DEPARTMENTAL VISION AND MISSION STATEMENT

VISION
To be known for excellence in producing electronic engineering professionals who use engineering and technology for societal development in South Africa.

MISSION
• To produce socially responsible graduates attuned to the needs of industry, the environment and the community.

• To ensure that teaching and learning follows best practice.

• To engage in research and development activities that are responsive to national and international challenges, in clearly defined areas of strength.

What is a University of Technology?
A university of technology is characterized by being research informed rather than research driven where the focus is on strategic and applied research that can be translated into professional practice. Furthermore, research output is commercialized thus providing a source of income for the institution. Learning programmes, in which the emphasis on technological capability is as important as cognitive skills, are developed around graduate profiles as defined by industry and the professions.
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<th>Page</th>
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### ABBREVIATED SYLLABI: All Programmes

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IMPORTANT NOTICE
The departmental rules in this handbook must be read in conjunction with the Durban University of Technology’s General Rules contained in the current General Handbook for Students.

NOTE TO ALL REGISTERED STUDENTS
Your registration is in accordance with all current rules of the Institution. If, for whatever reason, you do not register consecutively for every year/semester of your programme, your existing registration contract with the Institution will cease. Your re-registration anytime thereafter will be at the discretion of the Institution and, if permitted, will be in accordance with the rules applicable at that time.
GENERAL INFORMATION

Important contact information

Department of Electronic Engineering, DUT
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Postal Address: PO Box 1334 Durban, KwaZulu-Natal, RSA. 4000

All Departmental queries to:-
Secretary    Mrs Premi Chetty
Telephone   031-373 2932
Fax      031-373 2744
Email     premi@dut.ac.za
Website    http://cs.dut.ac.za

All Faculty queries to:-
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Telephone   031-373 2718
Fax      031-373 2719
Location of Faculty Office: Steve Biko Campus, S4 Level 3

Executive Dean     Prof T Andrew
Dean’s Secretary  Ms P Nadar
Telephone   031-373 2762
Fax      031-373 2724
Location of
Executive Dean’s Office: Steve Biko Campus, S6 Level 5

Central Applications Office (CAO)
Private Bag X06, Dalbridge 4014. Tel: 031-2684444, website: www.cao.ac.za

Engineering Council of South Africa (ECSA)
Private Bag X691, Bruma, 2026. Tel: 011-6079500, Fax: 011-6229295
Email: engineer@ecsa.co.za, website: www.ecsa.co.za

South African Institute of Measurement and Control
Tel. /Fax: 011-888 8332
Email: ctr@SAIMC.org.za, website: www.saimc.org.za

South African Institute of Electrical Engineers (SAIEE)
Secretary: Ms Gill Nortier, PO Box 22222, Glenashley, 4022.
Tel/fax: 031-5725838
Email: saiee@africa.com, website: www.saiee.org.za

South African Qualifications Authority (SAQA)
Postnet Suite 248, Private Bag X06, Waterkloof, 0145.
Tel: 012-4315000 Fax: 012-4315039, website: www.saqa.org.za
STAFFING
Head of Department: Mr K E Moorgas, N Dip (MLST); B Tech (DIT); M Tech (DUT); MSAIEE, Pr. Techni. Eng;
Deputy Head of Department: Dr S Reddy, BSc(Eng) (UND); M. Eng (UP); PhD (UCT)
Director: Mr K S Moodley, NDT (MLST); MDipTech (MLST); MSAIEE
Associate Professor: Prof B Nleya; Pr. Eng, ECSA, MSc, PhD (SUT, St. Petersburg), SMIEEE, SMIEICE
Associate Directors: Mr S D MacPherson, Pr. Tech. Eng, NDT (TN); M Dip Tech (TN); MSAIEE
Senior Lecturers: Mr G P Janse van Vuuren, Pr. Tech. Eng; NDT (TN); M Dip Tech (TN); SMSAIMC
Mr A Moolla, NHD (PSE); (MLST); MDipTech (MLST)
Mr B Saligram, MDipTech (MLST)
Dr N Singh, Pr.Eng; BSc (Eng) (UN); MSc (Eng) (UN); MBA (UN); PhD(UKZN)
Dr OA Sokoya, BSc(Eng)(OAU), M.Eng(UKZN); PhD(UP)
Lecturers: Mr M R A Bera, BSc (Eng) (UDW); MSAIEE
Mr V Beerajh, NHD (MLST); NHD (PSE)
Mr L G Budula, N Dip (MLST); B Tech (MLST)
Mr S A K Essack, NDT (MLST); M Dip Tech (MLST); MSAIEE
Mr P A Howells, N Dip (TN); B Tech (TN)
Dr N Pillay, Pr. Tech. Eng; N Dip (MLS); B Tech (DIT); M Tech (DUT); DEng (Electronic Eng) (DUT)
Mrs A Pillay, NDip (TN); B Tech (DIT); M Tech (DUT)
Mr S Sewdass, NDip (DIT); B Tech (DUT); MEng (DUT)
Mr R Sewsunker, BSc (Eng) (UKZN); M Sc (Eng)(UKZN), MSc in E Eng (MSEE) (WSU, USA), ECSA; SAIEE
Junior Lecturer: Vacant
Senior Technicians: Mr P Morris, NDip (TN); B Tech (DUT)
Mr B Doorsamy, B Tech (TUT)
Technicians: Mr G Gramanie, Pr. Techni. Eng; NHD (MLST); SMSAIMC
Mr I Haniff, BSc(Eng)(UKZN); SMSAIMC
Mr P Hendry, NDip (MLST)
Mr A Jooravan, NDip (DIT); BTech (DUT), MBA(UKZN)
Mr N Ragbeer, NHD (MLST)
Senior Technical Assistants: Mr N Rupnarain
Secretary: Mr R Ebrahim
Secretary: Mrs D Chetty, NHD (MLST)
INSTRUCTIONAL PROGRAMMES OFFERED BY THE DEPARTMENT
Programmes are offered in this Department which, upon successful completion, lead to the award of the following qualifications:-

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Qualification Code</th>
<th>SAQA NLRD Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Diploma: Engineering: Electrical (Light Current)</td>
<td>NDELC2</td>
<td>72228</td>
</tr>
<tr>
<td>National Diploma: Engineering: Computer Systems</td>
<td>NDCSY2</td>
<td>72227</td>
</tr>
<tr>
<td>Bachelor of Technology: Engineering: Electrical</td>
<td>BTELC1</td>
<td>72129</td>
</tr>
<tr>
<td>Master of Engineering (Electronic)</td>
<td>MNELC1</td>
<td>96827</td>
</tr>
<tr>
<td>Doctor of Engineering (Electronic)</td>
<td>DNELC1</td>
<td>96812</td>
</tr>
<tr>
<td>Bachelor of Engineering Technology in Electronic Engineering</td>
<td>BNELC1</td>
<td>99514</td>
</tr>
</tbody>
</table>
NATIONAL DIPLOMA PHASE-OUT PLAN

I. PHASE-OUT RULES FOR THE NATIONAL DIPLOMA: ENGINEERING: COMPUTER SYSTEMS

Important information for current and prospective students
(effective as of January 2017):

The current National Diploma: Engineering: Computer Systems will be phased out starting in 2017 to allow for the introduction of the new Bachelor of Engineering Technology in Electronic Engineering.

The last cohort of first-time entering students admitted to this National Diploma qualification will be in January 2017.

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

<table>
<thead>
<tr>
<th>Module Name</th>
<th>Last Possible Semester of Registration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Skills I</td>
<td>July 2017</td>
</tr>
<tr>
<td>Computer Skills I</td>
<td>July 2017</td>
</tr>
<tr>
<td>Programming I</td>
<td>July 2017</td>
</tr>
<tr>
<td>Electrical Engineering I</td>
<td>July 2017</td>
</tr>
<tr>
<td>Electronics I</td>
<td>July 2017</td>
</tr>
<tr>
<td>Mathematics I</td>
<td>July 2017</td>
</tr>
<tr>
<td>Digital Systems I</td>
<td>July 2017</td>
</tr>
<tr>
<td>Projects I</td>
<td>July 2018</td>
</tr>
<tr>
<td>Programming II</td>
<td>July 2018</td>
</tr>
<tr>
<td>Digital Communications II</td>
<td>July 2018</td>
</tr>
<tr>
<td>Electronics II</td>
<td>July 2018</td>
</tr>
<tr>
<td>Mathematics II</td>
<td>July 2018</td>
</tr>
<tr>
<td>Digital Systems II</td>
<td>July 2018</td>
</tr>
<tr>
<td>Operating Systems III</td>
<td>July 2019</td>
</tr>
<tr>
<td>Programming III</td>
<td>July 2019</td>
</tr>
<tr>
<td>Network Systems II</td>
<td>July 2019</td>
</tr>
<tr>
<td>Systems Analysis II</td>
<td>July 2019</td>
</tr>
<tr>
<td>Mathematics III</td>
<td>July 2019</td>
</tr>
<tr>
<td>Digital Systems III</td>
<td>July 2019</td>
</tr>
<tr>
<td>Design Project III</td>
<td>July 2020</td>
</tr>
<tr>
<td>Software Engineering III</td>
<td>July 2020</td>
</tr>
<tr>
<td>Network Systems III</td>
<td>July 2020</td>
</tr>
<tr>
<td>Database Principles III</td>
<td>July 2020</td>
</tr>
<tr>
<td>Logic Design III</td>
<td>July 2020</td>
</tr>
<tr>
<td>Microprocessors III</td>
<td>July 2020</td>
</tr>
<tr>
<td>Experiential Learning I (P1)</td>
<td>January 2021</td>
</tr>
<tr>
<td>Experiential Learning II (P2)</td>
<td>July 2021</td>
</tr>
</tbody>
</table>
### New Rule

