Subject to approval

SYLLABUS FOR THE DEGREE OF BACHELOR OF ENGINEERING IN ENGINEERING SCIENCE [BEng(EngSc)]

The syllabus applies to students admitted in the academic year 2019-20 and thereafter under the four-year curriculum.

Curriculum Structure

Candidates are required to complete not fewer than 240 credits in accordance with the regulations and syllabuses for the Bachelor of Engineering degree in Engineering Science. The curriculum structure of the Bachelor of Engineering degree in Engineering Science is as follows:

Course Categories	No. of credits
UG5 Requirements	
• English language enhancement courses	12
• Chinese language enhancement courses	6
• Common Core Curriculum Courses	36
Sub-total	***54***
Major option in Engineering Science	
• Engineering Core Courses	36 to 42
• Discipline Introductory Courses	12 to 24
• Discipline Advanced Courses	12 to 24
• Capstone Experience	6 to 12
• Discipline Elective Courses	6 to 24
Sub-total	***96***
Elective Courses (including Discipline Elective Courses, Second Major/Minor option; Free Electives)	*90*
Total	**240**

Major Options

- Systems Analytics
- Environmental Engineering
- Energy Engineering
- Materials Engineering
- Biomedical Engineering

Curriculum

The Curriculum comprises 240 credits of courses as follows:

Engineering Core Courses
Students are required to complete 36 to 42 credits of Engineering Core Courses.

Discipline Core Courses
Students are required to complete ALL discipline core courses in accordance with the syllabuses of major option concerned (24 to 36 credits), comprising introductory core courses and advanced core courses.

Discipline Elective Courses
Students are required to complete 6 to 24 credits of discipline elective courses in accordance with the syllabuses of major option concerned.

Elective Courses
Students are required to complete at least 90 credits of elective course(s) offered by departments within or outside of the Faculty of Engineering.

University Requirements
Students are required to complete:

a) 12 credits in English language enhancement, including 6 credits in "CAES1000 Core University English" and 6 credits in English-in-the-Discipline course of respective major option;
b) 6 credits in Chinese language enhancement course "CENG9001 Practical Chinese for engineering students" and
c) 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits during the whole period of study.

Capstone Experience
Students are required to complete 6-credit or 12-credit capstone experience course of respective major option to fulfill the capstone experience requirement for the degree of BEng in Engineering Science.

Internship
Students may enroll in the non-credit bearing internship of respective departments as discipline elective course subject to the approval of the Programme Director. The internship normally takes place after their third year of study.

Degree Classification

The degree of Bachelor of Engineering shall be awarded in five divisions in accordance with ES 15 of the Regulations for the Degree of Bachelor of Engineering in Engineering Science and UG 9 of the Regulations for First Degree Curricula.

The details of the distribution of the above course categories are as follows:

The curriculum of BEng in Engineering Science degree comprises 240 credits of courses with the following structure:

A. Common Requirements for all major options in BEng in Engineering Science

UG 5 Requirements (54 credits)

Course Code	Course	No. of credits
CAES1000	Core University English	6
CAES95##	English in the Discipline course*	6

CENG9001	Practical Chinese for engineering students	6
CC##XXXX	University Common Core Course (6 courses)**	36
Total for UG5 Requirements		54

*English in the Discipline course of respective major options of BEng in Engineering Science curriculum is as follows:

Course Code	Course Title	Major option of BEng(EngSc)	Year/ Semester
CAES9544	Technical English for Mechanical Engineering	Materials Engineering	Semester 2, Year 4
CAES9531	Technical English for Biomedical Engineering	Biomedical Engineering	Semester 1, Year 3
CAES9540	Technical English for Civil Engineering	Environmental Engineering	Semester 1, Year 4
CAES9541	Technical English for Electrical and Electronic Engineering	Energy Engineering	Semester 2, Year 4
CAES9532	Technical English for Industrial and Manufacturing Systems Engineering	Systems Analytics	Semester 1, Year 3

** Students have to complete 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits.

B. Specific Requirements for Individual Major Option of BEng in Engineering Science degree

1. Systems Analytics

Engineering Core Courses (36 credits)

