ***Credits:*** *12*

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.

EMXDR1A **Foundation Drawing 1** *DE0801 DE0811 DE0831 DE0841 DE0851*
NQF Level: *5* ***Credits:*** *10 F*

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.

EMEDR1B **Drawing 1** *DE0801 DE0811 DE0831 DE0841 DE0851*
NQF Level: *5* ***Credits:*** *10* ***Prerequisite:*** *EMXDR1A*

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.

EMMEC1B **Mechanics 1** *DE0831 DE0841*
NQF Level: *5* ***Credits:*** *10* ***Prerequisites:*** *APXPH1A; APXPH2A*

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.

12.3 ADVANCED DIPLOMA MODULES (ALPHABETICAL PER COURSE)

Course Code	Course Name
AD0400	Operations Management
AD0800	Chemical Engineering
AD0810	Civil Engineering
AD0822	Computer Systems Engineering
AD0823	Electronic Engineering
AD0824	Power Engineering
AD0825	Process Control Engineering
AD0830	Industrial Engineering
AD0840	Mechanical Engineering

Module Code **Module Name** **Courses**
Module Description

OPERATIONS MANAGEMENT

EBFIM4A **Financial Management** *AD0400*
NQF Level: *7* ***Credits:*** *20*

Principles of financial management; Analysing and interpreting financial statements; Budgeting; Capital investment decisions; Risk and return; Risk and management tools.

EBMAS4A **Manufacturing Systems** *AD0400*
NQF Level: *7* ***Credits:*** *20*

This module takes an in-depth look into production systems; Providing the students with an understanding of product development and design activities; Production planning and control methods, as well as the coordination of the entire manufacturing processes.; Hands-on experience in the practical sessions will ensure an understanding of the complexity and challenges of the various production systems; In addition, the module focuses on the practical application of the taught theoretical concepts in industrial companies.

EBMOM4A **Modelling in Operations Management** *AD0400*
NQF Level: *7* ***Credits:*** *20*

Continuous systems: classification of systems, system's abstraction and modelling, types of systems and examples, system variables, input-output system description, system response and analysis of system behaviour; System simulation (computer-aided: Arena software), real-world system examples; Discrete systems: difference equations, numerical simulation of continuous-time dynamics, discrete-event systems, and real-world system examples.

EBQMA4A **Quality Management** *AD0400*
NQF Level: *7* ***Credits:*** *20*

Quality definition; Quality in manufacturing; Foundations of Quality; Customer service, satisfaction, and engagement; Workforce contributions at workplace; Manufacturing process; Tools and techniques for Quality; Design for Quality; Process improvement and Six Sigma.

EBRMO4A **Research Methodology for Operations Management** *AD0400*
NQF Level: *7* ***Credits:*** *20*

Research as a way of thinking and the role of research in product and service industries; Research process or concept map, Identification of research approaches and evaluating research strategies; Formulation of research problems; Research main question and sub-questions; Setting research aim(s) and objectives; Conceptualization and design of research; Critically reviewing literature and secondary data; Types of data: quantitative and qualitative; Constructing an instrument for Data collections; How to select a research sample; Collecting

primary data through experimentation, measurement, observation, interviews and questionnaires; Data management/analysis and data presentation techniques, The writing of research proposal; Writing research report, Research Ethics.

EBSCM4A Supply Chain Management *AD0400*

NQF Level: *7* ***Credits:*** *20*

Purchasing and supply management in perspective; The task of purchasing and supply management; Process and procedures; Policies and strategies; Assessment and selection of suppliers; Sustainable purchasing and supply management; Price and cost analysis; Electronic commerce and procurement applications.

EBWDE4A Workplace Design *AD0400*

NQF Level: *7* ***Credits:*** *20*

Introduction to facilities planning and materials handling; Workplace design and shape, The ergonomic workplace design Product, process, and schedule design; Flow systems, activity relationships, and space requirements; Principles of material handling; Plant layout generation; Warehousing operations; Manufacturing systems and material handling; Facilities systems Quantitative techniques for facilities planning; Evaluating, selecting, and implementing the facilities plan, Improving work performance; Minimizing the physical strain; Designing workload of the working person; Facilitating task execution. Occupational health and safety; Workplace elements.

CHEMICAL ENGINEERING

EHAEM4A Advanced Engineering Mathematics *AD0800*

NQF Level: *7* ***Credits:*** *12*

Least Square method and curve fitting of data, cubic spline problems, approximation of functions interpolation and extrapolation of techniques; forward, backward and central difference, error approximation; derivatives from difference tables; Numerical integration – Newton Cotes Integration technique, Simpson's 1/3rd and 3/8th rule, trapezoidal rule, Gaussian quadrature; Multiple Integral solution of Non-linear equation, bisection methods, regular-falsi method, Newton- Raphson methods, Euler's method, Euler's modified iteration technique, Picaed method, Runge-Kutta 4^{th} order technique, Taylor series method; Solutions of ordinary differential equation (initial and boundary value problem).

EHAPC4A Advanced Process Control *AD0800*

NQF Level: *7* ***Credits:*** *12*

Introduction to Process Control, Control System Hardware, Control and Modelling Philosophies, and Economic Justification of Process Control. Theoretical Models of Chemical Processes or Mathematical Modelling of Chemical Processes. Dynamic Behaviour of Chemical Processes. Analysis and Design of Feedback Control Systems (Closed-loop Control Systems). Analysis and Design of Feed Forward (FF) Control Systems.

EHAPD4A Advanced Process Design *AD0800*

NQF Level: *7* ***Credits:*** *30*

Equipment Design: Design and sizing of most common equipment used in chemical plants: shell & tube exchangers, cooling towers, multicomponent flash drums, distillation columns, absorption columns, catalytic reactors, etc. Chemical Plant Design Aspects: Code of Professional Practice; Process design principles and design objectives; Design Guidelines: Conceptual design, detailed design process, detailed design layout, Operation and Maintenance, Documentation; Safety. Process Flow diagrams (PFD), Process Piping and Instrumentation Diagrams (P&ID's) Hazard and Operability Analysis (HAZOP); Environmental and Sustainability Aspects of Plant Design and Operations: Chemical Plant Emissions (Air Emission. Solid waste, liquid effluent), Environmental Impact Assessment (EIA). Chemical Process Economics: Plant capital costs estimates (detailed factorial method); Operating costs estimates; Economic evaluation: NPV,

IRR, etc. Design Project: Literature survey – evaluation of process and engineering alternatives; Material and Energy balances; Process Flow sheeting – PFD and P&I diagrams; Simulation of a continuous flow process using rigorous simulation packages e.g., CHEMCAD / ASPEN / HYSIM etc.; Equipment design and specifications; Hazards and Operability Study; Environmental considerations, legislation and pollution control; Process economics.

EHARE4A **Advanced Reaction Engineering** *AD0800*

NQF Level: *7* ***Credits:*** *12*

Basic principles, rate controlling steps, Thermodynamic aspects of chemical equilibrium calculations, Intrinsic and Global rates. Heterogeneous reactor design. Non-catalytic and catalytic heterogeneous reaction and reactor design, axial mixing phenomenon, Fluidized bed reactors, Analysis of real reactors. Multiphase flow reactors, Stirred vessel reactors, miscellaneous reactors, Multiphase flow regimes, Gas-liquid, Solid-gas, Gas- solid, liquid-solid reactors, Isothermal and adiabatic fixed bed reactors, Non-isothermal and non-adiabatic fixed bed reactors, fixable bed reactors. Classification, characterization, preparation and application of catalysts, activation & deactivation catalysts, Specific design aspects and the typical industrial reactors with their performance, Reactor stability and optimization, Scale up of reactors.

EHCEL4A **Chemical Engineering Laboratory** *AD0800*

NQF Level: *7* ***Credits:*** *8*

Continuous Distillation: Conduct an energy and material balance around the column, determine the number of theoretical plates using the McCabe-Thiele method, determine the feed location stage. Refrigeration: Observe the effects of high ambient temperature, to observe the effects of a shortage of refrigerant, observe the effects of severely restricted air flow through the condenser, observe the effects of a stopped condenser fan. To observe the effects of hot air over the condenser. Batch Stirred Tank Reactor: determine the reaction order with respect to NaOH, determine the reaction rate constant with respect to NaOH, determine the rate of the chemical reaction. Evaporator: evaluate the mass and energy balances, determine the amount of heat transferred by the steam, determine the steam required (kg/s), determine the overall heat transfer coefficient (U), determine the efficiency (%).

EHFLM4A **Advanced Fluid Mechanics** *AD0800*

NQF Level: *7* ***Credits:*** *12*

Similitude and scale-up applications, Advanced Equations of Fluid Flow (Energy Mass and momentum conservation), Incompressible Flow in Pipes and Channels, Flow of incompressible non- Newtonian fluids in pipes, Flow of Compressible Fluids, Flow of multiphase mixtures, Flow Past Immersed Bodies, Transportation and Metering of Fluids, Agitation and Mixing of Liquids, Introduction to unsteady state flow (laminar flow).