No student may register for Experiential Learning I or Experiential Learning II unless they have completed the following prerequisites:

**Experiential Learning I (P1)**
Pre-requisites: Complete ALL Diploma modules BEFORE commencing Experiential Learning I

**Experiential Learning II (P2)**
Pre-requisites: Complete Experiential Learning I

*The dates stated in this rule are module to change depending on the effective approval date for the new HEQF aligned programmes.*
2. **PHASE-OUT RULES FOR THE NATIONAL DIPLOMA: ENGINEERING: ELECTRICAL (LIGHT CURRENT)**

Important information for current and prospective students (effective as of January 2017):

The current National Diploma: Engineering: Electrical (Light Current) will be phased out starting in 2017 to allow for the introduction of the new Bachelor of Engineering Technology in Electronic Engineering.

The last cohort of first-time entering students admitted to this National Diploma qualification will be in January 2017.

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

<table>
<thead>
<tr>
<th>Module Name</th>
<th>Last Possible semester of Registration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Skills I</td>
<td>July 2017</td>
</tr>
<tr>
<td>Computer Skills I</td>
<td>July 2017</td>
</tr>
<tr>
<td>Electrical Engineering I</td>
<td>July 2017</td>
</tr>
<tr>
<td>Electronics I</td>
<td>July 2017</td>
</tr>
<tr>
<td>Mathematics I</td>
<td>July 2017</td>
</tr>
<tr>
<td>Digital Systems I</td>
<td>July 2017</td>
</tr>
<tr>
<td>Projects I</td>
<td>July 2018</td>
</tr>
<tr>
<td>Electrical Engineering II</td>
<td>July 2018</td>
</tr>
<tr>
<td>Electronics II</td>
<td>July 2018</td>
</tr>
<tr>
<td>Mathematics II</td>
<td>July 2018</td>
</tr>
<tr>
<td>Digital Systems II</td>
<td>July 2018</td>
</tr>
<tr>
<td>Projects II</td>
<td>July 2019</td>
</tr>
<tr>
<td>Electronic Communications II</td>
<td>July 2019</td>
</tr>
<tr>
<td>Electronics III</td>
<td>July 2019</td>
</tr>
<tr>
<td>Mathematics III</td>
<td>July 2019</td>
</tr>
<tr>
<td>Digital Systems III</td>
<td>July 2019</td>
</tr>
<tr>
<td>Process Instrumentation I</td>
<td>July 2019</td>
</tr>
<tr>
<td>Process Instrumentation II</td>
<td>July 2019</td>
</tr>
<tr>
<td>Control Systems II</td>
<td>July 2019</td>
</tr>
<tr>
<td>Design Project III</td>
<td>July 2020</td>
</tr>
<tr>
<td>Microwave Communication III</td>
<td>July 2020</td>
</tr>
<tr>
<td>Radio Engineering III</td>
<td>July 2020</td>
</tr>
<tr>
<td>Software Design II</td>
<td>July 2010</td>
</tr>
<tr>
<td>Network Systems II</td>
<td>July 2020</td>
</tr>
<tr>
<td>Process Instrumentation III</td>
<td>July 2020</td>
</tr>
<tr>
<td>Control Systems III</td>
<td>July 2020</td>
</tr>
<tr>
<td>Experiential Learning I (P1)</td>
<td>January 2021</td>
</tr>
<tr>
<td>Experiential Learning II (P2)</td>
<td>July 2021</td>
</tr>
</tbody>
</table>
New Rule

No student may register for Experiential Learning I or Experiential Learning II unless they have completed the following prerequisites:-

**Experiential Learning I (P1)**
- Pre-requisites: Complete ALL Diploma modules BEFORE commencing Experiential Learning I

**Experiential Learning II (P2)**
- Pre-requisites: Complete Experiential Learning I

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

**PROGRAMME: BACHELOR OF ENGINEERING TECHNOLOGY IN ELECTRONIC ENGINEERING (BEng Tech)**

**BEI**  
**GENERAL INFORMATION**

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

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

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

- The educational base required for registration as a Professional Engineering Technologist and/or Certificated Engineer with ECSA;

- Entry to NQF level 8 programmes e.g. Honours, and Post Graduate Diploma Programmes and then to proceed to Masters Programmes;

- For certificated engineers, this provides the education base for achieving proficiency in mining / factory plant and marine operations and occupational health and safety.

The learning programme leading to this qualification contains 424 credits with a minimum of 120 Credits at NQF level 7. The Credits are distributed in order to create a coherent progression of learning toward the exit level. This qualification requires a minimum of three years of academic study.
The graduates of this degree will demonstrate evidence, as appropriate to their disciplines, of the following attributes: -

1. Basic Proficiency and Competencies, including:
   a. Information literacy
   b. Communication (oral and written)
   c. Numeracy
   d. Technology applications

2. Innovation, including:
   a. Entrepreneurship
   b. Leadership

3. Social Responsibility, including:
   a. Ethics
   b. Diversity
   c. Critical and engaged citizenry embedded in a local and global context

4. Personal Development, including:
   a. Self-awareness
   b. Self-directed and life-long learning

5. Broad understanding of their chosen discipline and/or profession, including:
   a. An appropriate discipline or professional approach to knowledge production
   b. Workplace adaptability

Engineering students completing this qualification will demonstrate competence in all the following Exit Level Outcomes indicated below:

- **Exit Level Outcome 1: Problem Solving**
  Students will be required to apply engineering principles to systematically diagnose and solve *broadly-defined* engineering problems in modules at all levels.

- **Exit Level Outcome 2: Application of scientific and engineering knowledge**
  Students will be required to apply knowledge of mathematics, natural science, and engineering sciences to defined and applied engineering procedures, processes, systems and methodologies to solve *broadly-defined* engineering problems.

- **Exit Level Outcome 3: Engineering Design**
  Students will be required to perform design tasks in Projects at all levels. Work will be more of a procedural nature at the first level, and will increase in complexity through the levels.

In Electronic Design Projects 3A & 3B, the preliminary part of the design will be carried out in part 3A, while part 3B will see to the project completion. The project will include one or more of the following impacts: social, economic, legal, health, safety, and environmental. Design Projects A & B are to be seen collectively as one large project.
• **Exit Level Outcome 4: Investigation**
Students will conduct investigations of broadly-defined problems through locating, searching and selecting relevant data from codes, data bases and literature, designing and conducting experiments, analysing and interpreting results to provide valid conclusions.

• **Exit Level Outcome 5: Engineering methods, skills, tools, including Information technology**
Use of appropriate techniques, resources, and modern engineering tools, including information technology, prediction and modelling, for the solution of broadly-defined engineering problems, with an understanding of the limitations, restrictions, premises, assumptions and constraints.

• **Exit Level Outcome 6: Professional and Technical Communication**
Students will be required to demonstrate the ability to communicate effectively, by submitting research assignments and deliver oral presentations, with engineering audiences and the affected parties.

• **Exit Level Outcome 7: Impact of Engineering Activity**
Demonstrate knowledge and understanding of the impact of engineering activity will be embedded in many courses as well as specifically in the module of Environmental Engineering.

• **Exit Level Outcome 8: Individual and Teamwork**
Knowledge and understanding of engineering management principles will be specifically covered in the Module of Entrepreneurship Skills. Individual and teamwork competency will be addressed in other modules as well. The ability to manage a project will be demonstrated in the module Design Projects A & B.

• **Exit Level Outcome 9: Independent Learning**
Engage in independent and life-long learning through well-developed learning skills. Range Statement: The learning context is varying and unfamiliar. Some information is drawn from the technological literature.

• **Exit Level Outcome 10: Engineering Professionalism**
Students will be assessed on their comprehension and application of ethical principles and commitment to professional ethics, responsibilities and norms of engineering technology practice.

