3.1.1 Overview of the Engineering Curriculum

### TABLE 3.1.1: ENGINEERING UNDERGRADUATE CURRICULUM

<table>
<thead>
<tr>
<th>UNIVERSITY LEVEL REQUIREMENTS</th>
<th>PROGRAMME REQUIREMENTS</th>
<th>UNRESTRICTED ELECTIVE MODULES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty Requirements:</td>
<td>Foundational Requirements:</td>
<td></td>
</tr>
<tr>
<td>General Education Modules</td>
<td>Foundational modules in Mathematics, Sciences, Programming/Computing and others.</td>
<td></td>
</tr>
</tbody>
</table>

**Aim to develop abilities required of well-rounded engineers and includes modules related to Critical Thinking, Writing & Communications, Engineering Ethics & Professionalism and Management Basics.**

| Discipline-specific modules for various engineering programmes: | Unrestricted Elective Modules |
| Biomedical, Chemical, Civil, Computer, Electrical, Environmental, Industrial & Systems, Materials & Science, and Mechanical. | |

| Sub-total = 20 MCs (12.5%) | Sub-total = 11 MCs (6.88%) | Sub-total = 109 MCs (68.12%) | Sub-total = 20 MCs (12.5%) |

**Minimum required for graduation = 160 MCs**

Note 1: Minimum modular credits required for graduation could be higher than 160MCs for some engineering programmes.

As illustrated in table 3.1.1, the minimum requirements for the Bachelor of Engineering degree programme are as follows:

- University Level Requirements: 20 MCs
- Programme Requirements*: 120 MCs
- Unrestricted Elective Modules*: 20 MCs
- Total: **160 MCs**
UNIVERSITY LEVEL REQUIREMENTS

Engineering undergraduates have considerable flexibility in their choice of elective study. In addition to technical electives within their discipline (via the programme requirements), students have a wide choice of General Education Modules (GEMs) and Unrestricted Elective Modules (UEMs). These may be chosen and used in the many exciting ways described in this section. Students are strongly encouraged to consider some modules which will prepare them for their future roles as engineer-leaders. In most cases, these should be chosen from the list of business and management modules shown in Table 3.1.1b. Students should seek guidance from the departmental academic advisors on their elective choices.

The 20 MCs of the University Level Requirements (ULR) consist of:

- Five GEMs

**General Education Modules**

GEMs are different from other modules in two respects. First, they are general because they aim at those aspects of knowledge and abilities that we expect of educated individuals in general, not the knowledge and abilities that are required in the specialisation in a particular discipline or profession. Second, they seek to inculcate higher order qualities of the mind and intellect that make a person educated, as opposed to practical know-how and abilities that might be useful in one’s daily life or to contribute to success in one’s career. Students are advised to consult [nus.edu.sg/gem](http://nus.edu.sg/gem) for further details concerning GEMs.

[Note: The General Education curriculum is currently being reviewed for students who will be admitted in AY2016/17 onwards. Full details will be available in due course. Please consult the above website for further details.]

**PROGRAMME REQUIREMENTS**

Programme Requirements comprise the Faculty, Foundational and Discipline specific requirements:

- **Faculty Requirements** include modules that aim to develop important abilities required of well-rounded engineers with professional maturity and include modules related to Critical Thinking, Writing & Communications (ES1531 & ES2331, see below); Engineering Ethics & Professionalism (EG2401 Engineering Professionalism);
- **Foundational Requirements** include Mathematics, Sciences, Programming/Computing, and other modules as defined by the student’s engineering discipline (details in section 3.2);
- **Discipline Specific Modules** which are core/essential modules, technical electives modules, project modules, industry engagement modules (see below), and independent study modules as defined by the student’s engineering discipline (details in section 3.2).

**Critical Thinking, Writing & Communications (Faculty Requirements)**

One of the hallmarks of a university education is the ability to engage in high-level discourse when undertaking professional and other roles. The ability to critically evaluate problems, ask the right
questions, and able to clearly articulate ideas & solutions to problems in oral and written forms is vitally important for aspiring engineers. Throughout the engineering curriculum, emphasis is placed on developing and enhancing critical thinking abilities, and writing & oral skills.

Faculty of Engineering students are required to read a Critical Thinking & Writing (CTW) module and a Communications module; preferably read in the first-year semester of study. ES1531 Critical Thinking & Writing and ES2331 Communicating Engineering offered by the Centre for English Language Communication (CELC) would meet these requirements. ES1531 addresses the need to develop critical thinking and communication skills which will enable engineering students to ask good questions, think & reason well and be able to convince others when they practise their profession. ES2331 provides students with an opportunity to enhance their communication skills through competent and effective use of language in interpersonal, academic and public contexts.