EHHMX4A **Advanced Heat, Mass Transfer and Separation: Mod 1** *AD0800*

NQF Level: *7* ***Credits:*** *10*

Mod 1: Heat Transfer to Fluid without Phase Change, Heat transfer to fluid with a phase change, Radiative heat transfer, Heat-Exchange Equipment, Mass Transfer, Multicomponent distillation, multiple effect evaporation, liquid-liquid extraction, crystallization, drying, adsorption Solid-liquid extraction (leaching), membrane separations and absorption.

EHHMY4A **Advanced Heat, Mass Transfer and Separation: Mod 2** *AD0800*

NQF Level: *7* ***Credits:*** *11*

Mod 2: Heat Transfer to Fluid without Phase Change, Heat transfer to fluid with a phase change, Radiative heat transfer, Heat-Exchange Equipment, Mass Transfer, Multicomponent distillation, multiple effect evaporation, liquid-liquid extraction, crystallization, drying, adsorption Solid-liquid extraction (leaching), membrane separations and absorption.

EHMAN4A **Engineering Management** *AD0800*

NQF Level: *7* ***Credits:*** *7*

Using Operations to Complete. Managing Effective Projects. Developing a Process Strategy. Analysing Processes. Managing Quality. Planning Capacity. Managing Process Constraints. Maintenance and Reliability. Linear Programming Model. Engineering Economics Analysis.

EHRMP4A **Research Methodology and Project** *AD0800*

NQF Level: *7* ***Credits:*** *28*

Identify, describe, and delimit an industrial process problem/research problem, Motivate the need for the project, State specific objectives, Estimate resource requirements, Establish various tasks in project and time frame for each task, Survey relevant sources on the research problem, Write a properly referenced literature survey, Identify and justify relevant theoretical framework and justify choice, Describe and defend methodology, Design and conduct experiments and trials to study the effects of process variables on process operations, analyse, interpret and report results of experiments and trials, write technical reports.

CIVIL ENGINEERING

ECBDC4A **Business Development in the Civil Engineering Environment** *AD0810*

NQF Level: *7* ***Credits:*** *10*

Structure of the South African Economy; Business opportunities in the build environment; SMME and enterprise development; Role of government and programmes in business development; Government and private sector budgeting and funding processes; BBBEE requirements; PPP; business (organisation) models, Ownership, shareholding, etc., Legal requirements, registration; Company taxes; Financial statements and interpretation; Project and company funding methods; Planning and control; Project and company viability / feasibility; Company risks; Insurance.

ECEDE4A **Earthworks Design** *AD0810*

NQF Level: *7* ***Credits:*** *10*

Materials selection; Design and construction of embankments; Design and construction of cuttings; Environmental impact control; Problem soils: Collapsible soils and expansive soils; Compaction equipment and techniques; Other soil improvement techniques.

ECENS4A **Environmental Studies** *AD0810*

NQF Level: *7* ***Credits:*** *10*

To understand the planning and design of a civil engineering project in order to identify potential fatal flaws such as unavailability of technical and scientific information; To demonstrate the knowledge on understanding the Interested and Affected parties (I&APs) of a proposed civil engineering development, during the scoping phase of the EIA; To be able to identify the environmental specialists (geologist, botanist, economist, etc.) needed for a particular civil engineering project or development; To be able to integrate the findings of the environmental specialist with other available information and synthesized into an Environmental Impact Report (EIR); To be able to understand the Authority review and decision making process.

ECHTE4A **Highway and Traffic Engineering** *AD0810*

NQF Level: *7* ***Credits:*** *10*

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.

ECMAT4A **Civil Engineering Materials** *AD0810*

NQF Level: *7* ***Credits:*** *10*

Concrete technology; Asphalt technology; Bitumen technology; Steel technology; Timber technology.

ECMTT4A **Management Tools and Techniques** *AD0810*

NQF Level: *7* ***Credits:*** *10*

Management Tools and Techniques For: Project Integration Management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Human Resource Management, Project Communication Management, Project Risk Management, Project Procurement Management and Project Stakeholder Management.

ECRED4A **Reticulation Design** *AD0810*

NQF Level: *7* ***Credits:*** *10*

Hydraulic principles; Design parameters; Ancillary works; Pumping installations; System operation; Water management; Waste management; Environmental aspects and design project.

ECREM4A **Civil Engineering Research Methodology** *AD0810*

NQF Level: *7* ***Credits:*** *15*

Introduction to Research and the Research Process; Research Ethics and Integrity; Introduction to Quantitative Research, Study Designs and Methods; Analysis and Interpretation of Quantitative Data; Introduction to Qualitative Research; Study Designs and Methods; Analysis and Interpretation of Qualitative Data; Literature survey.

ECREP4A **Civil Engineering Research Project** *AD0810*

NQF Level: *7* ***Credits:*** *15* ***Prerequisites:*** *ECREM4A*

Data collection according to prescribed specifications; Validation of results, discussion and conclusions; and Dissemination of research findings by means of a research report and presentation.

ECRWE4A **Railway Engineering** *AD0810*

NQF Level: *7* ***Credits:*** *10*

Introduction to railways; Functions of railway track components (Signalling, Switches and Crossings; Rail Joints and Welding); Components of Track Structure; Manual and Mechanised Maintenance; Geometric Design of Railways; Railway Safety and Derailment Investigation.

ECSRD4A **Steel and Reinforced Concrete Design** *AD0810*

NQF Level: *7* ***Credits:*** *10*

To design structural steel connections in accordance with SABS 0162-1; To design thin, cold-formed steel structural elements to SANS 10162-2; To design a complete heavy industrial building that incorporates crane gantry girders and composite steel-concrete elements with reference to relevant design codes; To analyse to reinforced concrete elements and structures to determine forces, reactions, stresses and bending moments; To design reinforced concrete slabs (flat, waffle, ribbed and hollow), corbels, deep beams and shear walls; To design silos and water retaining structures; To utilise computer software packages (PROKON and AUTOCAD) for analysis, design and detailing of a design project.

ECSTR4A **Structural Analysis** *AD0810*

NQF Level: *7* ***Credits:*** *10*

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.

ECWWE4A **Water and Wastewater Engineering** *AD0810*

NQF Level: *7* ***Credits:*** *10*

Water and Wastewater Properties; Treatment Processes; Treatment Plant Design; Water Recycling and Reuse; Recovery and Conservation; Environmental Aspects; Plant- Operation and Management.

ELECTRICAL ENGINEERING

AMAEM4A **Advanced Engineering Mathematics** *AD0822 AD0823 AD0824 AD0825*

NQF Level: *7* ***Credits:*** *15*

Mathematical skills using: Applications of integration; Laplace transform; First order differential equations and D-operators and Two-dimensional Laplace equations.

BHEMN4A **Engineering Management** *AD0822 AD0823 AD0824 AD0825*

NQF Level: *7* ***Credits:*** *10*

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

EEAEL4A **Electronics** *AD0823*

NQF Level: *7* ***Credits:*** *20*

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.

EEAMI4A **Microwave Engineering** *AD0823*

NQF Level: *7* ***Credits:*** *20* ***Prerequisite:*** *EEMIC3A*

Apply scientific engineering knowledge to solve microwave transmission lines problems, Geometry, characteristics. Materials selection criteria for substrates, Strip lines, coplanar wave slot line design formulas, Patch, and parabolic dish antenna. Microstrip component: Microwave components and component design, directional couplers. application of CAD knowledge to design and simulate microstrip component, matching a transistor to a load and source impedance. Microwave amplifiers and filters: solid state microwave devices. S- parameters. Design, simulate, and evaluate radio frequency power amplifier, for maximum available gain using S- parameters most applicable in the industry, acquire adequate knowledge and techniques to attain a maximum power transfer in a transmitter. Amplifier design. Determine maximum power transfer to antenna via transmission line. Design for a specific gain. Impedance matching. The design of filters (Chebyshev, Butterworth). Filter design and impedance matching using CAD programmes.

EEAOE4A **Opto-Electronics** *AD0823*

NQF Level: *7* ***Credits:*** *20*

History of Opto-electronics; Transmitting and receiving devices; Manufacturing of cables and connectors; Opto-electronic communication system and Test equipment. Optical Design calculations. Optical Design circuitry.

EEPOW4A **Power Electronics** *AD0824*

NQF Level: *7* ***Credits:*** *20* ***Prerequisite:*** *EEPEL4A*

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

EEPRO4A **Electrical Engineering Project** *AD0823*

NQF Level: *7* ***Credits:*** *25*

Solving an Industrial based IOT project using research methods, electronic interface principles to interface various types of sensors to specific microcontrollers and producing a hardware and software solution. The data from the sensors must be locally displayed as well as through WiFi

on a mobile device. The solution must demonstrate the student's ability to do relevant research on the topics as well as present a final script and poster document.