Course Code	Course Title	No. of credits
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
ENGG1330	Computer programming I	6
ENGG1340	Computer programming II	6
ENGG1320	Engineers in the modern world	6
Choose one of the following		
ENGG1300	Fundamental mechanics	6
ENGG1310	Electricity and electronics	6
Total for Engineering Core Courses		36

Discipline Core Courses (36 credits)

Introductory Courses (18 credits)

Course Code	Course Title	No. of credits
COMP2119	Introduction to data structures and algorithms	6
IMSE2132	Statistical analysis	6
IMSE2134	Operational research	6

Total for Introductory Discipline Core Courses	18

Advanced Courses (18 credits)

Course Code	Course Title	No. of credits
IMSE3134	Innovation and entrepreneurship	6
IMSE4137	Operational risk management	6
Choose one of the following *		
COMP3314	Machine learning	6
IMSE3111	Intelligent optimization	6
Total for Advanced Discipline Core Courses		18

* Students cannot take both COMP3314 and IMSE3111

Capstone Experience (12 credits)

Course Code	Course Title	No. of credits
IMSE4175	Systems analytics and integration	12
Total for Capstone Experience		12

Discipline Elective Courses (12 credits)

Course Code	Course Title	No. of credits
COMP3278	Introduction to database management systems	6
ELEC3241	Signals and linear systems	6
ELEC3249	Pattern recognition and machine intelligence	6
ELEC4543	Fuzzy systems and neural networks	6
ELEC4544	Artificial intelligence and deep learning	6
ELEC4545	Time series analysis with financial applications	6
ELEC4546	Investment and trading for engineering students	6
IMSE2112	Engineering technology	6
IMSE3103	Systems automation	6
IMSE3107	Systems modelling and simulation	6
IMSE3115	Engineering economics and finance	6
IMSE3137	Virtual reality for systems engineering	6
IMSE3139	Cyber-physical systems	6
IMSE4102	Engineering project management	6
IMSE4119	Digital enterprises and e-commerce	6
IMSE4110	Financial engineering	6
LLAW3069	Regulation of financial markets	6
Total for Discipline Elective Courses		12

Elective Courses (90 credits)

At least 90 credits of elective course(s) offered by departments within or outside of the Faculty of Engineering.

Note: Students can take Research Postgraduate courses as discipline elective course subject to the approval of the Programme Director.

Reference Table for BEng in Engineering Science (Systems Analytics)

Year	Language	Common Core	Engineering Core/ Core/Capstone Experience	Discipline Electives	Elective Courses	Total
1	12	12	36	0	0	60
2	0	12	18	0	30	60
3	6	12	12	6	24	60
4	0	0	18	6	36	60
Total	**18**	**36**	**84**	**12**	**90**	**240**

2. Environmental Engineering

Engineering Core Courses (36 credits)

Course Code	Course Title	No. of credits
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
ENGG1310	Electricity and electronics	6
ENGG1320	Engineers in the modern world	6
ENGG1330	Computer programming I	6
ENGG1350	Thermofluid mechanics	6
Total for Engineering Core Courses		36

Discipline Core Courses (30 credits)

Introductory Courses (18 credits)

Course Code	Course Title	No. of credits
CIVL1105	Environmental engineering	6
CIVL2103	Fluid mechanics	6
ENGG1300	Fundamental mechanics	6
Total for Introductory Discipline Core Courses		18

Advanced Courses (12 credits)

Course Code	Course Title	No. of credits
CIVL2104	Hydraulics and hydrology	6
MECH2407	Multivariable calculus and partial differential equations	6
Total for Advanced Discipline Core Courses		12

Capstone Experience (12 credits)

Course Code	Course Title	No. of credits
CIVL4103	Capstone design project	12
OR		
CIVL4102	Project	12
Total for Capstone Experience		12

Discipline Elective Courses (18 credits)

Course Code	Course Title	No. of credits
CIME2101	Water & air quality: concepts & measurements	6
CIVL3106	Engineering hydraulics	6
CIVL3107	Environmental impact assessment of civil engineering projects	6
CIVL3111	Wastewater treatment	6
CIVL3115	Solid and hazardous waste management	6
CIVL3121	Water resources engineering	6
CIVL3122	Wind engineering	6
MECH3420	Air pollution control	6
MECH4428	Sound and vibration	6
Total for Discipline Elective Courses		18

Elective Courses (90 credits)

At least 90 credits of elective course(s) offered by departments within or outside the Faculty of Engineering.