**BE2 MINIMUM ADMISSION REQUIREMENTS: BACHELOR OF ENGINEERING TECHNOLOGY IN ELECTRONIC ENGINEERING (BEng Tech: Electronic Eng)**

The minimum entry requirement is the National Senior Certificate or the National Certificate (Vocational) with appropriate module combinations and levels of achievement as defined in the Government Gazette, Vol. 751, No. 32131 of 11 July 2008, and in the Government Gazette, Vol. 533, No. 32743, November 2009. In addition the minimum admission requirements, rule G7, is stipulated in the General Rules Handbook.
Further to the above, the following are required for admission into BEng Tech: Electronic Engineering:

**[A] NSC, NCV, SC:**

<table>
<thead>
<tr>
<th>Compulsory Subjects</th>
<th>National Senior Certificate</th>
<th>National Certificate, (Vocational)</th>
<th>Senior Certificate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rating</td>
<td>Mark</td>
<td>HG</td>
</tr>
<tr>
<td>English</td>
<td>4</td>
<td>60%</td>
<td>E</td>
</tr>
<tr>
<td>Mathematics</td>
<td>4</td>
<td>70%</td>
<td>E</td>
</tr>
<tr>
<td>Physical Science</td>
<td>4</td>
<td>70%</td>
<td>E</td>
</tr>
<tr>
<td>Life Orientation</td>
<td></td>
<td>60%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+ 2 Vocational Subjects (70%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

1. The subject NSC Mathematical Literacy will not be accepted as a substitute for the subject NSC Mathematics.
2. The exit certificate of the candidate must qualify the candidate for degree study at an institution of higher learning.
3. Applicants will be ranked according to the sum of their scores for Mathematics and Physical Science, subject to a minimum combined score of 120.

**[B] OTHER:**

Applicants, that qualify for degree study at an institution of higher learning (Bachelor’s Pass), but do not meet the departmental mathematics and/or physical science requirements, may present the following N4 subjects, for consideration for entry to the BET programme:

- Mathematics and Engineering Science, plus any two of the following:-
  - Industrial Electronics OR Electronics
  - Digital Systems OR Logic Systems
  - Electrotechnics

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

Applicants may present a cognate level 6 Diploma for entry into the BET programme, Credit transfer will be considered dependent on the content thereof being presented.

Applicants may present a cognate National N Diploma for entry into the BET programme. Credit transfer is not possible.
BE3 PROMOTION TO A HIGHER LEVEL/ PROGRESSION RULES

(1) All modules have a minimum pass mark of 50%. A sub-minimum of 50% will apply to modules having a practical component.

(2) A student would not be able to attempt higher-level modules before completing the prerequisite modules.

(3) In addition to the prerequisite and co-requisite requirements of the individual modules, the student needs to pass all 1st and 2nd Year modules to register for 3rd Year – Semester 2 modules.

(4) To complete the qualification by the end of five years of registration.

BE4 UNSATISFACTORY ACADEMIC PROGRESS

(1) Students who do not meet the progression rules listed above, will be regarded as having Unsatisfactory Academic Progress, and will not be permitted to continue with the degree unless an appeal to continue is upheld, (refer to G1 (8) for appeals).

(2) In modules where Exit Level Outcomes (ELO’s) are assessed, the student would need to achieve a final minimum pass mark of 50% as well as be deemed competent in achieving the ELO’s. A student that achieves a final minimum pass mark of 50% but fails to achieve the ELO’s would fail the module.

(3) In order to progress from one study level to the next, a student would need to accumulate a minimum number of credits as indicated in the table below. Students achieving below the minimum credits would be considered as making unsatisfactory academic progress.

<table>
<thead>
<tr>
<th>END OF SEMESTER</th>
<th>MINIMUM CREDITS</th>
<th>MAXIMUM CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>56</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>104</td>
<td>148</td>
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<tr>
<td>3</td>
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<td>4</td>
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<tr>
<td>5</td>
<td>256</td>
<td>360</td>
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<tr>
<td>6</td>
<td>304</td>
<td>424</td>
</tr>
</tbody>
</table>

PROGRAMME STRUCTURE

All modules in year one and year two are compulsory. Students may choose three electives in year three as indicated in the table below. The programme is offered on a full-time basis and require attendance to lectures. The method by which they will be examined is indicated in each module study guide.
<table>
<thead>
<tr>
<th>Name of Module</th>
<th>Study Level</th>
<th>NQF Level</th>
<th>Module Credits</th>
<th>C/E*</th>
<th>Pre-Req.</th>
<th>Co-Req</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1 Semester 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering Mathematics IA</td>
<td>1</td>
<td>5</td>
<td>12</td>
<td>C</td>
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<tr>
<td>Engineering Physics IA</td>
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<td>5</td>
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<td>Electronic Measurements</td>
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<td>Type</td>
<td>Prerequisites</td>
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<td>7 8</td>
<td>C</td>
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<td>C</td>
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<td>Project Management</td>
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<td>C</td>
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**Year 3 Semester 2**

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<th>Module</th>
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<tr>
<td>Digital Signal Processing 3B</td>
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<td>Principles of Management</td>
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<td>Process Instrumentation 3A, Nil</td>
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<td>E</td>
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<tr>
<td>RF Engineering 3B</td>
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</tbody>
</table>

**Total Credits for Graduation (Minimum 424)**

C = Compulsory  
E = Elective  
NB:-  
*Indicates Compulsory Modules  
**Indicates Elective Modules of which a minimum of 3 must be selected
Description of the National Diploma: Engineering: Electrical (Light Current) Programme

At DUT you will receive a vocationally oriented education that will prepare you to be functional in the field of Instrumentation and Control OR Electronic Communications, so that you will be able to make a meaningful contribution to industry. Students completing the National Diploma, function at the level of a technician and students completing the Bachelor of Technology degree will function at the level of a technologist.

To be successful in a career in the electronic engineering industry you must have the following traits:

- Be able to think logically and creatively;
- Be willing to work hard and have a positive attitude;
- Have a passion for all technology and specifically electronics;
- Be prepared for life-long learning;
- Have excellent technical communication skills;
- Be prepared to master new technology on a daily basis.
CAREER CHOICES: NATIONAL DIPLOMA: ENGINEERING: ELECTRICAL

Instrumentation and Control Field of Study:
As an electronic engineering professional you should be able to justify, design, construct, commission and maintain instrumentation and control systems in a wide range of industries including paper, sugar, vehicle manufacturing, refining, water reticulation and chemical.

Qualified electronic engineering professionals specializing in instrumentation are highly sought after by industry.

The Diploma course includes basic electronics, digital systems, electrical engineering, mathematics, software design and networking. This enables the student to specialise in instrumentation. Some examples of the course material include:
- Measurements of variables including pressure, flow, level, temperature, position and mass;
- Unit operations (e.g. boilers, distillation columns, refrigeration);
- Control systems;
- Software design (e.g. PLCs, high level programming);
- Final control elements (e.g. drives and valves).

The necessary control theory to effectively utilise systems is also included. All modules are supported by relevant practical work.

Electronic Communications Field of Study:
As an electronic engineering professional you will be able to justify, design, construct, commission and maintain electronic and communication systems in a wide range of industry including the telecommunications, mobile wireless, cellular and general electronic manufacturing industries.

Qualified electronic engineering professionals specialising in communications are highly sought after by industry.

The Diploma programme includes core modules such as electronics, digital systems, electrical engineering, mathematics, software design and network systems, with specialist modules such as electronic communications, radio engineering and microwave communications.

All modules are supported by relevant laboratory work which include:
- To fabricate and test electronic circuits
- Manufacturing, testing and maintenance of electronic devices and systems.
- To understand the construction, identification, characteristics, specifications, merits, limitations and applications of electronic components and materials
- To understand lines communication, audio and video communication, and microwave communication

Description of the National Diploma: Engineering: Computer Systems
At DUT you will receive a vocationally oriented education that will prepare you to be functional in the field of Computer Systems, so that you will be able to make a meaningful contribution to industry. Students completing the National Diploma, function at the level of a technician and students completing the Bachelor of Technology degree will function at the level of a technologist.
To be successful in a career in the computer systems industry you must have the following traits:

- Be able to think logically and creatively;
- Be willing to work hard and have a positive attitude;
- Have a passion for all technology and specifically electronics and computer technology
- Be prepared for life-long learning;
- Have excellent technical communication skills;
- Be prepared to master new technology on a daily basis.

This qualification is a hybrid electronic engineering and computer engineering course. It is envisaged that the students obtaining this Diploma will be exposed to the following areas of learning:

- Fundamental Electronics and Electrical Engineering
- Data Communication and Networking
- Computer Systems architecture
- Embedded Systems (Microcontrollers)
- Computer Programming
- Operating Systems

Career opportunities
Our graduates find work opportunities in a wide spectrum of industries. The following are some of the major destinations: Telecommunication and data networking companies, embedded systems designers, IT infrastructure (design, installation and support), Industry Programmers.