EERAD4A **Radio Engineering** *AD0823*

NQF Level: *7* ***Credits:*** *20* ***Prerequisite:*** *EERAD3A*

Apply scientific engineering knowledge to solve radio engineering problems. Antennae design: Yagi, stacked dipoles, Stacked Yagis, Industrial application of dipole arrays, ZL special, Slim Jim. Various Omni. Antennae simulation and analysis, Impedance matching of antennae components. Transmission line systems: Determine maximum power transfer to antenna via transmission line and splitters. Determine power delivered to each antenna and individual impedance of each antenna. Receiver: The design of filters (Chebyshev, Butterworth). Filter design and impedance matching using cad programmes. Power filter design and matching. The analysis of a small signal amplifier using various cad programmes. Solve broadly defined small signal amplifier problems. The design of a small signal amplifier using various cad programmes. Small signal amplifier simulations and analysis. Power amplifier transmitters, measurement. Cooling of high-power transmitters, and industrial applications.

EIREM4A **Engineering Research Methods** *AD0822 AD0823 AD0824 AD0825*

NQF Level: *7* ***Credits:*** *15*

Aspects of research: Introduction, importance of research, elements of research, defining research, dimensions of research, what research is not, nature of research and ethical requirements for researchers. Types of Research: Introduction, basic and applied research and research as per discipline or technical group. Sources of topics for scientific research: Introduction, starting point for research, sources of research topics or problems, when a topic is not a research problem and determining the suitability of a research problem. Demarcating of the research problem: Introduction, selecting a subject for research, posing a research problem as statement and steps in problem demarcation and formulation. Formulating a hypothesis: Introduction, defining a hypothesis, inductive and deductive hypothesis, variables and examples of formulated hypothesis. Writing a research proposal: Introduction, defining a research proposal, value of a research proposal, types of research proposals and components of the research proposal.

EICNS4A **Computer Network Security** *AD0822*

NQF Level: *7* ***Credits:*** *20*

Network Security Threats: Fundamental principles, Worms, Viruses and Trojan Horses. Attack methodologies. Securing Network Devices: Device Access and Files, Privilege Levels and CLi. Monitoring Devices. Automated features. Authentication, Authorization and Accounting: Purpose of AAA, Local AAA, Server Based AAA, Implementing Firewall Technologies: Access Control Lists, Firewall Technologies, Context based Access Control, Zone based Policy Firewalls. Intrusion prevention: IPS Technologies, Implementation of IPS.

EIDBA4A **Database Administration** *AD0822*

NQF Level: *7* ***Credits:*** *20*

This module equips students with the essential skills to manage, secure, and optimise relational database systems. It explores database design, performance tuning, data integrity, security, backup and recovery, as well as emerging technologies such as NoSQL and cloud databases. Students gain hands-on experience in administering Microsoft SQL Server and learn to implement strategies that ensure the availability, scalability, and long-term efficiency of enterprise-level database systems.

EIDBP4A **Database Programming** *AD0822*

NQF Level: *7* ***Credits:*** *20*

This module introduces students to relational database design and development using Microsoft SQL Server. It covers core concepts of SQL, database structures, data manipulation, joins, stored

procedures, triggers, and user-defined functions. Students gain practical experience in creating efficient SQL code and developing robust database solutions, preparing them for real-world software engineering environments where database programming plays a key role.

EIINT4A **Industrial Network Systems** *AD0822 AD0825*

NQF Level: *7* ***Credits:*** *20*

The ISA-95 standard and the basic concepts used in the standard. ISA-95 standard functionality, looking at the ISA-95 parts and how it is used. Integration of the ISA-88 and the ISA-95 standards and the comparison of the two models. Using secure architecture for industrial process control systems in ICS Security architecture and the use of the Purdue model for control hierarchy and Enterprise zones. The use of Industrial IOT (IIOT), Plantweb Digital Eco System, Industry 4.0 and the 4th Industrial revolution in process control and mobile process control networking systems.

EIMSD4A **Micro Systems Design** *AD0822*

NQF Level: *7* ***Credits:*** *20* ***Prerequisite:*** *EIDSY3A*

Introduction: Concepts of embedded systems and Internet-of- Things (IoT), Architecture of microcontrollers, three-layered IoT architecture, Hardware platforms - Arduino UNO hardware and Node MCU/ESP8266. Programming IDE (Integrated development environment), Circuit design in electronic design automation (EDA) simulator software. Programming and algorithm design: Embedded system design, Design of algorithms – pseudocode and flow charts, C++ coding; variable and data types, Operators, Flow control statements and loops, functions, libraries and pre- compiler directives. Interfacing and sensors: Interfacing microprocessors to the physical world, Using interrupts and polling, Resistive sensors, analogue and Digital interfaces, Analogue to digital conversion. Serial communication peripheral interfaces: Universal Asynchronous Receiver/Transmitter (UART), Serial Peripheral Interface (SPI), Inter-integrated Circuit (I2C), Interfacing the LCD and custom digital interface - DHT22. Communication layer: Implementation of wireless sensor networks (WSN), The need for energy efficiency in WSN, TCP/IP protocol stack, Network layer, transport layer, lower layer wireless communication protocols; IEEE 802.11, IEEE 802.15.4, Bluetooth low energy and Z-wave. Application layer: Hyper Text Transport Protocol (HTTP) - server and client, Message Queue Telemetry Transport (MQTT)- clients and broker, data logging on the Serial Peripheral Interface Flash File System (SPIFF) and other application layer protocols; CoAP, XMPP and AMQP.

EIPRE4A **Electrical Engineering Project** *AD0822*

NQF Level: *7* ***Credits:*** *25*

Solving an Industrial based IOT project using research methods, electronic interface principles to interface various types of sensors to specific microcontrollers and producing a hardware and software solution. The solution must be interfaced through WiFi technology to the cloud to a database and the information retrieved from the sensors must be displayed on a local designed webpage. The solution must demonstrate the student's ability to do relevant research on the topics as well as present a final script, a poster document and final project demo.

EICIA4A **Circuit Analysis** *AD0823*

NQF Level: *7* ***Credits:*** *20* ***Prerequisite:*** *AMMAT3A*

The practical and conceptual skills building the foundation for understanding First order circuits, Second order circuits, doing Sinusoidal analysis in the time domain. Using Resonance to analyse series resonant circuits and analyse parallel resonant circuits. Using Laplace Network Analysis to calculate the Laplace transform of common time functions and perform Laplace network analysis. Design of second and third order step response.

EIDCS4A **Digital Control Systems** *AD0823 AD0825*

NQF Level: *7* ***Credits:*** *20* ***Prerequisite:*** *AMMAT3A*

The practical and conceptual skills building the foundation for understanding digital process control techniques and processes analysing in depth the principles of Sampled Data Systems,

Transfer Functions, Time Domain Analysis, Stability Analysis, Root Locus Techniques and Digital Controller Design. Design of industrial digital controllers and solving a digital control system industrial based problem.

EIDSP4A **Digital Signal Processing** *AD0823 AD0825*

NQF Level: *7* ***Credits:*** *20* ***Prerequisite:*** *AMMAT3A*

Apply and analyse the basic concepts underlying linear discrete-time systems, Time Domain Analysis, D using Z Transform to determine response of second order circuits with initial conditions and non-zero inputs. Do Frequency Domain Analysis, using Discrete Fourier Transform to determine the frequency spectrum of non-periodic signals and determine the frequency spectrum of periodic signals. Design of Low Pass finite impulse response filters (FIR) and infinite impulse response filters.

EIPRI4A **Process Instrumentation** *AD0825*

NQF Level: *7* ***Credits:*** *20* ***Prerequisite:*** *EIPRI3A*

Working principles of Industrial plants, valves and control valves. Principles of new generation process instruments addressing temperature, level, pressure and flow instruments used in the industrial plants. Wireless process instruments use in modern industrial plants. The use of intrinsic safe and flame proof instrumentation in hazardous and classified areas. The use of safety instrumented systems (SIS) instruments as final protection layer of a basic process control system. Design of and industrial instrumentation and system solution utilising all the above technologies.

EIPRO4A **Electrical Engineering Project** *AD0825*

NQF Level: *7* ***Credits:*** *25*

Solving an Industrial based IOT project using research methods, electronic interface principles to interface various types of sensors to specific microcontrollers and producing a hardware and software solution. The solution must be interfaced through WiFi technology to a mobile application on a mobile device from where the solution must be monitored and controlled. The solution must demonstrate the student's ability to do relevant research on the topics as well as present a final script, a poster document and final project demo.

EISPC4A **Signal Processing** *AD0823*

NQF Level: *7* ***Credits:*** *20* ***Prerequisite:*** *AMMAT3A*

Apply and analyse the basic concepts underlying Signal Spectra, Filter Transmission and Network Analysis. Use filter design techniques and mathematical principles to design Butterworth and Chebychev Filters. Design of a Low Pass Butterworth Filter based on specific system parameters

EPELM4A **Electrical Machines** *AD0824*

NQF Level: *7* ***Credits:*** *20* ***Prerequisite:*** *EPEMA4A*

Synchronous Alternators, Synchronous machines, Induction motors, Design.

EPELP4A **Electrical Protection** *AD0824*

NQF Level: *7* ***Credits:*** *20* ***Prerequisite:*** *EPEPR3A*

Z-bus and symmetrical faults, Symmetrical components and sequence networks, Unsymmetrical faults.