**ES1531 Critical Thinking & Writing** is designed to prepare students to think, speak, and write critically and effectively. While oral communication skills are emphasized throughout the engineering curriculum, the compulsory oral communications module, **ES2331 Communicating Engineering** provides engineering students further opportunity to harness their communication skills through competent and effective use of language in interpersonal, academic and public contexts, focusing on elements of engineering practice.

However, CELC no longer offer ES2331. Students can read either IS2101 (Business and Technical Communication) or ES2007D (Professional Communication) in place of ES2331. Furthermore, ES1531 was cross listed to ES2531. Students matriculated in AY2019/20 will read ES2531 while students matriculated earlier will continue to read ES1531 to fulfill their graduation requirements.

Engineering students can read a single module, **ES1501X Academic Expository Writing** (ES1501A, ES1501B, etc.) in place of **ES1531 and ES2331**. ES1501X’s content-specific nature allows a contextualised platform to hone argumentation skills required in academic expository writing.

Engineering students who complete the requirements of the University Scholars Programme (USP) and the University Town (UTown) Residential Program need not read ES1531 & ES2331. Computer Engineering students would read another set of writing and communications modules in lieu of ES1531/ES2331 (please read section 3.2.4 for more details).

Good performance in the compulsory CTW and Communication modules is an indicator of ability of students to communicate well and so would be an important factor when selecting students for special programmes including the Student Exchange Programme.

**Industry Engagement (Programme Requirements)**
For students admitted into the BEng programmes from AY2014/2015, industry engagement will feature as a **compulsory requirement**. The type of industry engagement varies according to the engineering discipline and includes the 6-month industrial attachment/internships, projects with industry, etc. (details in section 3.2). Such industry engagement facilitates a form of experiential learning that integrates knowledge and theory learned in the classroom with practical application and skill development in a professional setting. The programme also enables students to learn about the latest developments in various industries and to interact/network with engineers & other professionals as they join in on projects or tasks that help to develop or enhance their skills whilst contributing to the organisation. By participating in internships, students gain invaluable experience that will make them stronger candidates when applying for jobs after graduation. Internships / industrial-attachment are optional for Polytechnic direct-intake students and students undergoing the following special programmes: Double Degree Programmes (DDP), Concurrent Degree Programmes (CDP), Global Engineering Programme* (GEP) and Chemical Sciences Programme (CSP). The modular credits for the internship/industrial-attachment for students in these special programmes will be considered as ‘Free Electives’. Students should consult their respective programme/department office on the utilisation of the Free Elective modular credits.

*GEP and Polytechnic direct-intake students in the Engineering Science Programme are required to fulfil the 12-week Vacation Internship Programme.

Students admitted from AY2016 will also undertake the **specially designed ‘Root & Wings Module’** which is a 10-week zero-MC module to sensitise freshmen to the importance of (i) focus, (ii) self awareness, (iii) interpersonal awareness & effectiveness, and (iv) personal vision for their future careers. Students can then start to plan their education and projects, hone their expertise and experiences and develop a credible portfolio towards their career goals.

**UNRESTRICTED ELECTIVES**

Unrestricted Elective Modules (UEMs) enable students to pursue their interests without any restrictions. Students may use Unrestricted Elective (UE) space to partially or wholly satisfy exciting academic programmes such as the Enhancement Programmes (see section 3.4), a minor, a second major, or even a second degree. To achieve a greater depth in their engineering major, students may also take engineering technical electives as UEMs.

To achieve a good understanding of the fundamental concepts and underlying principles of systems engineering, including systems thinking, as well as the design and management of complex systems, engineering undergraduates are encouraged to read IE2105 and/or other modules listed in Table 3.1.1c. Those who wish to be equipped with a good foundation of systems engineering principles, and thus better prepared for challenges in an increasing complex and interdependent world throughout their career can also consider a second major in Systems Engineering offered by the Department of Industrial & Systems Engineering.
TABLE 3.1.1C: UNRESTRICTED ELECTIVES OFFERED BY DEPARTMENT OF INDUSTRIAL & SYSTEMS ENGINEERING.

<table>
<thead>
<tr>
<th>MODULE</th>
<th>PREREQUISITES</th>
<th>PRECLUSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IE2105 Fundamentals in Systems Engineering</td>
<td>None</td>
<td>IE2101</td>
</tr>
<tr>
<td>IE2140 Engineering Economy</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>IE4240 Project Management</td>
<td>IE2140</td>
<td>None</td>
</tr>
<tr>
<td>IE4241 Work, Technology and Organisation</td>
<td>MNO1001</td>
<td>None</td>
</tr>
</tbody>
</table>

Important Advice Concerning UEMs

Students should carefully plan the use of UE and ULR modules which can be used to satisfy the requirements of a number of exciting programmes such as the Enhancement Programmes, Double Degree Programmes, a minor, and a second major. Students should take note of the 60 MC limit on Level-1000 modules (see section 3.1.3) when selecting UE and ULR modules.