Note: Students can take Research Postgraduate courses as discipline elective course subject to the approval of the Programme Director.

Reference Table for BEng in Engineering Science (Environmental Engineering)

Year	Language	Common Core	Engineering Core/ Core/Capstone Experience	Discipline Electives	Elective Courses	Total
1	6	18	36	0	0	60
2	0	18	24	0	18	60
3	12	0	18	18	12	60
4	0	0	0	0	60	60
Total	**18**	**36**	**78**	**18**	**90**	**240**

3. Energy Engineering

Engineering Core Courses (42 credits)

Course Code	Course Title	No. of credits
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
ENGG1300	Fundamental mechanics	6
ENGG1310	Electricity and electronics	6
ENGG1320	Engineers in the modern world	6
ENGG1330	Computer programming I	6
ENGG1350	Thermofluid mechanics	6
Total for Engineering Core Courses		42

Discipline Core Courses (36 credits)

Introductory Courses (12 credits)

Course Code	Course Title	No. of credits
ELEC2147	Electrical energy technology	6
ELEC2346	Electric circuit theory	6
Total for Introductory Discipline Core Courses		12

Advanced Courses (24 credits)

Course Code	Course Title	No. of credits
ELEC3141	Power transmission and distribution	6
ELEC3142	Electrical energy conversion	6
ELEC3143	Power electronics	6
MECH2407	Multivariable calculus and partial differential equations	6
Total for Advanced Discipline Core Courses		24

Capstone Experience (6 – 12 credits)

Course Code	Course Title	No. of credits
ELEC3848	Integrated design project	6
OR		
ELEC4848	Senior design project	12
Total for Capstone Experience		6 - 12

Discipline Elective Courses (6 - 12 credits)

Course Code	Course Title	No. of credits
ELEC2243	Introduction to electricity and magnetism	6
ELEC3241	Signal and linear systems	6
ELEC3844	Engineering management and society	6
ELEC4141	Electric railway systems	6
ELEC4142	Power system protection and switchgear	6
ELEC4144	Electric vehicle technology	6

ELEC4145	Building services – electrical services	6
ELEC4146	Building services – electrical installations	6
ELEC4147	Power system analysis and control	6
MECH3418	Dynamics and control	6
MECH4409	Energy conversion systems	6
MECH4411	Heat transfer	6
Total for Discipline Elective Courses		6 - 12

Elective Courses (90 credits)

At least 90 credits of elective course(s) offered by departments within or outside the Faculty of Engineering.

Note: Students can take Research Postgraduate courses as discipline elective course subject to the approval of the Programme Director.

Reference Table for BEng in Engineering Science (Energy Engineering)

Year	Language	Common Core	Engineering Core/ Core/Capstone Experience	Discipline Electives	Elective Courses	Total
1	6	12	42	0	0	60
2	0	24	24	0	12	60
3	12	0	18 - 24	6 - 12	18	60
4	0	0	0	0	60	60
Total	**18**	**36**	**84 - 90**	**6 - 12**	**90**	**240**

4. Materials Engineering

Engineering Core Courses (42 credits)

Course Code	Course Title	No. of credits
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
ENGG1300	Fundamental mechanics	6
ENGG1310	Electricity and electronics	6
ENGG1320	Engineers in the modern world	6
ENGG1330	Computer programming I	6
ENGG1350	Thermofluid mechanics	6
Total for Engineering Core Courses		242

Discipline Core Courses (36 credits)

Introductory Courses (24 credits)

Course Code	Course Title	No. of credits
MECH2404	Drawing and elements of design and manufacture	6
MECH2413	Engineering mechanics	6
MECH2419	Properties of materials	6
ELEC2243	Introduction to electricity and magnetism	6

Total for Introductory Discipline Core Courses	24

Advanced Courses (12 credits)