EPEPS4A **Electrical Power Systems** *AD0824*

NQF Level: *7* ***Credits:*** *20* ***Prerequisites:*** *EPEEN4A, EPSYS3A*

Basic concepts, Three-phase Transformers, Synchronous machines: Real and Reactive Power, Series impedance of Transmission Lines, Capacitance of Transmission lines, Current and Voltage regulations on Transmission Lines, Power flow studies, Economic operation of Power Systems.

EPHVE4A **High Voltage Engineering** *AD0824*

NQF Level: *7* ***Credits:*** *20*

Breakdown mechanisms of gasses, liquids and solids, generation of high AC and DC voltages, Generation of Impulse voltages and currents, Measurement of High voltages and currents, High Voltage Testing of electrical equipment, Non-destructive Insulation test techniques.

EPPRO4A **Electrical Engineering Project** *AD0824*

NQF Level: *7* ***Credits:*** *25*

Research Methodology: Introduction to Research methodology, Research topics, Different types of research, All research concepts and outputs, Referencing. Project Proposal: Discussion of the project proposal, Introduction: (Background, Purpose, Problem), Problem statement, Sub problems, Hypothesis, Assumptions, Delimitations, Definition of terms, Importance of the project, Overview of the project and summary. Literature Review: Introduction to literature study, Background of the topic being researched, Relevance of literature used for the study, Evidence of researched literature to address the components of the project, Citations and referenced used with research literature with reference to the VUT referring documentation. Sub-Problem 1 chapter: Introduction relevant to identified sub problem 1, Restatement of what the sub problem 1 is that need to be solved, Restatement of the hypothesis associated with the stated sub problem 1, Theory, relevant laws, fundamentals applicable to the stated sub problem 1, Methods, methodology used as well as what resources used to solve the sub problem1, Results obtained through tests, analysis and interpretation of the obtained data, Discussion of the results (explanations and evaluation of the data obtained), Testing of the hypothesis, Summary of what was discussed in the chapter. Sub-Problem 2 chapter: Introduction relevant to identified sub problem 2, Restatement of what the sub problem 2 is that need to be solved, Restatement of the hypothesis associated with the stated sub problem 2, Theory, relevant laws, fundamentals applicable to the stated sub problem 2, Methods, methodology used as well as what resources used to solve the sub problem2, Results obtained through tests, analysis and interpretation of the obtained data, Discussion of the results (explanations and evaluation of the data obtained), Testing of the hypothesis, Summary of what was discussed in the chapter. Final chapter: Summary of the identified problem statement and sub problems, Findings and deductions, Meaning and implications of the research that was conducted, Re-assessment of the original identified problems, Recommendations, Fields for further studies Final project demonstration: Presentation of the identified problem and sub problems, technologies used and how was the final solution obtained, Final project hardware layout, Demonstration of the solution, Questions and answers (Moderator/Examiners).

INDUSTRIAL ENGINEERING

EBFPD4A **Facility Planning and Design** *AD0830*

NQF Level: *7* ***Credits:*** *20*

Introduction to facility planning and material handling; Product, process and schedule design; Flow systems, activity relationships and space requirements; Principles of material handling; Plant layout generation; Warehouse operations; Manufacturing systems and material handling; Facilities systems; Quantitative techniques for facility planning; Evaluating, selecting, and implementing the facilities plan.

EBHFE4A **Human Factors and Ergonomics** *AD0830*

NQF Level: *7* ***Credits:*** *20*

Ergonomics; Human factors; Work design; Method study; Work measurement; Health and safety including healthcare; Enterprise applications.

EBIEM4A **Industrial Engineering Management** *AD0830*

NQF Level: *7* ***Credits:*** *20*

This module takes an in-depth look into the managerial systems in the working environments; Providing the students with understanding of managerial principles and practice in internal and external working environments; The various challenges face by managers in today's manufacturing/working environments, and way forward; An approach and models for decision making and problem solving; In addition, the module focuses on the Industrial engineering managerial principles in managing operation, Quality and Crisis management. The topics covered include, amongst others: Introduction to Management Practice, Managing in organizations, Model of management, Managing internationally, Cooperate responsibility and employability skills, Planning, Decision making, Managing strategy, Managing marketing, Organizational structure, Creativity, Innovation and change, Teams, Managing operation and quality, Control and performance measurement.

EBMOS4A **Modelling and Simulation** *AD0830*

NQF Level: *7* ***Credits:*** *20*

Continuous systems: classification of systems, system's abstraction and modelling, types of systems and examples, system variables, input-output system description, system response and analysis of system behaviour; System simulation (computer-aided: Arena software), real-world system examples; Discrete systems: difference equations, numerical simulation of continuous-time dynamics, discrete-event systems, and real-world system examples.

EBMPS4A **Manufacturing and Production Science** *AD0830*

NQF Level: *7* ***Credits:*** *20*

Introduction and Basic Principles; Generalized Additive Manufacturing Process Chain; Extrusion Based Systems; The Impact of Low-Cost AM Systems Guidelines for Process Selection; Post-Processing; Development of Additive Manufacturing Technology; Business Opportunities and Future Directions; Automated Inspection, Renewable Energy & CAD/CAM; Software Issues for Additive Manufacturing; Direct Digital Manufacturing; Design for Additive Manufacturing; Rapid Tooling; Applications for Additive Manufacture; Final Additive Manufacturing Project.

EBQIC4A **Quality Control and Improvement** *AD0830*

NQF Level: *7* ***Credits:*** *20*

Trilogy of quality processes; Fundamentals and principles of quality assurance; Use of engineering statistics in reducing product variation; International standards for quality/quality management systems; Use of lean Six Sigma in reducing waste and/or reduction of process or product variation; Process design and/or Design of experiments to design robust processes and products; Reliability engineering and product safety concepts; TQM management and concepts; Inspection and testing; Quality audits.

EBRMI4A **Research Methods and Industrial Engineering Project** *AD0830*

NQF Level: *7* ***Credits:*** *20*

Research as a way of thinking and the role of research in product and service industries; Research process or concept map, Identification of research approaches and evaluating research strategies; Formulation of research problems; Research main question and sub-questions; Setting research aim(s) and objectives; Conceptualization and design of research; Critically reviewing literature and secondary data; Types of data: quantitative and qualitative; Constructing an instrument for Data collections; How to select a research sample; Collecting primary data through experimentation, measurement, observation, interviews and questionnaires; Data management/analysis and data presentation techniques, The writing of research proposal; Writing research report, Research Ethics.

MECHANICAL ENGINEERING

AMMAT4B **Applied Engineering Mathematics** *AD0840*

NQF Level: *7* ***Credits:*** *15*

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; Apply the solution techniques in polar; Cylindrical and spherical co-ordinates to mechanical engineering problems.

EMECN4A **Engineering Economics** *AD0840*

NQF Level: *7* ***Credits:*** *10*

Explain financial statements and perform ratio analysis, cost control and its application; Classify and distribute overheads, depreciation, perform depreciation calculations, determine the effects of overheads to production cost; Apply standard costing and its utility variances, budgetary control, marginal costing to production; Explain the significance of waste extraction, waste recovery in relation to engineering costing.

EMEPR4A **Engineering Professionalism** *AD0840*

NQF Level: *7* ***Credits:*** *10*

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.

EMHMT4A **Heat and Mass Transfer** *AD0840*

NQF Level: *7* ***Credits:*** *15*

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.

EMMTS4A **Material Science** *AD0840*

NQF Level: *7* ***Credits:*** *15*

Identify different types of engineering materials; Processes that enhance their properties, selection and their uses.

EMRMD4A **Research Methods and Engineering Design Project** *AD0840*

NQF Level: *7* ***Credits:*** *30*

The student will be guided to: identify a mechanical engineering design problem, set the objectives, develop the methodology, determine the project plan, determine the budgetary constraints of the project, systematically develop a solution using a step-by-step scientific approach, and present the solution in a scientifically written design project report to a panel of assessors.

EMSMS4A **Solid Mechanics and Stress Analysis** *AD0840*

NQF Level: *7* ***Credits:*** *15*

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.

EMTFM4A **Thermo-Fluids and Turbo Machinery** *AD0840*

NQF Level: *7* ***Credits:*** *15*

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.

EMVCE4A **Vibration and Control Engineering** *AD0840*

NQF Level: *7* ***Credits:*** *15*

This module introduces students to the theory and practice of control systems engineering, by emphasizing on the practical application of the subject to the analysis and design of feedback systems. It enables the student to develop representative models of real vibrating systems, to determine and control the dynamic systems performance and behaviour parameters under a given set of constraints.

METALLURGICAL ENGINEERING

AMMAT3A **Mathematics 3** *AD0850*

NQF Level: *7* ***Credits:*** *10*

Application of Integration: Volumes of solids of revolution, Length of Curves, Double Integration. First Order Differentiation Equations: Exact DE, Homogeneous DE, Bernoulli DE, Applications.; Numerical Solutions of First Order Differential Equations: Euler's method, Runge-Kutta order 2, Runge-Kutta order 4. D-Operator Methods: complementary function; Complementary function higher than second order; D-operator & inverse, binomial or long division method; Theorem 1; Theorem 2; Theorem 3; Special cases; General solutions; Applications. Laplace Transforms: Table of transforms; First shifting property; Transforms of step functions: Heaviside; Inverse Laplace Transforms using tables; Solution of differential equations; Application to mechanics; Application to electric circuits; Application to beams. Fourier Series: Periodic functions and harmonics, sketching of graphs; Important integrals; Formulae for series with period 2π; Formulae for series with period $2l$; Even and odd; half-range; Numerical harmonic analysis.

