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 2018-19 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	30 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

- Environmental Engineering
- Energy Engineering
- Materials Engineering
- Biomedical Engineering
- Computing & Data Analytics

Curriculum

The Curriculum comprises 240 credits of courses as follows:

Engineering Core Courses
Students are required to complete 30 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 48 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
CAES9542	Technical English for Computer Science	Computing & Data Analytics	Semester 1, Year 4

** 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. 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	Computing 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
CIVL4101	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 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 (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**

2. 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 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 (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**

3. 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		42

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 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 (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**

4. 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 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 (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**

5. Computing & Data Analytics

Engineering Core Courses (30 credits)

Course Code	Course Title	No. of credits
COMP2121	Discrete mathematics	6
ENGG1320	Engineers in the modern world	6
ENGG1330	Computer programming I#	6
ENGG1340	Computer programming II	6
MATH1013	University mathematics II*	6
Total for Engineering Core Courses		30

Non-BEng students are required to complete "COMP1117 Computer programming" (6 credits) in lieu of ENGG1330.

*Students can be waived for taking "MATH1013 University mathematics II" and take another elective course in lieu, should they complete "MATH1851 Calculus and ordinary differential equations" and "MATH1853 Linear algebra, probability & statistics".

Pre-requisite for "MATH1013 University mathematics II":

- Level 2 or above in HKDSE Mathematics plus Extended Module 1; or
- Level 2 or above in HKDSE Mathematics plus Extended Module 2; or
- Completed "MATH1011 University mathematics I"

Discipline Core Courses (48 credits)

Introductory Courses (24 credits)

Course Code	Course Title	No. of credits
COMP2119	Introduction to data structures and algorithms	6
MATH2014	Multivariable calculus and linear algebra	6
STAT2601	Probability and statistics I	6
STAT2602	Probability and statistics II	6
Total for Introductory Discipline Core Courses		24

Advanced Courses (24 credits)

Course Code	Course Title	No. of credits
COMP3250	Design and analysis of algorithms	6
COMP3278	Introduction to database management systems	6
COMP3407	Scientific computing	6
STAT3600	Linear statistical analysis	6
Total for Advanced Discipline Core Courses		24

Capstone Experience (6 - 12 credits)

Course Code	Course Title	No. of credits
COMP4804	Computing and data analytics project	6
OR		
COMP4801	Final year project *	12
Total for Capstone Experience		6 - 12

* The project must be related to Computing and Data Analytics.

Discipline Elective Courses (6 - 12 credits)

Course Code	Course Title	No. of credits
STAT3609	The statistics of investment risk	6
STAT3612	Data mining	6
STAT3613	Marketing engineering	6
STAT3615	Practical mathematics for investment	6
STAT3618	Derivatives and risk management	6
STAT3622	Data visualization	6
STAT4601	Time series analysis	6
STAT4607	Credit risk analysis	6
STAT4608	Market risk analysis	6
STAT4609	Big data analytics	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 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 (Computing and data analytics)

Year	Language	Common Core	Engineering Core/ Core/Capstone Experience	Discipline Electives	Elective Courses	Total
1	6	24	30	0	0	60
2	0	12	18	0	30	60
3	6	0	30	6 -12	12 - 18	60
4	6	0	6 - 12	0	42 - 48	60
Total	**18**	**36**	**84 – 90**	**6 - 12**	**90**	**240**

Programme Structure of BEng in Engineering Science - Reference

Major Option/ Course Type	Engineering Core	Introductory Course	Advanced Course	Capstone Experience	Discipline Electives	Total
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
Computing & Data Analytics	30	24	24	6 - 12	6 -12	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
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 (6 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)
COMP2121. Discrete mathematics (6 credits)
COMP3250. Design and analysis of algorithms (6 credits)
COMP3278. Introduction to database management systems (6 credits)
COMP3407. Scientific computing (6 credits)
COMP4801. Final year project (12 credits)
COMP4804. Computing and Data Analytics Project (6-credits)
CAES9542. Technical English for Computer Science (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)
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)
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.

IMSE3106. Manufacturing technology (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 medicine and biology (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.

MATH1013. University mathematics II (6 credits)
MATH2014. Multivariable calculus and linear algebra (6 credits)
STAT2601. Probability and statistics I (6 credits)
STAT2602. Probability and statistics II (6 credits)
STAT3600. Linear statistical analysis (6 credits)
STAT3609. The statistics of investment risk (6 credits)
STAT3612. Data mining (6 credits)
STAT3613. Marketing engineering (6 credits)
STAT3615. Practical mathematics for investment (6 credits)
STAT3618. Derivatives and risk management (6 credits)
STAT3622. Data visualization (6 credits)
STAT4601. Time-series analysis (6 credits)
STAT4607. Credit risk analysis (6 credits)
STAT4608. Market risk analysis (6 credits)
STAT4609. Big data analytics (6 credits)

Please refer to the syllabus for the degree of BSc for course description.