Course Code	Course Title	No. of credits
ELEC3347	Electronic materials and quantum physics	6
BMED3600	Biomaterials science and engineering	6
Total for Advanced Discipline Core Courses		12

Capstone Experience (6 - 12 credits)

Course Code	Course Title	No. of credits
MECH3427	Design and manufacture	6
OR		
MECH4429	Integrated capstone experience	12
Total for Capstone Experience Courses		6 - 12

Discipline Elective Courses (6 - 12 credits)

Course Code	Course Title	No. of credits
IMSE3106	Manufacturing technology	6
ELEC4248	Photonic systems technologies	6
MECH3409	Mechanics of solids	6
MECH3416	Fundamentals of aeronautical engineering	6
MECH4412	Product design and development	6
MECH4414	Materials for engineering applications	6
MECH4415	Applied stress and strength analysis	6
BMED4500	Biomedical instrumentation and systems	6
Total for Discipline Elective Courses		6 - 12

Elective Courses (90 credits)

At least 90 credits of elective course(s) offered by departments within or outside the Faculty of Engineering.

Note: Students can take Research Postgraduate courses as discipline elective course subject to the approval of the Programme Director.

Reference Table for BEng in Engineering Science (Materials Engineering)

Year	Language	Common Core	Engineering Core/ Core/Capstone Experience	Discipline Electives	Elective Courses	Total
1	6	12	42	0	0	60
2	0	24	24	0	12	60
3	12	0	18 - 24	6 - 12	18	60
4	0	0	0	0	60	60
Total	**18**	**36**	**84 - 90**	**6 - 12**	**90**	**240**

5. Biomedical Engineering

Engineering Core Courses (42 credits)

Course Code	Course Title	No. of credits
MATH1851	Calculus and ordinary differential equations	6
MATH1853	Linear algebra, probability & statistics	6
ENGG1300	Fundamental mechanics	6
ENGG1310	Electricity and electronics	6
ENGG1320	Engineers in the modern world	6
ENGG1330	Computer programming I	6
ENGG1350	Thermofluid mechanics	6
Total for Engineering Core Courses		42

Discipline Core Courses (24 credits)

Introductory Courses (12 credits)

Course Code	Course Title	No. of credits
BMED2206	Engineering in biology and medicine	6
BMED2301	Life sciences I (Biochemistry)	6
Total for Introductory Discipline Core Courses		12

Advanced Courses (12 credits)

Course Code	Course Title	No. of credits
BMED2302	Life sciences II (Cell Biology & Physiology)	6
BMED3301	Life sciences III (Physiology)	6
Total for Advanced Discipline Core Courses		12

Capstone Experience (6 - 12 credits)

Course Code	Course Title	No. of credits
BMED3010	Integrated Project	6
OR		
BMED4010	Final year project	12
Total for Capstone Experience		6 - 12

Discipline Elective Courses (18 - 24 credits)

Course Code	Course Title	No. of credits
BMED3500	Electromagnetics in biomedicine	6
BMED3501	Medical imaging	6
BMED3600	Biomaterials science and engineering	6
BMED4500	Biomedical instrumentation and systems	6
BMED4501	Biophotonics	6
BMED4602	Molecular and cellular biomechanics	6
BMED4603	Transport phenomena in biological systems	6
BMED4604	Cell and tissue engineering	6

ELEC4252	Robotic control and vision	6
Total for Discipline Elective Courses		18 - 24

Elective Courses (90 credits)

At least 90 credits of elective course(s) offered by departments within or outside the Faculty of Engineering.

Note: Students can take Research Postgraduate courses as discipline elective course subject to the approval of the Programme Director.

Reference Table for BEng in Engineering Science (Biomedical Engineering)

Year	Language	Common Core	Engineering Core/ Core/Capstone Experience	Discipline Electives	Elective Courses	Total
1	6	12	42	0	0	60
2	0	24	18	0	18	60
3	12	0	12 - 18	18 - 24	12	60
4	0	0	0	0	60	60
Total	**18**	**36**	**72 - 78**	**18 - 24**	**90**	**240**

Programme Structure of BEng in Engineering Science - Reference

Major Option/ Course Type	General Engineering	Introductory Course	Advanced Course	Capstone Experience	Discipline Electives	Total
Systems Analytics	36	18	18	12	12	96
Environmental Engineering	36	18	12	12	18	96
Energy Engineering	42	12	24	6 - 12	6 - 12	96
Materials Engineering	42	24	12	6 - 12	6 - 12	96
Biomedical Engineering	42	12	12	6 - 12	18 - 24	96

COURSE DESCRIPTIONS

Candidates will be required to do the coursework in the respective courses selected. Not all courses are offered every semester.