EBQCO3A **Quality Control 3** *AD0850*

NQF Level: *7* ***Credits:*** *10*

Introduction; Different philosophies; Quality cost; Quality control and Quality improvement. Acceptance quality control: Inspection and testing; Measurement and acceptance sampling and Special quality experiments.

EYHYD4A **Hydrometallurgy 4** *AD0850*

NQF Level: *7* ***Credits:*** *20*

Revision of background process thermodynamics; leaching rates; winning and recovery processes - ion exchange, solvent extraction, cementation, electrowinning; applications in extraction of copper, gold, platinum group metals, titanium, lead, zinc and uranium (primary minerals, occurrences, leaching chemistry, flowsheet, existing plants); quantitative analyses.

EYMAM4A **Manufacturing Metallurgy 4** *AD0850*

NQF Level: *7* ***Credits:*** *20*

Manufacturing Processes. Additive manufacturing (e.g., 3-D printing). Computer Integrated Manufacturing and Automation (e.g., in welding processes). Nanomanufacturing. Sustainable Manufacturing. Case studies.

EYMIP4A **Mineral Processing 4** *AD0850*

NQF Level: *7* ***Credits:*** *20*

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.

EYPME4A **Physical Metallurgy 4** *AD0850*

NQF Level: *7* ***Credits:*** *20*

Production Metallurgy and applications of cast irons, non-ferrous alloys (Al, Ti, Mg, Cu, Ni). The physical metallurgy of light alloys (e.g. Al, Ti, Mg alloys), superalloys (Ni and PGMs), smart alloys (NiTi alloys), hard materials (WC-Co, hard steels), Ceramic materials (structural, electrical,

energy storage) and their processing technology. Advanced physical metallurgy of low alloy C steels and stainless steels.

EYPRO4A **Metallurgical Research Methods and Project 4** *AD0850*

NQF Level: *7* ***Credits:*** *20*

Introduction to research methodology in Metallurgical Engineering. Laboratory safety. Generation of empirical data. Reporting of data. Interpretation of data. Report writing. Oral presentations.

EYPYR4A **Pyrometallurgy 4** *AD0850*

NQF Level: *7* ***Credits:*** *20*

Electric arc steel making. Conventional and continuous casting of steel. Monolithic refractory materials. Manufacturing techniques and properties expected from plastic-, castable- and all relevant monolithic refractories. Mass balances, thermodynamics and basic electro refining calculations over typical plants. The pyrometallurgy of vanadium, titanium and platinum.

12.4 POSTGRADUATE DIPLOMA MODULES (ALPHABETICAL PER COURSE)

Course Code	Course Name
PG0400	Operations Management
PG0800	Chemical Engineering
PG0810	Civil Engineering
PG0821	Alternative Energy
PG0822	Computer Systems Engineering
PG0823	Electronic Engineering
PG0824	Power Engineering
PG0825	Process Control and Instrumentation Engineering
PG0830	Industrial Engineering
PG0840	Mechanical Engineering
PG0850	Metallurgical Engineering

Module Code **Module Name** **Courses**
Module Description

OPERATIONS MANAGEMENT

EBAIM5A **Advanced Industrial Management** *PG0400*
***NQF Level:** 8* ***Credits:** 20*

Business strategic formulation process; internal and macro- environmental assessments; Industry assessment; Selection of best business strategy; Implementation of business strategy and managing change; Components of successful strategy implementation; Short-term objectives, functional tasks and policies; strategic control and evaluation; strategic leadership and governance.

EBAMA5A **Advanced Manufacturing Systems** *PG0400*
***NQF Level:** 8* ***Credits:** 20*

Industry 4.0/smart factory; Programmable Logic Control (PLC) programming; Internet of Things (IoT) Technology; Robotics programming; Computer Numerical Control (CNC) Programming.

EBAMO5A **Advanced Modelling in Operations Management** *PG0400*
***NQF Level:** 8* ***Credits:** 20*

Introduction to discrete event simulation; Simulation project methodology, event calendar and implications; Advanced statistic distributions; Making decisions with simulation; Introduction to advanced modelling techniques; Modelling material handling devices; Conveyor modelling; Continuous systems; Discrete systems; System simulation software, real-world system examples.

EBOPI5A **Operations Management Project Design and Implementation** *PG0400*
***NQF Level:** 8* ***Credits:** 30*

Product design; Process Design; Field survey; Workshop design; Emphasizing project design and implementation from an organisational perspective by acquiring data and validating the relationship between the project and the overall strategy of the organisation (governance); Investigating real-live operations management cases.

EBOPP5A **Operations Management Project Planning and Design** *PG0400*
***NQF Level:** 8* ***Credits:** 30*

Overview of the project cycle; Starting, organising and preparing a project; Dealing with ethical dilemmas, Project quality management; Preparing the capstone project; Planning, project organisation, financial control, controlling and leading projects within the operations management environment; Investigating real-life cases from industry.

CHEMICAL ENGINEERING

EHBIX5A **Bioprocess Engineering** *(Bioprocessing Option)* *PG0800*

***NQF Level:** 8* ***Credits:** 10*

Introduction to bioprocess engineering; Calculations, Presentation and Analysis of Data; Material and Energy Balances, hydrodynamics and mixing; Structure and Biology of Cells: Prokaryotic, Eukaryotic; Cell types: Bacteria, Yeasts, Molds, Algae, Protozoa, Animal & Plant Cells; Structure and function of bio- molecules: lipids, proteins, carbohydrates (sugars & polysaccharides), nucleic acids, hybrid bio-chemicals; Kinetics of Enzyme-Catalysed reactions and Applied Enzyme Catalysis: Mechanistic models, Michaelis-Menten Equation to determine rate parameters; Immobilised systems.

EHBIY5A **Bioprocess Engineering II (***Bioprocessing Option)* *PG0800*

***NQF Level:** 8* ***Credits:** 10*

Fermentation (Process Design and Optimisation) – Foods and beverages, Amino Acids, Organic feedstocks, Organic acids, Vitamins, Antibiotics, Single-cell proteins; Design and Analysis of Bioreactors: Batch, Continuous and Plug-Flow Reactors, Dynamic models, stability, non-ideal processes, Sterilisation, Immobilised Biocatalysts and Multiphase systems, Bioreactor scale-up, Instrumentation and Control, Bio-process economics.

EHPDX5A **Chemical Process Design I** *PG0800*

***NQF Level:** 8* ***Credits:** 15*

Process synthesis philosophy of integrated process synthesis; Integrated process synthesis with process mass and energy balance targets; Process based flow sheet synthesis; Application of transport processes: mass, heat and momentum transfer; Application of reacting systems; Introduction to renewable resources and integration of renewable energy with industrial processes; Heat and mass integration - designing for maximum energy recovery and wastewater minimization.

EHPDY5A **Chemical Process Design II** *PG0800*

***NQF Level:** 8* ***Credits:** 15*

Introduction to Computational Modelling; Discrete modelling of process systems; Solution methods for discrete optimization problems: Process synthesis using implicit enumeration; Algorithmic approaches to synthesis of sustainable systems: heat exchanger networks; Process synthesis under uncertainty; Flexibility analysis; Computer based modelling, simulation and optimisation of integrated processes using ChemCad; Advanced process economics; Process engineering in the green economy.

EHPEX5A **Environmental Engineering I** *PG0800*

***NQF Level:** 8* ***Credits:** 15*

Conventional and advanced water treatment techniques; Local and international environmental regulations for a chemical industry; environmental impact assessment of a chemical process; environmental economics; design of sampling and assessment tools; indicators of ecological integrity; environmental risk assessment and management; policy decision- making; impact assessment and environmental audit; national and international air pollution regulations; Source and propagation of water, air and land pollutants; modelling of diurnal and seasonal pollution dispersion; quantification methods for pollutants; Conventional and advanced treatment techniques for industrial wastewater from petrochemical, mining and energy industries; Air pollution control in petrochemical, mining and energy industries; Causes of land pollution such as agricultural chemicals, industrialisation, mining, landfills, human sewage; Effects of land pollution and prevention and mitigation strategies.

EHPEY5A **Environmental Engineering II** *PG0800*

NQF Level: *8* ***Credits:*** *15*

Primary, secondary and advanced wastewater treatment and other methods such as activated carbon adsorption; membrane separation; ozonolysis, photodegradation; enhanced coagulation; heavy metal removal, chemical precipitation; neutralization; oxidation-reduction; desalination processes; ion exchange. Composition and characterization of sewage; Basic design principles of sewage treatment systems; Sludge handling and treatment; simulation software for wastewater treatment processes; Simulation and modelling tool to design and optimized the performance of wastewater treatment systems.

