Master of Philosophy (MPhil) and Doctor of Philosophy (PhD) Programs in Mechanical Engineering

Curriculum for Master of Philosophy (MPhil) Program in Mechanical Engineering

Students enrolled in the Master of Philosophy (MPhil) program in Mechanical Engineering are required to:

- Take 12 credits of postgraduate courses (excluding courses from SBM and SHSS), of which 9 credits must be from MECH courses;
- Take and pass ENGG 6770 Professional Development in Engineering in their first 1.5 years of study. Students may be exempted from certain course events, subject to prior approval of the School. Part-time students may be given extension to complete the course, subject to prior approval of the School;
- Full-time RPg students are required to take an English Language Proficiency Assessment (ELPA) Speaking Test administered by the Center for Language Education before the start of their first term of study. Students whose ELPA Speaking Test score is below Level 4, or who failed to take the test in their first term of study, are required to take LANG 5000 Foundation in Listening & Speaking for Postgraduate Students until they pass the course by attaining at least Level 4 in the ELPA Speaking Test before graduation;
- Take LANG 5001 Postgraduate English for Engineering Research Studies. Students can be exempted from taking LANG 5001 with the approval of the Department Head and PG Coordinator;
- The credits earned from ENGG 6770, LANG 5000 and LANG 5001 cannot be counted toward the credit requirements;
- Take MECH 6090 Seminar in Mechanical Engineering for at least three terms. Subject to the approval of the Department, students can take MECH 6090 for less than three terms;
- Register in MECH 6990 MPhil Thesis Research every regular term; and
- Present and oral defend the MPhil thesis.

<u>Nanotechnology Concentration</u>

Students who opt for the Nanotechnology Concentration are required to:

- Take 12 credits of postgraduate courses (excluding courses from SBM and SHSS), of which 6 credits must be from MECH courses and 3 credits from NANO courses;
- Take and pass ENGG 6770 Professional Development in Engineering in their first 1.5 years of study. Students may be exempted from certain course events, subject to prior approval of the School. Part-time students may be given extension to complete the course, subject to prior approval of

the School;

- Full-time RPg students are required to take an English Language Proficiency Assessment (ELPA) Speaking Test administered by the Center for Language Education before the start of their first term of study. Students whose ELPA Speaking Test score is below Level 4, or who failed to take the test in their first term of study, are required to take LANG 5000 Foundation in Listening & Speaking for Postgraduate Students until they pass the course by attaining at least Level 4 in the ELPA Speaking Test before graduation;
- Take LANG 5001 Postgraduate English for Engineering Research Studies. Students can be exempted from taking LANG 5001 with the approval of the Department Head and PG Coordinator;
- The credits earned from ENGG 6770, LANG 5000 and LANG 5001 cannot be counted toward the credit requirements;
- Take MECH 6090 Seminar in Mechanical Engineering for at least three terms. Subject to the approval of the Department, students can take MECH 6090 for less than three terms;
- Complete NANO 6010 Advanced Topic in Nano Science and Technology for one term. Students can use NANO 6010 to replace one term of registration of MECH 6090;
- Register in MECH 6990 MPhil Thesis Research every regular term;
- Conduct research in nano area; and
- Present and oral defend the MPhil thesis.

Energy Technology Concentration

Students who opt for the Energy Technology Concentration are required to:

- Take 12 credits of postgraduate courses (excluding courses from SBM and SHSS) of which 6 credits must be from MECH courses and 3 credits from ENEG courses;
- Take and pass ENGG 6770 Professional Development in Engineering in their first 1.5 years of study. Students may be exempted from certain course events, subject to prior approval of the School. Part-time students may be given extension to complete the course, subject to prior approval of the School;
- Full-time RPg students are required to take an English Language Proficiency Assessment (ELPA) Speaking Test administered by the Center for Language Education before the start of their first term of study. Students whose ELPA Speaking Test score is below Level 4, or who failed to take the test in their first term of study, are required to take LANG 5000 Foundation in Listening & Speaking for Postgraduate Students until they pass the course by attaining at least Level 4 in the ELPA Speaking Test

before graduation;

- Take LANG 5001 Postgraduate English for Engineering Research Studies. Students can be exempted from taking LANG 5001 with the approval of the Department Head and PG Coordinator;
- The credits earned from ENGG 6770, LANG 5000 and LANG 5001 cannot be counted toward the credit requirements;
- Take MECH 6090 Seminar in Mechanical Engineering for at least three terms. Subject to the approval of the Department, students can take MECH 6090 for less than three terms;
- Complete ENEG 6010 Advanced Topics in Energy Technology for one term. They can use ENEG 6010 to replace one term of registration of MECH 6090;
- Register in MECH 6990 MPhil Thesis Research every regular term;
- Conduct research in energy area; and
- Present and oral defend the MPhil thesis.

Scientific Computation Concentration

In addition to the existing program requirements, students who opt for the Scientific Computation concentration are required to:

(i) MPhil: Complete a minimum of 7 credits from the following course lists.
PhD: Complete a minimum of 10 credits from the follow course lists.

The credits earned under the concentration will be counted toward the total credit requirements of the programs.

Core Courses
MPhil: at least 3 credits
PhD: at least 6 credits

All students must take MATH 6915 and MATH 6916. Credits earned from MATH 6915 can be repeated for up to 2 credits.