Purpose Statement: National Diploma: Engineering: Electrical
The purpose of the National Diploma: Engineering: Electrical (Light Current) is to provide a career oriented education that will prepare students to be functional in the field of Instrumentation and Control Engineering or Electronic Communications in order to make a meaningful contribution to Industry.

The engineering profession contributes to the technical, social, economic and environmental infrastructure of the country, leading to socio-economic growth. A framework of engineering qualifications develops the human resources essential for sustaining the profession. Within that framework, this qualification is designed for the development of engineering technicians.

A graduate with this qualification will be:
1. Competent to apply technical knowledge, engineering principles and problem-solving techniques in the field of Electrical Engineering by operating within the relevant standards and codes
2. Able to work independently, and as a member of a team.

The qualified person will be able to register with the Engineering Council of South Africa (ECSA) as a Technician-in-Training in the field of Electrical Engineering.
Purpose Statement: National Diploma: Engineering: Computer Systems

The purpose of the National Diploma: Engineering: Computer Systems is to provide a foundation in both hardware and software; and prepare students for a career demanding specialist knowledge in Computer Programming, Computer Systems, Embedded Systems, Systems Analysis and Computer Engineering.

The engineering profession contributes to the technical, social, economic and environmental development of the country, leading to socio-economic growth. A framework of engineering qualifications develops the human resources essential for sustaining the profession.

Within that framework, this qualification is designed for the development of computer engineering technicians.

A graduate with this qualification will be:-

• Competent to apply the theoretical and practical knowledge and skills of the following: hardware, software, networking and basic engineering aspects in the environment of the computer industry.

• Competent to apply the integration of theory, principles, proven techniques, practical experience and appropriate skills, to the solution of well-defined problems in the field of computer engineering.

• Competent in providing professional, technical and developmental support in the computer industry

• Able to work independently, and as a member of a team.

The qualified person will be able to register with the Engineering Council of South Africa (ECSA) as a Technician-in-Training in the field of Computer Systems.
Purpose Statement: Bachelor of Technology: Engineering: Electrical
The engineering profession contributes to the technical, social, economic and environmental infrastructure of the country, leading to socio-economic growth. A framework of engineering qualifications develops the human resources essential for sustaining the profession. Within that framework, this qualification is designed for the development of engineering technologists to enhance a student’s knowledge within a specialized discipline.

A graduate with this qualification will be able to:-

• Apply engineering principles to systematically diagnose and solve well-defined as well as ill-defined problems in an engineering environment within a chosen field of specialization.
• Communicate technical, supervisory and general management information effectively.
• Apply management principles and concepts to manage projects and/or operations within an engineering environment.
• Conduct and manage an industrial project.
• Exercise independent technological judgment and responsible decision making by taking into account the relevant financial, economic, commercial, social, environmental and statutory factors.

The qualified person will be able to register with the Engineering Council of South Africa (ECSA) as a Professional Technologist in the field of Electrical Engineering.

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

Purpose Statement: Doctor of Engineering
This qualification is intended for persons who will make a significant and original contribution to knowledge in a specialised area of technology. They will have a high level of overall knowledge in that specialised area ranging from fundamental concepts to advanced theoretical or applied knowledge.
DEPARTMENTAL RULES FOR THE NATIONAL DIPLOMA:
ENGINEERING: ELECTRICAL & COMPUTER SYSTEMS

EL1 MINIMUM ADMISSION REQUIREMENTS

In addition to the general admission requirements as stated in the General Rules, the following minimum requirements (or their equivalent) shall apply:

(1) **Senior Certificate Requirements:**

<table>
<thead>
<tr>
<th>Subject</th>
<th>SC Higher Grade</th>
<th>SC Standard Grade</th>
<th>NSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>E (HG) C (SG)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Science (or equivalent)</td>
<td>E (HG) C (SG)</td>
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<td></td>
</tr>
</tbody>
</table>

In addition, a student must obtain a minimum score of 35 using the scoring system listed in Table 1 to be conditionally accepted into the programme. The scores for each Senior Certificate module result obtained are added together, with the Mathematics and Physical Science scores multiplied by a factor of 2.

(2) **National Senior Certificate Requirements:**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>4 (Adequate achievement)</td>
</tr>
<tr>
<td>Physical Science</td>
<td>4 (Adequate achievement)</td>
</tr>
<tr>
<td>English (Primary)</td>
<td>4 (Adequate achievement)</td>
</tr>
</tbody>
</table>

OR

English (First additional): 4 (Adequate achievement)

**Note**

(1) The module Mathematical literacy will not be accepted as a substitute for the module Mathematics.

(2) Paper Three in Mathematics (Geometry) is a co-requisite for Engineering Mathematics 1 and is compulsory for all applicants unless the applicant has passed Paper Three with a minimum rating of 4 (Adequate achievement).

In addition, a student must obtain a minimum score of 28 using the scoring system listed in Table 1 to be conditionally accepted into the programme. The scores for each National Senior Certificate module result obtained are added together, with the Mathematics and Physical Science scores multiplied by a factor of 2.

(3) **National Technical Certificate N4:**

A student having an N4 Certificate with passes of 50% or higher in four (4) relevant modules including Mathematics and Electrotechnics, or an equivalent SAQA NQF Level 4 qualification, as well as compliance with the English language requirements as stated in the General Rules, will be accepted provided there is sufficient space.

S1 credits may be given for equivalent modules passed, with a minimum of 50%, at both the N5 and N6 level.
National Certificate Vocational Level 4
National Certificate Vocational with a minimum mark of 60% in English, Mathematics, Physical Science or equivalent, Life Orientation and 2 vocational modules relevant to the field of electrical engineering.

EL2 SELECTION
Due to the limited number of places available, the final selection for the purpose of admission to the programme will be done taking the following factors into consideration:
(1) Academic performance at Senior Certificate, National Senior Certificate, N4 certificate, National Certificate Vocational, or equivalent SAQA NQF level 4.

EL3 DURATION OF STUDIES
The minimum duration of academic studies at the Durban University of Technology shall be four semesters (2 years), unless credits for studies at another institution have been granted.

EL4 AWARD OF DIPLOMA
(1) The diploma will only be awarded where a student has successfully completed the requisite number of modules, as listed in the relevant field of study, and in addition has completed a minimum of two semesters of appropriate work integrated learning. The diploma will be awarded after a minimum period of three years.
(2) All modules, as listed under the relevant field of study, are to be completed at DUT unless prior written permission is granted by the HOD for the student to register at an alternative institution.
(3) Diplomas are not automatically awarded to candidates who have satisfied all of the requirements for each instructional programme. The onus is on the student to apply to the University for the Award of the Diploma. In this regard the candidate should obtain the necessary forms from the Secretary of the Department.

EL5 REGISTRATION
(1) All students registering for the programme for the first time will be required to pay a toolkit levy in addition to the standard course fee.
(2) No registration for any module will be allowed later than one week after commencement of lectures without prior written permission from the Head of Department. Furthermore any late registration is conditional, module to the student having attended all lectures and practical sessions during the late registration week.
(3) No student will be allowed to register for a module if there is a timetable clash with any other module.
EL6 STUDENT CONDUCT
(1) Eating, smoking or drinking in any lecture venue or laboratory is forbidden.
(2) Safety rules are to be strictly observed at all times.
(3) Students are required to have a toolkit for laboratory sessions.
(4) All equipment issued to a student during a laboratory session must be returned at the end of the laboratory session.
(5) Mobile phones are to be switched off during lecture, laboratory and assessment sessions.

EL7 PROMOTION TO A HIGHER LEVEL
(1) A student may not register for higher level academic modules unless all prerequisites are complied with.
(2) A student may not register for any semester 3 academic modules without having obtained credits for all semester 1 academic modules.
(3) A student may not register for any semester 4 academic modules without having obtained credits for all semester 2 academic modules.

EL8 UNSATISFACTORY ACADEMIC PROGRESS
(1) A student who does not obtain a credit for a module after having twice been registered for that module will be given a warning of slow progress. If after a third registration a credit is not obtained the student will not be allowed to re-register for the programme.
(2) A student must pass ALL the specified modules for the diploma within eight registered semesters of study. A student wishing to appeal against the application of this rule, must submit to the Department an application to appeal for re-registration. Re-registration will be granted at the discretion of the Appeals Committee.

EL9 SEMESTER MARK
(1) The semester mark for all examinable modules is set at 40% of the final mark.
(2) A student who for any reason is absent from a particular test, assessment, or scheduled laboratory period, must provide acceptable proof of their reason for absence to the lecturer concerned within two days after returning to classes. Failure to provide proof of acceptable reasons for absence, or failure to undergo a specified alternative assessment, shall result in a zero mark for that test/assessment.

EL10 METHOD OF ASSESSMENT
Modules are evaluated through a minimum of two class tests of one hour duration each, one three-hour examination and a practical/assignment mark. Those modules marked with # are evaluated through a process of continuous assessment. Further details of the method of assessment are included in the module study guide.
EL11 SUB-MINIMUM
(1) A sub-minimum of 50% will apply to the practical component of all semester marks.
(2) A sub-minimum of 40% will apply to all semester marks.
(3) A sub-minimum of 40% will apply to all written examinations.