EHPRM5A **Research Project (Chemical Engineering)** *PG0800*

NQF Level: *8* ***Credits:*** *40*

Perform critical review of the published literature in areas appropriate to the area of the research and identify and apply relevant theories to the problem. Record and analyse experimental data. Draw appropriate conclusions from the results. Discuss the purpose of a research project and its significance in relation to relevant previous work reported in literature. Communicate/Convey the work and its outcomes in a variety of formats – report, poster and academic paper. Carry out/Do literature search using library and IT facilities to identify knowledge gaps.

CIVIL ENGINEERING

ECEEN5A **Environmental Engineering** *PG0810*

NQF Level: *8* ***Credits:*** *10*

Water Resources management; Climate Change; Environmental Engineering Problems, their Causes and sustainability; Engineered Environmental systems; Renewable and Non-Renewable Energy; Green Engineering.

ECGTE5A **Geotechnical Engineering** *PG0810*

NQF Level: *8* ***Credits:*** *20*

Soil mechanics relating to foundations; Types of foundations and their applications; Shallow foundations; Mat foundations; Pile foundations; Drilled-piers and caisson foundations; Foundations on problem soils; Lateral earth support; Kinematics and Strain; Stress in soils; Governing Equations of Continua; Infinitesimal Elasticity Constitutive Theory; Poro-elastic Theory; Introduction to Finite Element Methods; Strong form, weak form of governing equations; element formulations; Iso-parametric Elements and Gauss Integration.

ECPMC5A **Project and Construction Management** *PG0810*

NQF Level: *8* ***Credits:*** *10*

Project management theory and requirements. The project and construction stages; Types of contracts, contract documentation and conditions of contract; Procurement processes and requirements; government development and social objectives (requirements); Estimating and tendering; Site inspection, site overheads; pre-constructing planning – site layout and organization, construction programme, etc.; Plan and keeping within time and budget, managing delays, disputes and on-site problems; Manage quality control, complying with health and safety; communication with stakeholders; managing material and equipment; payments and claims; handover and closing out.

ECRPX5A **Research Project in Civil Engineering (Module 1)** *PG0810*

NQF Level: *8* ***Credits:*** *15*

The concept and philosophy of research; Research topic; Identify and define a project title; Objectives, Research problem and problem statement, Hypothesis statement and Research proposal; Data bases; Categories of journals; Impact factor; Hirsch Index; Proposal writing (detailed analysis); Relevance of research to society; Time management; Effective technical communication; Research proposal for project funding; Plagiarism.

ECRPY5A **Research Project in Civil Engineering (Module 2)** *PG0810*

NQF Level: *8* ***Credits:*** *25* ***Prerequisite:*** *ECRPX5A*

Experimental design, Thesis writing, Data interpretation and analysis: Data capture and validation; Copyright and plagiarism; Fundamentals of research project management; Presentation.

ECSTE5A **Structural Engineering** *PG0810*

NQF Level: *8* ***Credits:*** *20*

Analysis of plates and simple shells; Introduction to structural dynamic; Plastic analysis of beams and frames; Yield line analysis of slabs; Properties of fresh (rheology) and hardened (mechanical and durability) concrete; Sustainable concrete (concrete and environment); laboratory practical; Investigational project.

ECTEN5A **Transportation Engineering** *PG0810*

NQF Level: *8* ***Credits:*** *20*

Transport models; Travel demand analysis and Transport policy; Traffic Design; Geometric Design & Safety and Pavement Design & Maintenance.

ECWEN5A **Water Engineering** *PG0810*

NQF Level: *8* ***Credits:*** *20*

Hydrodynamic principles to solve complex problems on static and moving fluids; Operating principles of hydraulic machinery in the design of pumping stations, structures for surge protection and hydropower plants; Complex problems on varied flow in channels; Hydraulic structures design such as culverts, stilling basins and drop structures; Groundwater and surface water resources for resources planning; Water demand through reservoir design and operation; Integrated water resources management.

ELECTRICAL ENGINEERING

EAAMT5A **Advanced Measurement Technology** *PG0823*

NQF Level: *8* ***Credits:*** *25*

The module will focus on: Intelligent metering systems, Propagation losses, Load management, Data acquisition, Energy consumption patterns, Global positioning system, Harmonic distortion in electrical systems.

EAERP5A **Engineering Research Project** *PG0821*

NQF Level: *8* ***Credits:*** *30*

The subject Engineering Research Project will contribute to and equip students with a sound knowledge base in the field of electrical engineering and the ability to apply knowledge and skills to be utilised in a particular career or profession. This module will focus on: Project Identification; Project proposal; Literature study; Conceptual design; Functional design; Implementation; Testing and data analysis; Oral presentation and Documentation.

EEAEF5A **Alternative Energy Feasibility** *PG0821 PG0823 PG0824*

NQF Level: *8* ***Credits:*** *25*

The purpose of the module "Alternative Energy Feasibility" for a Postgraduate Diploma is to provide students with a comprehensive understanding of alternative energy sources and technologies. This module aims to equip students with the knowledge and skills needed to evaluate, develop, and implement sustainable energy solutions. Resource availability, Cost, Environmental impact, Policy and Regulations, and Energy Storage. By evaluating these factors comprehensively, stakeholders can make informed decisions about the feasibility and potential of alternative energy sources in specific contexts. The successful student will meet the intended learning outcomes (ILO) of the subject.

EEEMA5A **Energy Management** *PG0821 PG0823 PG0824*

***NQF Level:** 8* ***Credits:** 25*

Energy management is the systematic process of tracking, regulating, and preserving energy inside any organization. It involves a systematic approach to assist an organisation to improve energy performance, reduce energy consumption, and lower energy costs. A collection of instruments, procedures, and technological advancements used to track, regulate, and maximize an enterprise's energy usage is called an Energy Management System (EMS). An EMS aids businesses in methodically enhancing their energy performance and is generally built around the ISO 50001 standard. The knowledge areas will include standards, policies, procedures, and processes for effectively managing energy use and improving energy performance, power quality management, measurement and verification and different industrial energy management systems.

EEERP5A **Engineering Research Project** *PG0823*

***NQF Level:** 8* ***Credits:** 30*

The subject Engineering Research Project will contribute to and equip students with a sound knowledge base in the field of electrical engineering and the ability to apply knowledge and skills to be utilised in a particular career or profession. This module's focus will include: Project Identification; Project proposal; Literature study; Conceptual design; Functional design; Implementation; Testing and data analysis; Oral presentation and Documentation.

EEPOS5A **Power Systems** *PG0824*

***NQF Level:** 8* ***Credits:** 25*

The module discusses power system protection requirements, design characteristics for transmission lines and power transformers. Protection zones. Protection of transmission lines and power transformers. The perspective of protection in a smart grid system, including renewable and distributed generation. Withstand High Voltage tests for AC, DC and Impulse.

EERST5A **Research Statistics** *PG0821 PG0822 PG0823 PG0824*

***NQF Level:** 8* ***Credits:** 15*

Statistical concepts are discussed and applied to model and solve engineering problems. Statistical methods such as probability, hypothesis testing, regression analysis and cluster analysis are discussed. Statistical data mining and analysis techniques, data Interpretation techniques and data visualization and mathematical modelling techniques are investigated. Processes of data mining will include data selection cleaning and coding using statistical pattern recognition and machine learning techniques. Machine learning algorithms such as logistics regression, k-nearest neighbour, support vector machine are applied in solving complex engineering problems. The course delivery will comprise of tutorials, assignments and projects.

EICDD5A **Advanced DCS and Safety Systems Engineering** *PG0825*

***NQF Level:** 8* ***Credits:** 25*

The module will focus on the IEC 61508 and IEC 6151 safety standards that are used to design plant safety systems and to interface the Smart safety system to Basic plant control systems (BPCS). Integration protocols such as Modbus TCP, OPC, and OPC.net will be addressed to do transparently, and independently integration between BPCS and SIS. An In depth look into Safety Systems design will be done with reference to SIL ratings of final element shutdown equipment and interfacing to fire and gas detection systems to enable proper plant shutdown during a plant emergency.

EICNC5A **Smart Industrial Network Control** *PG0825*

***NQF Level:** 8* ***Credits:** 25*

Introduction to WirelessHart® and Industrial Wi-Fi™ technologies. The technologies address Wireless Plant Network Overall Topologies as per the ISA95 model, field instrumentation integration and plant operation applications. It also addresses Wireless Plant Network Security,

Wireless defence in depth, control access to the network, protecting the network and ensuring client integrity. Jamming, eavesdropping, detection and replay attacks, man in the middle, Sybil attack is introduced as they have certain effects on Smart Wireless field instrumentation

EICPI5A **Advanced Process Instrumentation Systems** *PG0825*

NQF Level: *8* ***Credits:*** *25*

On successful completion of the subject Advanced Process Instrumentation Systems, the student will be able to: Design and configure a PlantWeb™ digital ecosystem; Manage IIoT security challenges within the Azure and IoT Cloud; Utilize PlantWeb™ Insight applications to deliver fast ROI and provide a low-barrier entry point to the Industrial Internet of Things; Utilize Health Advisor and Performance Advisor round out portfolio to help customers increase reliability, efficiency, safety and reduce energy consumption and emissions; Use the holistic PlantWeb™ monitoring platform to improve reliability and plant availability; Configure and use mobile plant and business access to role-based tools, analytics and dashboards; Cloud-based technologies enable remote systems to continuously monitor plant assets and processes and generate actionable data to optimize operational performance; Utilize and configure Microsoft Azure and IoT Cloud.