Engineering Core Courses

MATH1851 Calculus and ordinary differential equations (6 credits)
MATH1853 Linear algebra, probability & statistics (6 credits)
ENGG1300 Fundamental mechanics
ENGG1310 Electricity and electronics

ENGG1320 Engineers in the modern world
ENGG1330 Computer programming I
ENGG1340 Computer programming II
ENGG1350 Thermofluid mechanics

Please refer to the Engineering Core Courses in the syllabus for the degree of BEng for details.

University Requirements on Language Enhancement Courses

All the students admitted to the Bachelor of Engineering in Engineering Science curriculum are required to take two English language enhancement courses and one Chinese language enhancement course in the study year as specified in the syllabuses:

CAES1000. Core University English
CENG9001. Practical Chinese for engineering students (to be taken at the first semester of third year of study)

Please refer to the University Language Enhancement Courses in the syllabus for the degree of BEng for details.

CAES95##. English in the Discipline course for respective BEng curriculum and BEng(EngSc) major option

Please refer to the syllabus of the respective BEng programmes for course description.

University Common Core Curriculum

Successful completion of 36 credits of courses in the Common Core Curriculum, comprising at least one and not more than two courses from each Area of Inquiry with not more than 24 credits of courses being selected within one academic year except where candidates are required to make up for failed credits:

- Scientific and Technology Literacy
- Humanities
- Global Issues
- China: Culture, State and Society

Discipline Core/Discipline Elective/Capstone Experience Courses

CIME2101. Water and air quality: concepts and measurement (6 credits)
CIVL1105. Environmental engineering (6 credits)
CIVL2103. Fluid mechanics (6 credits)
CIVL2104. Hydraulics and hydrology (6 credits)
CIVL3106. Engineering hydraulics (6 credits)
CIVL3107. Environmental impact assessment of civil engineering projects (6 credits)
CIVL3111. Wastewater treatment (6 credits)
CIVL3115. Solid and hazardous waste management (6 credits)

CIVL3121. Water resources engineering (6 credits)
CIVL3122. Wind engineering (6 credits)
CIVL4101. Capstone design project (12 credits)
CIVL4102. Project (12 credits)
CAES9540. Technical English for Civil Engineering (6 credits)

Please refer to the syllabus of the Civil Engineering programme for course description.

COMP2119. Introduction to data structures and algorithms (6 credits)
COMP3278. Introduction to database management systems (6 credits)
COMP3314. Machine learning (6 credits)

Please refer to the syllabus of the Computer Science programme for course description.

ELEC2147. Electrical energy technology (6 credits)
ELEC2243. Introduction to electricity and magnetism (6 credits)
ELEC2346. Electric circuit theory (6 credits)
ELEC3141. Power transmission and distribution (6 credits)
ELEC3142. Electric energy conversion (6 credits)
ELEC3143. Power electronics (6 credits)
ELEC3241. Signals and linear systems (6 credits)
ELEC3249. Pattern recognition and machine intelligence (6 credits)
ELEC3347. Electronic materials and quantum physics (6 credits)
ELEC3844. Engineering management and society (6 credits)
ELEC3848. Integrated design project (6 credits)
ELEC4141. Electric railway systems (6 credits)
ELEC4142. Power system protection and switchgear (6 credits)
ELEC4144. Electric vehicle technology (6 credits)
ELEC4145. Building services- electrical services (6 credits)
ELEC4146. Building services- electrical installations (6 credits)
ELEC4147. Power system analysis and control (6 credits)
ELEC4252. Robotic control and vision (6 credits)
ELEC4248. Photonic systems technologies (6 credits)
ELEC4543. Fuzzy systems and neural networks (6 credits)
ELEC4544. Artificial intelligence and deep learning (6 credits)
ELEC4545. Time series analysis with financial applications (6 credits)
ELEC4546. Investment and trading for engineering students (6 credits)
ELEC4848. Senior design project (12 credits)
CAES9541. Technical English for Electrical and Electronic Engineering (6 credits)

Please refer to the syllabus of the Computer Engineering/Electrical Engineering/Electronic Engineering programme for course description.