EL12 SUPPLEMENTARY EXAMINATIONS
(1) Supplementary examinations are offered for all examinable modules. Students who have failed an examinable module qualify for the supplementary examination provided that they have obtained a final mark (semester mark and examination mark) of at least 45%. A semester mark is only valid for one examination and one supplementary session.
(2) A final examination is not written in modules evaluated through continuous assessment and if the required pass mark is not attained the module must be repeated.

EL13 WORK INTEGRATED LEARNING
(1) Students may register for work integrated learning at any point in the programme after completing semester 1.
(2) A student must register for work integrated learning with the department immediately on starting a period of learning in industry. Registration forms are available in the departmental offices. Unregistered periods of work integrated learning will not be considered for credit purposes.
(3) If any of the registered details regarding work integrated learning change (e.g. employer, supervisor, address, telephone numbers etc.), the student must advise the department in writing within two weeks of the changes.
(4) A student may not register for the second period of work integrated learning without having submitted the manual for the first period of work integrated learning.
(5) Registration for the second period of work integrated learning will be treated as provisional until such time as the department has approved the student’s completion of the requirements for the first period of work integrated learning.
(6) A student may not register for more than one academic module with the department while registered for work integrated learning.

EL14 SERVICE DEPARTMENTS
Students are referred to the departmental handbooks and module study guides for information regarding the rules applicable to modules serviced by other departments.

EL15 FIELDS OF STUDY
The department offers the following fields of study:
(1) Field of study one: National Diploma: Engineering: Electrical (LC): Instrumentation and Control (NDEIN1)
(2) Field of study two: National Diploma: Engineering: Electrical (LC): Electronic Communications (NDECM1)
(3) Field of study three: National Diploma: Engineering: Computer Systems (NDCSY2)
DEPARTMENTAL RULES FOR THE BACHELOR’S DEGREE IN TECHNOLOGY: ENGINEERING: ELECTRICAL AND COMPUTER SYSTEMS

BT1 MINIMUM ADMISSION REQUIREMENTS
(1) National Diploma: Engineering: Electrical (Light Current)
National Diploma: Engineering: Computer Systems
(2) Credits must be obtained for all prerequisite modules as listed in the relevant field of study, prior to first time registration for the degree.

BT2 DURATION OF STUDIES
(1) The minimum duration of academic studies at the Durban University of Technology shall be two semesters (1 year), unless credits for studies at another institution have been granted.
(2) The minimum duration of registration for Industrial Project 4 shall be one semester and the maximum duration three consecutive semesters. If a student has not completed all the requirements for this module within three consecutive semesters the student will be required to pay the full registration fee for the module on the next registration.
(3) A student may not register for Industrial Project 4 until written approval of the proposed project has been obtained from a committee comprised of academic staff from the relevant field of study.
(4) Students registering for Industrial Projects 4 must have passed a minimum of four (4) BTech modules.

BT3 AWARD OF DEGREE
(1) The degree will only be awarded where a student has successfully completed the requisite number of modules, as listed in the relevant field of study. The degree will be awarded after a minimum period of one year.
(2) All modules, as listed under the relevant field of study, are to be completed at DUT unless prior written permission is granted by the HOD for the student to register at an alternative institution.
(3) Degrees are not automatically awarded to candidates who have satisfied all of the requirements for each instructional programme. The onus is on the student to apply to the University for the Award of the Degree. In this regard the candidate should obtain the necessary forms from the Secretary of the Department.

BT4 UNSATISFACTORY ACADEMIC PROGRESS
A student who does not obtain a credit for a module after having twice been registered for that module will be given a warning of slow progress. If after a third registration a credit is not obtained the student will not be allowed to re-register for the programme.

BT5 SEMESTER MARK
(1) For all examinable Level 4 modules the semester mark is set at 40% of the final mark.
(2) A student who for any reason is absent from a particular test, assessment, or scheduled laboratory period, must provide acceptable proof of their reason for absence to the lecturer concerned within two days after returning to classes. Failure to provide proof of acceptable reasons for absence, or failure to undergo a specified alternative assessment, shall result in a zero mark for that test/assessment.

**BT6 METHOD OF ASSESSMENT**
Modules are evaluated through a *minimum* of two class tests of one hour duration each, one three-hour examination and a practical/assignment mark. Those modules marked with # are evaluated through a process of continuous assessment. Further details of the method of assessment are included in the module study guide.

**BT7 SUB-MINIMUM**
(1) A sub-minimum of 50% will apply to the practical component of all semester marks.
(2) A sub-minimum of 40% will apply to all semester marks.
(3) A sub-minimum of 40% will apply to all written examinations.

**BT8 SUPPLEMENTARY EXAMINATIONS**
(1) Supplementary examinations are offered for all *examinable* modules. Students who have failed an examinable module qualify for the supplementary examination provided that they have obtained a final mark (semester mark and examination mark) of at least 45%. A semester mark is only valid for one examination and one supplementary session.
(2) A final examination is not written in modules evaluated through continuous assessment and if the required pass mark is not attained the module must be repeated.

**BT9 FIELDS OF STUDY**
(1) Field of study one: BTECH: ENGINEERING: ELECTRICAL (LC): (Instrumentation and control) BTEIN1
(2) Field of study two: BTECH: ENGINEERING: ELECTRICAL (LC):(Electronic Communications) BTECM1
(3) Field of study three: BTECH: ENGINEERING: ELECTRICAL:(Computer Systems) BTECS1
### Field of Study One:
**BTECH: ENGINEERING: ELECTRICAL (Light Current): (Instrumentation and control) BTEIN1**

<table>
<thead>
<tr>
<th>MODULES</th>
<th>PREREQUISITES</th>
<th>Semester offered (Module to change)</th>
<th>Module Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Control 4 #</td>
<td>Process Instrumentation 3</td>
<td>1 Only</td>
<td>PRCT401</td>
</tr>
<tr>
<td>Engineering Management 4 #</td>
<td>None</td>
<td>1 and 2</td>
<td>EMGT402</td>
</tr>
<tr>
<td>Engineering Mathematics 4</td>
<td>Mathematics 3</td>
<td>1 and 2</td>
<td>EMTH402</td>
</tr>
<tr>
<td>Microcontroller Systems 4 #</td>
<td>Digital Systems 3</td>
<td>1 and 2</td>
<td>MCSY401</td>
</tr>
<tr>
<td>Control Systems 4 #</td>
<td>Control Systems 3</td>
<td>2 Only</td>
<td>CSYS402</td>
</tr>
<tr>
<td>Digital Signal Processing 4 #</td>
<td>Engineering Mathematics 4</td>
<td>1 and 2</td>
<td>DSPR401</td>
</tr>
<tr>
<td>Process Instrumentation 4 #</td>
<td>Process Instrumentation 3</td>
<td>2 Only</td>
<td>PSSI401</td>
</tr>
<tr>
<td>Industrial Project #</td>
<td>Design Project 3</td>
<td>1 and 2</td>
<td>IPRJ401 (1&lt;sup&gt;ST&lt;/sup&gt; Reg) IPRJ411 (2&lt;sup&gt;nd&lt;/sup&gt; Reg) IPRJ421 (3&lt;sup&gt;rd&lt;/sup&gt; Reg)</td>
</tr>
</tbody>
</table>

# Denotes continuous assessment

### Field of Study Two:
**BTECH: ENGINEERING: ELECTRICAL (Light Current): (Electronic Communications) BTECMI**

<table>
<thead>
<tr>
<th>MODULES</th>
<th>PREREQUISITES</th>
<th>Semester offered (Module to change)</th>
<th>Module Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic Comm. Systems 4 #</td>
<td>Radio Engineering 3</td>
<td>1 Only</td>
<td>ECMS401</td>
</tr>
<tr>
<td>Engineering Management 4 #</td>
<td>None</td>
<td>1 and 2</td>
<td>EMGT402</td>
</tr>
<tr>
<td>Engineering Mathematics 4</td>
<td>Mathematics 3</td>
<td>1 and 2</td>
<td>EMTH402</td>
</tr>
<tr>
<td>Microcontroller Systems 4 #</td>
<td>Digital Systems 3</td>
<td>1 and 2</td>
<td>MCSY401</td>
</tr>
<tr>
<td>Digital Signal Processing 4 #</td>
<td>Engineering Mathematics 4</td>
<td>1 and 2</td>
<td>DSPR401</td>
</tr>
<tr>
<td>Microwave Engineering 4#</td>
<td>Microwave Comm. 3</td>
<td>1 Only</td>
<td>MCWE 401</td>
</tr>
<tr>
<td>Electronic Communications 4#</td>
<td>Engineering Mathematics 4</td>
<td>2 Only</td>
<td>ECOM 402</td>
</tr>
<tr>
<td>Computer Networks 4</td>
<td>Computer Networks 3</td>
<td>2 Only</td>
<td>CNET402</td>
</tr>
<tr>
<td>*Circuit Analysis 4</td>
<td>None</td>
<td>1 Only</td>
<td>CRTA401</td>
</tr>
<tr>
<td>Industrial Project 4 #</td>
<td>Design Project 3</td>
<td>1 and 2</td>
<td>IPRJ401 (1&lt;sup&gt;ST&lt;/sup&gt; Reg) IPRJ411 (2&lt;sup&gt;nd&lt;/sup&gt; Reg) IPRJ421 (3&lt;sup&gt;rd&lt;/sup&gt; Reg)</td>
</tr>
</tbody>
</table>