EICRP5A **Engineering Research Project** *PG0825*

NQF Level: *8* ***Credits:*** *30*

See EAERP5A above.

EICSD5A **Process Control System Design and Development** *PG0825*

NQF Level: *8* ***Credits:*** *25*

By doing the subject Process Control System Design and Development the student will gain knowledge that can be used by applying engineering principles to systematically diagnose and solve ill-defined electrical engineering problems (disciplinary or cross-disciplinary). The knowledge that the student will gain, will be focused on: Introduction to new technological design features that will be used for optimizing the different features in a basic plant control system; Advanced control systems that will address control loop performance monitoring and tuning; Close loop adaptive PID control; Fuzzy for no-linear loop control; Neural online soft sensor for non-linear property estimation and multi-variable model predictive control (MPC) and optimization; Advanced control system elements will be used as an effective tool in optimizing operations; Reliability, and quality in an industrial plant environment.

EISES5A **Emerging Systems** *PG0822*

NQF Level: *8* ***Credits:*** *25*

By doing the subject Emerging Systems the student will gain knowledge that can be used by applying engineering principles to systematically diagnose and solve ill-defined electrical engineering problems (disciplinary or cross-disciplinary). The knowledge that the student will gain, will be focused on: This module addresses: New and emerging systems in the Computer Systems Engineering environment; New and Emerging Systems and Developing Platforms; Techniques and Tools. The subject Emerging Systems will contribute to and equip students with a sound knowledge based in the field of electrical engineering and the ability to apply knowledge and skills to be utilised in a particular career or profession.

EISIS5A **Intelligent Systems** *PG0822*

NQF Level: *8* ***Credits:*** *25*

By doing the subject Intelligent Systems the student will gain knowledge that can be used by applying engineering principles to systematically diagnose and solve ill-defined electrical engineering problems (disciplinary or cross-disciplinary). The knowledge that the student will gain, will be focused on: This module addresses: Artificial intelligence in the Computer Systems Engineering environment; Perspectives on the theory and application of systems that perceive,

reason, learn, and act intelligently as they serve many different professionals in a broad range of fields.

EISRP5A **Engineering Research Project** *PG0822*
***NQF Level:** 8* ***Credits:** 30*
See EAERP5A above

EISSS5A **Computer Systems Security** *PG0822*
***NQF Level:** 8* ***Credits:** 25*
Address Advance Security Concepts. Identity management/secure access, Threat defence, Troubleshooting security Systems, Monitoring and reporting tools, Threat defence architectures, Identity management architectures.

EPERP5A **Engineering Research Project** *PG0824*
***NQF Level:** 8* ***Credits:** 30*
The engineering research project consists of identifying, formulating, analysing, and solving complex electrical engineering problems creatively and innovatively, conducting investigations of complex or ill-defined electrical engineering-related problems, engaging with the research literature, and using research methods including the design of experiments, analysis, interpretation of data, and synthesis of information to provide valid conclusions. Use and implement appropriate techniques, resources, and modern engineering tools, including information technology, prediction, and modelling, to solve complex engineering problems, with an understanding of the limitations, restrictions, premises, assumptions and constraints.

INDUSTRIAL ENGINEERING

EBADA5A **Advanced Decision Analysis** *PG0830*
***NQF Level:** 8* ***Credits:** 20*
Introduction to decision analysis, modelling and decision making, decision analysis and probability; Benchmarking, modelling of preferences and experts' values; Structuring decision problems and measuring uncertainties; Modelling uncertainty and multi-attribute models; Structuring and building of decision trees; Conditional probabilities, sensitivity and specificity probabilistic risk assessment, likelihood ratios; Root cause analysis; Dynamic modelling basics; Stochastic cohort models and microsimulation models.

EBAMS5A **Advanced Modelling and Simulation** *PG0830*
***NQF Level:** 8* ***Credits:** 20*
Introduction to discrete event simulation; Simulation project methodology, event calendar and implications; Advanced statistic distributions; Making decisions with simulation; Introduction to advanced modelling techniques; Modelling material handling devices; Conveyor modelling; Continuous systems; Discrete systems; System simulation software, real-world system examples.

EBIPI5A **Industrial Engineering Project Design and Implementation** *PG0830*
***NQF Level:** 8* ***Credits:** 30*
Product design; Process Design; Field survey; Workshop design; Emphasizing project design and implementation from an organisational perspective by acquiring data and validating the relationship between the project and the overall strategy of the organisation (governance); Investigating real-live cases from industry.

EBIPP5A **Industrial Engineering Project Planning and Design** *PG0830*
***NQF Level:** 8* ***Credits:** 30*
Overview of the project cycle; Starting, organising and preparing a project; Dealing with ethical dilemmas, Project quality management; Preparing the capstone project; Planning, project organisation, financial control, controlling and leading projects within the industrial environment; Investigating real-life cases from industry.

EBMPE5A **Manufacturing and Production Engineering** *PG0830*

NQF Level: *8* ***Credits:*** *20*

Industry 4.0/smart factory; Programmable Logic Control (PLC) programming; Internet of Things (IoT) Technology; Robotics programming; Computer Numerical Control (CNC) Programming.

EBPRE5A **Project Engineering** *PG0830*

NQF Level: *8* ***Credits:*** *20*

Introduction to project engineering; Project charter and preliminary scope statement; Develop project scope; Work breakdown structure and communication plan; Risk planning and management; Project quality management; Project team development; Measuring and controlling team performance; Managing participation, teamwork and conflict; Monitoring and control change; Controlling work results and closing out the project.

MECHANICAL ENGINEERING

AMMAT5B **Advanced Engineering Mathematics** *PG0840*

NQF Level: *8* ***Credits:*** *15*

The purpose of this module is to provide participants with the skills, knowledge and attitudes required to further extend the concepts learned in Advanced Mathematics 1 to include the topics of Integral Calculus, Complex Numbers, Differential Equations, Statistics and Linear Algebra. The module aims to show the relevance of mathematics to engineering and applied science. This module, in conjunction with Applied Engineering Mathematics, also facilitates articulation to Degree courses in all streams of Engineering and forms a basis for more specialist branches of mathematics.

EMARM5A **Applied Research Methodology in Mechanical Engineering** *PG0840*

NQF Level: *8* ***Credits:*** *30*

This module offers students a clear understanding of research methodologies, sourcing and interpretation of researched topics, how to explain research work done in seminar presentations, and the compilation of a technical report on the selected topic.

EMCME5A **Continuum Mechanics** *PG0840*

NQF Level: *8* ***Credits:*** *15*

This module offers an in-depth clear understanding of the tensor notation, three-dimensional stress strain relationships, Stress strain law in elasticity, and Stress functions in the determination of principal stresses, principal planes and their principal directions. Analysis of the kinematic and mechanical behaviour of materials modelled on a continuum assumption. Development of the constitutive equations to characterise the behaviour of specific ideal materials, which are homogeneous and isotropic in nature.

EMEMX5A **Engineering Modelling and Simulations Module 1** *PG0840*

NQF Level: *8* ***Credits:*** *15*

The module is aimed at identifying simple mechanical engineering systems to build representative analytical models for simulating their behaviour and system characteristics using computational techniques. It identifies and models simple fundamental laws and principles in which mechanical engineering systems are operating and their physical activities.

EMEMY5A **Engineering Modelling and Simulations Module 2** *PG0840*

NQF Level: *8* ***Credits:*** *15*

This course examines a variety of engineering system modelling and simulation methods, as well as numerical and computer-based solution techniques utilized in industrial and engineering environments. Techniques for finding solutions to these systems include graphical, algebraic, numerical, state space, simulation and computational processes. Case studies in industry and engineering applications are used to illustrate the techniques and modelling concepts. Examples

of simulation and analysis methods will be related to the linear and non-linear, deterministic and non-deterministic systems.

EMENS5A **Energy Systems** *PG0840*
NQF Level: *8* ***Credits:*** *15*

The module enables students to identify, discuss and evaluate different energy systems, old and new technologies. Also included is a study of mechanisms and processes for cycles and system integration, the sizing of plant components for required output, what they cost, and what is their benefit or impact (plus mitigation strategies) on the natural environment. The module also enables student to proffer solutions to a given energy demand scenario using the Thermoptim software.

EMMAM5A **Maintenance Management** *PG0840*
NQF Level: *8* ***Credits:*** *7*

Requires managerial experience in business practice in the maintenance environment. It will provide the understanding of the principles, ethics, and skills to manage maintenance activities in organizations, under different organizational circumstances.