IMSE4175. Systems analytics and integration (12 credits)

Case-based learning on systems analysis, design and integration. Most students participate in the case studies and projects initiated by the participating companies in the manufacturing, logistics, service and

financial sectors. In collaboration with an industry supervisor, other practitioners and an academic supervisor, the students are expected to develop their quantitative skills in data collection, systems modelling, analysis and visualization, and systems integration. The students will accumulate their hands-on experience in applying their knowledge to real-world scenarios and familiarize themselves with real-world decision-making process.

Assessment: 100% continuous assessment

IMSE2112. Engineering technology (6 credits)
IMSE2132. Statistical analysis (6 credits)
IMSE2134. Operational research (6 credits)
IMSE3103. Systems automation (6 credits)
IMSE3106. Manufacturing technology (6 credits)
IMSE3107. Systems modelling and simulation (6 credits)
IMSE3111. Intelligent optimization (6 credits)
IMSE3115. Engineering economics and finance (6 credits)
IMSE3134. Innovation and entrepreneurship (6 credits)
IMSE3137. Virtual reality for systems engineering (6 credits)
IMSE3139. Cyber-physical systems (6 credits)
IMSE4102. Engineering project management (6 credits)
IMSE4110. Financial engineering (6 credits)
IMSE4119. Digital enterprises and e-commerce (6 credits)
IMSE4137. Operational risk management (6 credits)
IMSE4175. Systems analytics and integration (12 credits)
CAES9532 Technical English for Industrial and Manufacturing Systems Engineering (6 credits)

Please refer to the syllabus of the Industrial Engineering and Logistics Management programme for course description.

MECH2404. Drawing and elements of design and manufacture (6 credits)
MECH2407. Multivariable calculus and partial differential equations (6 credits)
MECH2413. Engineering mechanics (6 credits)
MECH2419. Properties of materials (6 credits)
MECH3409. Mechanics of solids (6 credits)
MECH3416. Fundamentals of aeronautical engineering (6 credits)
MECH3418. Dynamics and control (6 credits)
MECH3420. Air pollution control (6 credits)
MECH3427. Design and manufacture (6 credits)
MECH4409. Energy conversion systems (6 credits)
MECH4411. Heat transfer (6 credits)
MECH4412. Product design and development (6 credits)
MECH4414. Materials for engineering applications (6 credits)
MECH4415. Applied stress and strength analysis (6 credits)
MECH4428. Sound and vibration (6 credits)
MECH4429. Integrated capstone experience (12 credits)
CAES9544. Technical English for Mechanical Engineering (6 credits)

Please refer to the syllabus of the Mechanical Engineering programme for course description.

BMED2206. Engineering in biology and medicine (6 credits)
BMED2301. Life sciences I (Biochemistry) (6 credits)
BMED2302. Life sciences II (Cell Biology & Physiology) (6 credits)
BMED3010. Integrated project (6 credits)
BMED3301. Life sciences III (Physiology) (6 credits)
BMED3500. Electromagnetics in biomedicine (6 credits)
BMED3501. Medical imaging (6 credits)
BMED3600. Biomaterials science and engineering (6 credits)
BMED4010. Final year project (12 credits)
BMED4500. Biomedical instrumentation and systems (6 credits)
BMED4501. Biophotonics (6 credits)
BMED4602. Molecular and cellular biomechanics (6 credits)
BMED4603. Transport phenomena in biological systems (6 credits)
BMED4604. Cell and tissue engineering (6 credits)
CAES9531. Technical English for Biomedical Engineering (6 credits)

Please refer to the syllabus of the Biomedical Engineering programme for course description.

LLAW3069. Regulation of financial markets (6 credits)

Please refer to the syllabus of the Bachelor of Laws programme for course description.