# Denotes continuous assessment
### Field of Study Three:
**B.TECH: ENGINEERING: ELECTRICAL: (Computer Systems) BTECS1**

<table>
<thead>
<tr>
<th>MODULES</th>
<th>PREREQUISITES</th>
<th>Semester offered (Module to change)</th>
<th>Module Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Management 4#</td>
<td>None</td>
<td>1 and 2</td>
<td>EMGT402</td>
</tr>
<tr>
<td>Computer Networks 4</td>
<td>Network Systems 3</td>
<td>2 Only</td>
<td>CNET402</td>
</tr>
<tr>
<td>*Database Programming 4</td>
<td>Database Principles 3</td>
<td>1 Only (once in two years)</td>
<td>See note*</td>
</tr>
<tr>
<td></td>
<td>Software Engineering 3</td>
<td></td>
<td>DBPR401</td>
</tr>
<tr>
<td>Engineering Mathematics 4</td>
<td>Mathematics 3</td>
<td>1 and 2</td>
<td>EMTH402</td>
</tr>
<tr>
<td>Microcontroller Systems 4#</td>
<td>Digital Systems 3</td>
<td>1 and 2</td>
<td>MCSY401</td>
</tr>
<tr>
<td>*Software Engineering 4 #</td>
<td>Logic Design 3</td>
<td>2 Only (once in two years)</td>
<td>See note*</td>
</tr>
<tr>
<td></td>
<td>Microprocessors 3</td>
<td></td>
<td>SWEN401</td>
</tr>
<tr>
<td></td>
<td>Software Engineering 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital Signal Processing 4 #</td>
<td>Engineering Mathematics 4</td>
<td>1 and 2</td>
<td>DSPR401</td>
</tr>
<tr>
<td>Industrial Project 4 #</td>
<td>Design Project 3</td>
<td>1 and 2</td>
<td>IPRJ401 (1st Reg)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IPRJ411 (2nd Reg)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IPRJ421 (3rd Reg)</td>
</tr>
</tbody>
</table>

# Denotes continuous assessment
*Database Programming 4 offered part-time in 2019A, 2021A, etc
*Software Engineering 4 offered part-time in 2018B, 2020B, etc

Students registering for Industrial Project 4 must please take note of Rule BT2 (3)

**NOTE:**
The following core modules are offered at DUT for the B. Tech qualification:-
- Engineering Mathematics 4
- Engineering Management 4
- Microcontroller Systems 4
- Digital Signal Processing 4
- Industrial Project 4

*Please note that students can only register for the module Circuit Analysis 4 with prior approval from the Head of Department

**NOTE:** As gazetted in the Government Gazette, Vol. 613, No. 40123, 06 July 2016, the last date for first time entering students enrolling in academic programmes that are not aligned with the Higher Education Qualifications Sub-Framework is the 31st December 2019. This means that you will not be able to enrol for a Bachelor of Technology (BTech Degree) at DUT, or at any other Institution in South Africa after this date.
ABBREVIATED SYLLABI:
NATIONAL DIPLOMA

A. Contact Time
For each module, with the exception of Communication Skills 1, Computer Skills 1, Design Project 3 and Industrial Project 4, contact time per week is made up of four lecture periods and two periods devoted to either practical work or tutorials. Computer Skills 1 and Communication Skills 1 each have one lecture period and two practical/tutorial periods per week. Design Project 3 has two formal lecture periods per week. In addition to this the student is expected to devote eight hours per week to unsupervised work on a design project. Industrial Project 4 requires the student to devote 300 hours to the completion of an industry-based project. Most of this time will be unsupervised work on the project with regular report back meetings with a member of the academic staff in the department.

B. Self-Study
A student should set aside four hours per day (weekends included) for self-study and revision of work covered in lectures. In addition to this time will be required to prepare for tests, exams and to complete assignments.

C. Abbreviated syllabi
Communications Skills 1:
Communication theory, oral presentation, technical writing, group communication skills.

Computer Skills 1:
Computer Hardware including CPU, RAM, ROM, ALU and peripheral devices; Overview of Networks covering LAN, WAN, Internet, Intranet; File Management in the Windows environment; Performing mathematical calculations including conditional branching in Excel Spreadsheet; Word processing using MS Word covering tables, templates, Headers, Footers, Paragraphs, editing, savings, printing, Formatting.

Control Systems 2:
Introduction to control systems and MATLAB. Dynamic models of physical systems. Standard control systems inputs. Solutions to transfer function and state space models. Transient and steady state response of first and second order systems. Time domain specifications of systems. Routh-Hurwitz stability criterion.

Control Systems 3:
Control system design tools. Root locus plots. Frequency domain specifications, Bode plots, polar plots, log-magnitude versus phase plots and Nichols chart plots. Relation between frequency and time domain for second order systems. Introduction to compensator design. Simple designs.
Database Principles 3:

Design Project 3:
The design, construction, testing and documentation of a complete project.

Digital Communication 2:
Data communications and networking basics: Overview; Applications and networking terminology; Digital communications basics; Protocol basics; Protocol stacks. Telephone networks and modems: Introduction; Transmission systems; Access network signalling; Trunk network signalling; Broadband modems; Internet service providers. Multimedia data representation and compression. Error detection methods. Forward error control. The World Wide Web: Introduction; Overview; URLs and HTTP; HTML; Java and JavaScript; Audio and video; Wireless Web; Web operation.

Digital Systems 1:

Digital Systems 2:

Digital Systems 3:
**Electrical Engineering 1:**
Introduction to electrical and mechanical engineering quantities and the application thereof, batteries, direct current theory and network analysis, alternating current theory and measurements, electromagnetism, magnetic circuits, inductance and capacitance.

**Electrical Engineering 2:**
Alternating current networks, parallel and series resonance, direct and alternating current circuit analysis, power factor correction, harmonics, three phase circuits.

**Electronic Communication 2:**
Introduction to communications engineering. Fourier series analysis. The spectrum. Frequency response of RLC circuits. The dB. Noise analysis, Noise Ratio and Noise Figure. Analogue modulation, AM, FM and PM. The radio receiver and the radio transmitter. Basic antennas and propagation. The radio link budget.

**Electronics 1:**

**Electronics 2:**
Power supply filters and regulators including series, shunt and integrated voltage regulators. Zener diodes and zener diode applications. Frequency response including basic concepts, the decibel, filters and plotting filter response. Op-Amps and Comparators- explanation of circuits, operation, derivations of relevant equations, sketch of circuit waveforms. Amplifiers (small signal analysis). Multistage amplifiers. Field Effect transistors including ac and dc analysis. Power Control devices including SCR, diac, triac and UJT. Use of characteristic curves to explain operation of the device and its applications. Power Amplifiers. The different classes (A, B, AB, C) including biasing of devices, efficiency and advantages or disadvantages.

**Electronics 3:**
Amplifier theory and application: Direct coupled amplifiers; Direct-coupled differential amplifiers, differential and common mode signals and gains, CMRR; Current-source biasing, current mirrors, active loads. Integrated amplifiers: Op-amp applications; Performance limitations of real op amps; Oscillators: IC relaxation oscillators: Comparators and Schmitt triggers; a stable circuits;

**Logic Design 3:**
Introduction to PLDs. PLD types, uses and internal configurations. Performance issues. Implementation of a wide range of logic functions and logic devices using industry-standard PLDs. Programming, simulation and real-time prototype testing. Complete design of a digital project including background information, block diagrams, circuit design, testing and troubleshooting, recording resultant data and project presentation.

**Mathematics 1:**
Determinants, logarithms, formulae, trigonometry, radian measure, complex numbers, statistics, differentiation, elementary integration.

**Mathematics 2:**
Differentiation, integration and first order differential equations with applications, matrices.

**Mathematics 3:**
The solution of ODEs by D-operators, Laplace transforms, numerical techniques. Eigenvalues and eigenvectors, Fourier series.

**Microprocessors 3:**
Interpreting and understanding the architecture of a microprocessor system, programming a microprocessor system to perform small functions and applying microprocessor software design tools and techniques.