EMPME5A **Production and Manufacturing** *PG0840*
NQF Level: *8* ***Credits:*** *8*

The purpose of this module is to enable the student to understand the concepts of production and manufacturing, and to apply the knowledge in designing of appropriate manufacturing systems for optimal productivity. This module will give student in-depth knowledge of how to use Hand and Power tools effectively. More so, the module gives a practical introduction to what can be a very complex subject, and significant update and revised to include new material on current health and safety legislation, gauging and digital measuring instruments as well as modern measuring techniques such as laser scan micrometre, co-ordinate and visual measuring systems.

METALLURGICAL ENGINEERING

EYHMT5A **Heat and Mass Transfer** *PG0850*
NQF Level: *8* ***Credits:*** *10*

Distinguish between the mechanisms of heat transfer modes, derive suitable heat loss equations for different situations. Determine temperature distributions, heat losses, analyse heat flow resistances and discuss heat source systems. Compare flow patterns between objects at different angles, explain advantages of insulation layers and calculate the thickness. Interpret mechanisms of radiation, types of bodies, emissivity and apply these principles in solving typical problems. Apply Heissler charts as a method to determine energy losses and temperature distributions in different objects and at different depths. Discuss the kinetics of diffusion and calculate reaction mass flow rates, and evaporation processes. Compare flow types of liquids and gases and calculate volumetric flow rates. Illustrate different types of heat exchangers, calculate flow rates and temperature exchange.

EYHYD5A **Hydrometallurgy** *(Extractive Metallurgy Option)* *PG0850*
NQF Level: *8* ***Credits:*** *20*

Hydrometallurgy processes and plants design: review of hydrometallurgy basics; hydrometallurgical plants; general plant design considerations; process design; flowsheets development; drawing; plant design economics; secondary resources processing; South African core commodities; Case studies of recent trends in application to specific commodities; laboratory work.

EYMAE5A **Materials Engineering** *(Extractive Metallurgy Option)* *PG0850*
NQF Level: *8* ***Credits:*** *20*

Introduction to Materials science and Engineering. Structure-Property relationships of Materials and Materials design. An introduction to Properties and Applications of Materials: (Ceramics,

Polymers, Composites and non-ferrous alloys). Specialty Materials Applications: Functional Materials/Compositionally graded Materials (e.g. electronic, magnetic, superconducting, high temperature alloys, biomaterials, thermoelectric, smart materials). Manufacturing Methods (Casting & Powder Metallurgy). Additive Manufacturing. Materials Selection and Economics. Introduction to Computational Material Science: Modelling and Simulation.

EYMAM5A **Manufacturing Metallurgy** *(Extractive Metallurgy Option)* *PG0850*

***NQF Level:** 8* ***Credits:** 20*

Science and selection of Engineering Materials and Alloys. Basic Metallurgical Manufacturing Processes: Casting, Forming, Powder Processing, Machining, welding. Advanced Materials Manufacturing: Metal-Matrix Composites, Ceramic Matrix Composites and Polymer- Based composites, Additive manufacturing, Functionally graded Materials. Introduction to Materials Modelling and process simulation. Computer Automated Design, Manufacturing and Automation. Manufacturing Costs.

EYMAS5A **Advanced Modelling and Simulation** *PG0850*

***NQF Level:** 8* ***Credits:** 20*

Introduction to discrete event simulation - Applications, advantages, and limitations. Simulation project methodology, event calendar and implications. Advanced statistic distributions, familiarisation with Arena and Simio. Making decisions with simulation. Buffer zone modelling. Introduction to advanced modelling techniques. Modelling material handling devices. Conveyor modelling. Continuous systems: classification of systems, system's abstraction and modelling, types of systems and examples, system variables, input-output system description, system response and analysis of system behaviour. System simulation (computer-aided: Simio software), real-world system examples. Discrete systems: difference equations, numerical simulation of continuous-time dynamics, discrete-event systems, and real-world system examples.

EYMIP5A **Mineral Processing** *(Extractive Metallurgy Option)* *PG0850*

***NQF Level:** 8* ***Credits:** 20*

Introduction to mineral processing principles and terminology. Ore characteristics and mineral separation methods. Application of mineral separation methods in the concentration of coal, precious metals (Au and PGM's) and base metals (Cu, N, Zn, Pb). Material balance on complex mineral processing flow diagrams. Equipment selection and sizing. Principles of mineral processing plant design. Principles of mineral processing plant cost estimation. Application of mathematical models for mineral processing units.

EYMKR5A **Corrosion Engineering** *PG0850*

***NQF Level:** 8* ***Credits:** 10*

Corrosion Principles. Corrosion Electrochemistry. Thermodynamics and Kinetics of Corrosion Processes. Corrosion Processes (Atmospheric, Crevice and Pitting, EAC, Galvanic, Corrosion in water systems, Concrete Corrosion and High temperature Oxidation). Corrosion Control (Inhibitors, Protective Coatings, Materials Selection, CP and Anodic Protection). Corrosion Management, Modelling, Life Prediction, Computer Applications and Monitoring. Corrosion Failure Analysis. Corrosion Monitoring and Measurement techniques.

EYPME5A **Physical Metallurgy** *(Extractive Metallurgy Option)* *PG0850*

***NQF Level:** 8* ***Credits:** 20*

Thermodynamics and kinetics of Solidification. Diffusional transformation in solids. Diffusionless transformation in solids. Heat treatment process. Coarsening of particles. Discontinuous phase transformations. Thermomechanical treatment of metals and alloys.

EYMRE5A **Extractive Metallurgy Research Project** *PG0850*

NQF Level: *8* ***Credits:*** *30*

The theory of characterization tools. Research Methodology in Science and Engineering. The use of research tools and databases (literature search databases, zotero, origin, published articles, presentation of scientific data, presentation skills, conferences, networking in science and engineering, publishing etc.). Laboratory-based empirical research project.

EYMRP5A **Physical Metallurgy Research Project** *PG0850*

NQF Level: *8* ***Credits:*** *30*

The theory of characterization tools. Research Methodology in Science and Engineering. The use of research tools and databases (literature search databases, zetero, origin, published articles, presentation of scientific data, presentation skills, conferences, networking in science and engineering, publishing etc.).

EYPTH2A **Process Thermodynamics** *PG0850*

NQF Level: *8* ***Credits:*** *10*

Reaction spontaneities ΔG and equilibrium constant k. Phase equilibrium. Binary- and multiple solutions. Electrochemical cells. Activation energy. Solubility. Order of reactions. Reaction kinetics.

EYPYR5A **Pyrometallurgy** *(Extractive Metallurgy Option)* *PG0850*

NQF Level: *8* ***Credits:*** *20*

Define thermodynamic laws; Discuss and determine spontaneity of processes; Discuss influence of various parameters on processes in steel industry; Calculate flame temperatures and blast air volumes in blast furnaces; Calculate mass stoichiometric mass balances in blast furnaces; Calculate tap temperatures, tap times, compositions etc in steel production processes, continuous casting processes, electric arc furnaces and degassing processes; Define different slag theories and compare and discuss the role of slag; Discuss principles of solid-, liquid- and gas reactions and calculate parameters; Derive mathematical models for smelting and metal-slag systems; Calculate reaction rates for pyro systems.

12.5 M ENG MODULES (MP0823)

Module Code	Module Name	Courses
Module Description		

EEACC6A **Energy Accounting & Economics**

NQF Level: *9* ***Credits:*** *20*

Building energy use and economic analysis and life cycle costing; Building envelopes and insulation; Energy auditing; Audit instruments; Codes standards & protocols; Energy purchasing; Energy accounting & benchmarking; Energy rates structures; Electrical systems & electricity management.

EERNE6A **Renewable Energy**

NQF Level: *9* ***Credits:*** *25*

Renewable energy sources & water management: Wind generation; Water energy systems; Geothermal energy; Solar energy; Thermal energy storage; Hydrogen; Fuel cells. Distributed generation (DG): Economics of DG, Technologies, Analysing your own facility for DG application; A case study.

EERPE6A / EPRPE6A **Research Project**

NQF Level: *9* ***Credits:*** *90*

Research project relating to energy sources and/or water management systems pertaining to: Wind generation systems & optimization; Water energy systems & optimization; Geothermal energy systems & optimization; Solar energy systems & optimization; Thermal energy storage systems & optimization; Hydrogen & fuel cell systems & optimization.

EPESS6A **Electrical Systems**

NQF Level: *9* ***Credits:*** *20*

Rate structures; Electrical systems; Electric motors & drives, Tariffs & structures; Electrical protection systems; Energy systems maintenance: Types of controls: Manual systems, Basic automatic controls, Web based building automation systems

EPPEM6A **Process Energy Management**

NQF Level: *9* ***Credits:*** *25*

Fan systems; Pumps & pump systems; Air systems components management; Heating, ventilating and air conditioning; Understanding & managing boilers: Operation, Boiler components; Boiler controls & gauges; Boiler fuels, Heat balance for boilers, Boiler efficiency & improvements; Steam distribution systems: Introduction, Steam distribution components, Tracer lines, Waste heat recovery, Improving the hot water distribution system; Cogeneration.