**Microwave Communication 3:**
Mismatched transmission lines, VSWR, Reflection Coefficient and Return Loss, The Smith Chart, Microstrip. Lumped element components at high frequencies, Lumped and distributed element impedance matching networks. Network characterization using Y and S parameters, power gains associated with a 2 port network, the Vector Network Analyser. Narrowband amplifier design, stability, design for maximum available gain, design with potentially unstable active devices. Thermal noise, noise figure, cascaded noise figure, equivalent noise temperature, C/N and G/T ratio, measurement of noise figure, low noise amplifier design.

**Network Systems 2:**
The module explores the key topics in the field of data and computer communications, pertaining to the Network Layer, in the following general categories: Local Area Networks and Intranets. Wireless Networks. The Internet Protocol. Security. Radio Propagation and Transmission Basics.
Network Systems 3:
The module explores the key topics in the field of data and computer communications in the following general categories: Transport Layer: Address/Name resolution, Addressing methods, Segment development, Connection services, End-to-end flow control. Application Layer: Dialog control, Session administration, Translation and Encryption, Service advertisement and Service use Methods.

Operating Systems 3:
Introduction to Operating Systems. Discover the concepts, structure and mechanisms of Operating Systems. Beginning with the management of main memory and moving on to processors, devices, files and networks. Evaluate and research the nature and characteristics of modern operating systems. Compare key areas of Operating Systems design and relate contemporary issues to future directions in the Development of Operating Systems including Open Source Software and Open Standards.

Process Instrumentation 2a:

Process Instrumentation 2b:
Process control basics (On/Off control and PID control), Flow introduction, Bernoulli’s theorem. Flow measuring devices (restriction devices, velocity detectors, mass flow detectors and volume flow detectors), Flow calculations (liquid flow and steam flow), Valves, Actuators (pneumatic and electric), Positioners, Pumps, Telemetry (analogue and digital), Instrument documentation (P&ID and loop diagrams).

Process Instrumentation 3:

Programming 1:
An introduction to basic programming techniques. Problem solving techniques eg algorithms, flowcharting, tracing. Introduction to g++ for Linux. Use of complex programming structures such as control structures, arrays and functions. Programming of hardware devices via the parallel port.
Programming 2:
Application development in C/C++ using the Object-Oriented programming paradigm (composition, inheritance and polymorphism). Reading from and writing to text and binary files. String manipulation using character arrays and string objects. The use of pointers to enhance programme efficiency. Reading data from and sending data to the parallel port. Introduction to STL (Standard Template Library) and the graphics library.

Programming 3:

Projects 1:

Projects 2:
Design, planning, construction, and testing of a project. Design specifications and data sheets. Component failure and reliability. PCB silk screening, thru-hole plating and thick film technology. Single and double sided PCB track layout and board manufacture methods.

Radio Engineering 3:
Phase-locked loops and RF applications, frequency synthesis, Fourier series and Fourier transform in the context of digital modulation, Shannon-Hartley theorem, Shannon limit, pulse shaping, typical pulse formats, power in digital signals, sampling, DACs, ADCs, multiplexed PCM, dynamic range, quantisation noise, commanding, codecs, OOK, BPSK, quadrature modulator, quadrature demodulator, m-PSK, DQPSK, pi/4-DQPSK, BFSK, MSK, GMSK, m-QAM, ASCII, error detection and correction, convolutional codes, CRC, noise and error rate, serial interface standards.

Software Design 2:

Software Engineering 3:
System development life cycle models. The five stages of software process. Testing, requirements phase, analysis phase, object orientated analysis, design phase, implementation. Post-delivery maintenance. Planning the software process.
**Systems Analysis 2:**
Introduction to concepts, principles, and stages of computer-based information systems analysis. Systems development and the different methods, tools, and techniques used in systems analysis and design. Feasibility study, requirements for definition design and development of documentation. The system development life cycle, prototyping, data modelling, and user involvement. The objective of the course is to learn and demonstrate an understanding of systems analysis principles, concepts, and evaluation and to gain an appreciation for the scope of systems analysis in a business organization context.

**BACHELOR OF TECHNOLOGY**

**Computer Networks 4:**

**Control Systems 4:**

**Electronic Communications 4:**

**Electronic Communication Systems 4:**

**Engineering Mathematics 4:**
Linear differential equations, complex analysis, difference equations, linear algebra, z transforms.
Digital Signal Processing 4:
Discrete time DAC Synthesis techniques Elaborate signals complex exponentials ADC and sampling aliasing filtering time invariance, linearity system difference equation impulse response FIR, IIR testing method stability convolution causality DFT programming the DFT FFT LTI systems DTFT use of equaliser reconstruction filters Z-transform poles and zeros pure real system design stability oscillator design gain response phase response linear phase direct form I and II cascade structure.

Engineering Management 4:

Industrial Project 4:
300 hour industrial design project involving application of advanced principles related to the field of study.

Microcontroller Systems 4:
Embedded system, microprocessor, microcontroller, RAM, EPROM, EEPROM, flash memory, ADC, DAC, C programming language, C syntax, compiler, cross-compiler, pre-processor, C pre-processor, in-circuit emulator, debugger, debugging, revision control, SPI, I2C, RS-232, CAN, USB, Ethernet, real-time computing, real-time operating system, embedded Linux, Contiki, semaphore programming, message passing, interrupt, interrupt latency, system-on-a-chip, ASIC, PLD, FPGA, surface-mount technology, RoHS Directive, lead-free solder, electromagnetic interference, practical construction project, practical design, high-level programming and debugging of embedded system.

Microwave Engineering 4:
Principles of oscillator design using the loop method and the negative resistance method. LC oscillators, resonator Q factor, augmented resonators. Transmission line resonators, quartz crystal resonators and SAW resonators. Flicker and phase noise, measurement of phase noise. Negative resistance oscillators. An introduction to RF power amplifier design, Linear and non-linear networks, transmission distortion, gain compression, harmonic and intermodulation distortion, cascaded 3rd order intercept. An introduction to class A power amplifier design. Stability, the design of a class A power amplifier.

Process Control 4:
**Process Instrumentation 4:**

**Software Systems 4:**
Graphical applications software as applied to microprocessor systems.

**Micro Systems Design 4:**

**Software Engineering 4:**
Outline of software development, software development life cycle, planning and estimating, test plan, requirements, properties of good requirements, specifications, software design, coding, wrapping up design and coding, software testing, coverage and systematic testing.

**Database Programming 4:**
Basic concepts of database systems and advanced database systems. An overview of various theoretical approaches to database management systems and structures. Implementation and use of database systems, setting up of a database using fourth generation languages and database programming. A study of one database system implementation. Database planning, data models, R-R diagrams, database models, code generation packages.
ABBREVIATED SYLLABI:
Bachelor of Engineering Technology in Electronic Engineering

Analogue Electronics 1A
The following topics are covered in this module, semiconductor Theory, Diode Applications, Special Purpose Diodes, Transistors, Transistors Amplifiers, Power supplies Test Equipment

Analogue Electronics 1B
Output power stages and heatsinks, Switching regulator power supplies, Field Effect Transistors, Differential pair and current sources, Operational Amplifiers, Negative and Positive Feedback in electronic systems, Wave shaping circuits and Waveform Generators, Filters and their realisations

Communications and Networks 3 A
Introduction to switching and transmission as applied within modern telecommunications infrastructures. The background and terminology of telecommunications. Digital transmission and multiplexing, digital switching, network synchronization, control and management, fiber optic transmission systems. Synopsis: Telephone network overview and evolution to digital communications, A/D conversion and digital transmission fundamentals, Circuit-switching (blocking models), Analog and digital telecommunication networks and systems. Signalling., Optical transport networks, transmission and switching. Stored programme control, APIs and telephony

Communications and Networks 3B
Introduction to computer networks and concentrates on building a firm foundation for understanding Data Communications and Computer Networks. It is based around the OSI Reference Model that deals with the major issues in the bottom three (Physical, Data Link and Network) layers of the model. Students are also introduced to the areas of Network Security and Mobile Communications. This module provides the student with fundamental knowledge of the various aspects of computer networking and enables students to appreciate recent developments in the area. Course synopsis: Physical Layer Issues; The Datalink Layer; Local Area Networks; TCP/IP Suite of Protocols; Network Security; Mobile Networking, Client server programming. Network management

Computer Programming 2

Computing and Information Technology
The following topics are covered. Computer Hardware, Structure, and Operating Systems. Computer Software and the use of applications, Explanation of computer networks. Maintain security of computer systems against threats such as computer viruses, malware, phishing etc. Applications and Demonstration of software to
solve financial, mathematical, and engineering problems and to present results graphically. Portfolio, based on computer soft and hardware.

**Cornerstone 101**
The module content will be developed around the concept of journeys, across time, across space, and across human relationships. It will take the journey of the uMgeni River (which is close to all DUT campuses) as a metaphor. The module will bring different disciplinary perspectives to this content — environmental, historical and sociological in particular. The metaphor of the journey will be sustained across the module and will be applied to personal journeys, historical, political and environmental journeys, and social journeys, with a specific focus on gender. Each section will draw in issues of ethics, diversity and critical citizenry. The design team may later take a different metaphor or theme, but with the same outcomes and attributes. The final section of the module will identify and integrate learning from earlier sections, and examine implications for further learning. At each stage of the module, activities such as the weekly online journal and class discussion will involve reflection and build communicative practices. There will be a concluding section in which students will identify their learning and examine the implications for their roles as students and as citizens.

**Digital Electronics 1A**
Introduction to digital electronics, Number systems and coding, Basic logic functions, Logic tools and techniques, Combinational logic circuits, Introduction to sequential logic, Simulation of logic circuits, Introduction to programmable logic devices (PLDs)

**Digital Electronics 1B**
Sequential Logic Circuits, Multivibrators, Data Converters, Memory Technology, PLD configuration and Programming, IC Technologies, Displays

**Digital Signal Processing 3A**

**Digital Signal Processing 3B**
Electronic Circuit Design 2
Safety Issues, Electrostatic Discharge Protection, Review of basic instruments (physical and virtual), Review of electronic components, Fundamentals of engineering design, Power sources, power supply circuits, batteries, etc. Operational amplifier circuits (inverting and non-inverting amplifiers, summers, etc.), Limitations and strengths of integrated circuit operational amplifiers, Analogue filter circuits, Nonlinear operational amplifier circuits, Simple oscillators, Interface circuits to motors, relays, lamps, etc., using discrete transistors (bipolar and MOSFET). Digital-to-analogue and analogue-to-digital concepts, Basic sensor concepts, LED’s, lasers, phototransistors, and other interesting optoelectronic devices.
Boolean algebra, Switch logic and basic gates, Basic logic circuit design, Useful circuit building blocks and tricks, Engineering design processes – conceptual, preliminary, final design and implementation, How to build prototype circuits, How to debug analogue circuits, Introduction to CAE for PCB design, Introduction to CAE for simulation of circuits, Project documenting and reporting, Project presentation.

Electronic Design Projects 3
Perform procedural design of components, systems, works, products or processes to meet desired needs normally within applicable standards, codes of practice and legislation. A design project should be used to provide evidence of compliance with this outcome. The problem would be typical of that which the graduate would participate in a typical employment situation shortly after graduation. The selection of components, systems, engineering works, products or processes to be designed is dependent on the sub-discipline.

Demonstrate knowledge of project and application of engineering principles in design. Analyse results. Demonstrate effective Time management. Communicate effectively, both orally and in writing within an engineering context.

Electronic measurements

Embedded Systems 3
Introduction to embedded systems, Embedded Hardware, Embedded Software, Design and development of embedded systems, Quality assurance and testing of an embedded system
Maintenance of an embedded system

Engineering Mathematics 1A
Complex Numbers: Euler’s and De Moivre’s Formulas and Theorems
Calculus – Differentiation: Introduction to Differentiation, Methods of Differentiation, Applications of Differentiation, Differentiation of Implicit Functions, Logarithmic Differentiation, Calculus – Integration: Standard Integration, Applications of Integration

Engineering Mathematics 1B
Linear Algebra: The Theory of Matrices and Determinants, Solution of Simultaneous Equations by Matrices and Determinants, Trigonometry: Relationship between Trigonometry and Hyperbolic Functions, Compound Angles, Series: Maclaurin Series, Advanced Calculus - Differentiation: Differentiation of Parametric Equations, Differentiation of Hyperbolic Functions, Differentiation of Inverse Trigonometry and Inverse Hyperbolic Functions, Partial Differentiation, Total Differentiation, Rates of Change & Small Change, Maxima, Minima and Saddle Points for Function of Two Variables,

Advanced Calculus – Integration: Integration using Algebraic Substitutions, Integration using Trigonometry and Hyperbolic Substitutions, Integration by Partial Fractions, t-Substitution, Integration by Parts, Applications of Integration, Differential Equations: Solution of First-Order Ordinary Differential Equations (ODEs), Separation of Variable, Homogenous First-Order ODEs, Linear First-Order ODEs,

Statistics and Probability: Presentation of Statistical Data, Measures of Central Tendency

Engineering Mathematics 2A

Engineering Mathematics 2B

Engineering Physics 1A

Units, Physical Quantities, Vectors: Standards and Units, Unit Consistency and Conversions
Precision and Significant Figures, Vectors and Vector Addition, Components of vectors.

Equilibrium of a particle: Force, Equilibrium, Newton’s first law, Newton’s third law of motion


Torque: Moments, Second condition for equilibrium. Centre of gravity.

Elasticity: Stress, Strain,

Engineering Physics 1B

Units, Physical Quantities, Vectors: Standards and Units, Unit Consistency and Conversions
Precision and Significant Figures, Vectors and Vector Addition, Components of vectors.

Equilibrium of a particle: Force, Equilibrium, Newton’s first law, Newton’s third law of motion

Fundamentals of Communication 2

Fundamentals of Control Systems 2
Introduction to Control Systems Engineering, Open and closed loop systems, System models, for example, differential equations, state space representation, transfer functions, block diagrams and signal flow graphs, Control System inputs, including impulse, step, ramp, parabola, sinusoidal and combinations of these, Solution to the models based on the control system inputs, Analysis of first and
second order system response, time domain specifications and analysis including root locus plots, frequency domain specifications including Bode, Nyquist and Nichols plots.

**Fundamentals of Instrumentation 2**
Control Loop Fundamentals, Field measurement devices (temperature, pressure, level and flow), Control Modes, Instrumentation documentation

**Fundamentals of Networks 2**

**Microsystems Design 2**
Introduction to microprocessors, Microcontroller structure and operation, Basic Assembly language programming, Simulation and debugging techniques, Interfacing, Timing, Interrupt processing, Analog-to-Digital conversion, further application embedded applications.

**Microsystems Design 3**
Rationale for PLD usage, PLD evolution, Structure and operation of CPLDs and FPGAs, Hardware Description Programming languages, 5. Implementing PLD-based applications using hardware, State Machine design, PLD testing techniques, Advanced PLD applications.

**Control Systems 3A**
Compensator (including PID controller) design using time and frequency domain techniques.
Control system design using the state space approach and including pole placement design and observer design.

**Principles of Management 3**

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

**Radio Frequency Engineering 3A**
Radio Frequency Engineering 3B
Transmission Distortion in Linear and Non-linear Networks, Class A, B and C
Power Amplifier Design, Oscillator Design, Oscillator Noise, Mixer Parameters,
System level Design

Technical Literacy
The differences between language usage in academic, technical and common
environments
Experimental methods and the scientific method, Planning and documenting
experiments
Technical Report writing, Referencing practice, Utilising spreadsheets for graphical,
presentation of information, Standards (ISO, SABS, etc)
APPENDIX 1: FIELD OF STUDY 1 - PROCESS INSTRUMENTATION AND CONTROL (NDEIN1)

NOTES:
- Denotes prerequisites, that is, lower level module must be completed first.
- # Denotes complementary, that is, must register for prior to or simultaneously with.
- Denotes continuous assessment.
- ∗ All S4 level modules are complementary to Design Project 3.
APPENDIX 2: FIELD OF STUDY 2 - ELECTRONIC COMMUNICATIONS (NDECM1)

NOTES:

- Denotes prerequisites, that is, lower level module must be completed first.
- Denotes complementary, that is, must register for prior to or simultaneously with.
- # Denotes continuous assessment.
- * Radio Engineering 3 and Microwave Communication 3 are complementary to Design Project 3.
APPENDIX 3: FIELD OF STUDY 3 - COMPUTER SYSTEMS (NDCSY2)

Micro Processors 3 MPRO302

Logic Design 3 LODS301

Database Principles 3 DAPR302

Network Systems 3 NETS301

Software Engineering 3 SEGI302

Design Project 3 DEPJ301

Digital Systems 3 DSYS303

Mathematics 3 MATH301

Systems Analysis 2 SYSA201

Network Systems 2 NETS201

Programming 3 PRGM301

Operating Systems 3 OSYT301

Digital Systems 2 DSYS202

Mathematics 2 MATH201

Electronics 2 ETRS201

Digital Comms. 2 DICM201

Programming 2 PRGM201

Projects 1 PROJ103

Digital Systems 1 DSYS102

Mathematics 1 MATH101

Electronics 1 ETRS101

Electrical Engineering 1 ELEN103

Programming 1 PRGM101

Computer Skills 1 CSEL101

Communication Skills 1 CSKI103

Network Systems 3 NETS301

Electronics 2 ETRS201

Network Systems 2 NETS201

Software Engineering 3 SEGI302

Design Project 3 DEPJ301

Digital Systems 3 DSYS303

Mathematics 3 MATH301

Systems Analysis 2 SYSA201

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