COMP	5112	Parallel Programming
CIVL	5390	Finite Element Methods; or
MECH	5930	Finite Element Methods
CSIC	5001	Introduction to Advanced Computing Systems
CSIC	5011	Topological and Geometric Data Reduction and Visualization
CSIC	5031	Modeling, Optimization and Statistics
MATH	5311	Advanced Numerical Methods I
MATH	6915	Scientific Computation Seminar
MATH	6916	Student Seminars on Computation Related Research

Elective Courses

CHEM 5210	Computational Chemistry
CHEM 5220	Statistical Mechanics: Theory and Applications in Complex Systems
COMP 5212	Machine Learning
COMP 5213	Introduction to Bayesian Networks
COMP 5331	Knowledge Discovery in Databases
COMP 5421	Computer Vision
CSIC 5190	Special Topics in Scientific Computation
ELEC 5810	Introduction to Bioinformatics Algorithms
ELEC 5140	Advanced Computer Architecture
MATH 5350	Computational Fluid Dynamics for Inviscid Flows
MATH 5360	Weather, Climate and Pollution
MATH 5411	Advanced Probability Theory I
MATH 5431	Advanced Mathematical Statistics I
MECH 5230	Computational Fluid Dynamics and Heat Transfer
MECH 5280	Transport Phenomena and Its Application in Energy Systems
MSDM 5004	Mathematical Methods for Data Analysis
PHYS 5410	Numerical Modeling in Physics

(ii) Conduct research in the area of scientific computation.

Curriculum for Doctor of Philosophy (PhD) Program in Mechanical Engineering

Students enrolled in the Doctor of Philosophy (PhD) program in Mechanical Engineering are required to:

- Fulfill credit requirements as follows:

  i) PhD students without a master's degree are required to take 24 credits of postgraduate courses (excluding courses from SBM and SHSS), of which 18 credits must be from MECH courses.

  ii) PhD students with a master's degree are required to take 12 credits of postgraduate courses (excluding courses from SBM and SHSS), of which 9 credits must be from MECH courses.

  iii) Students deemed to be missing relevant background in Mechanical Engineering may be required to take extra MECH courses, which will be specified by the departmental Admissions Committee.

  iv) HKUST MPhil graduates in Mechanical Engineering may be granted credit transfer of up to 12 credits on condition that these credits have not been used in their MPhil degree or any other academic qualification. Subject to the approval of the departmental PG Committee, students who obtained master's degree from other universities may be granted credit transfer of up to 6 credits on condition that these credits have not been used to earn another academic qualification, and that the courses must be at 4000-level or above.

v) In addition, students must fulfill the school requirements on PhD programs stipulated in the section of *School of Engineering*.

- Take and pass ENGG 6770 Professional Development in Engineering and MECH 6770 Professional Development in Mechanical Engineering. Students may be exempted from certain ENGG 6770 events, subject to prior approval of the School. Part-time students may be exempted from a maximum of 50% of mini-workshops of MECH 6770, subject to prior approval of the Department. Students are expected to complete the Professional Development courses in their first two years of study. Subject to approval, part-time students may be given extension to complete the courses. HKUST MPhil graduates in Mechanical Engineering who have taken and passed ENGG 6770 before may be exempted from taking the same course, subject to prior approval from the Department Head and PG Coordinator.
- Full-time RPg students are required to take an English Language Proficiency Assessment (ELPA) Speaking Test administered by the Center for Language Education before the start of their first term of study. Students whose ELPA Speaking Test score is below Level 4, or who failed to take the test in their first term of study, are required to take LANG 5000 Foundation in Listening & Speaking for Postgraduate Students until they pass the course by attaining at least Level 4 in the ELPA Speaking Test before graduation;
- Take LANG 5001 Postgraduate English for Engineering Research Studies. Students can be exempted from taking LANG 5001 with the agreement of the Department Head and PG Coordinator;
- The credits earned from ENGG 6770, MECH 6770, LANG 5000 and LANG 5001 cannot be counted toward the credit requirements;
- Pass an oral qualifying examination (QE) which can be attempted twice at most.
    i) All PhD students admitted with only a bachelor's degree should attempt the first QE within the first four regular terms of study, or if failed, the second QE within the fifth regular term of study.
    ii) PhD students admitted with a master's degree should attempt the first QE within the first three regular terms of study, or if failed, the second QE within the forth regular term of study.
    iii) A student who fails the second attempt of QE is not allowed to continue with the PhD study. Subject to approval, he/she may be recommended for transfer to the MPhil program.
- Take MECH 6090 Seminar in Mechanical Engineering for at least four terms. Subject to Department's approval, students can take MECH 6090 for less than four terms;
- Register in MECH 7990 Doctoral Thesis Research every regular term; and
- Present and oral defend the PhD thesis.

Nanotechnology Concentration

Students who opt for the Nanotechnology concentration are required to:

- Fulfill credit requirements as follows:
  i) PhD students without a master's degree are required to take 24 credits of postgraduate courses (excluding courses from SBM and SHSS), of which 12 credits must be from MECH courses, 3 credits from NANO courses and 3 credits from NANO/MECH courses.
  ii) PhD students with a master's degree are required to take 12 credits of postgraduate courses (excluding courses from SBM and SHSS), of which 6 credits must be from MECH courses and 3 credits from NANO courses.
  iii) Students deemed to be missing relevant background in Mechanical Engineering may be required to take extra MECH courses, which will be specified by the departmental Admissions Committee.
  iv) HKUST MPhil graduates in Mechanical Engineering may be granted credit transfer of up to 12 credits on condition that these credits have not been used in their MPhil degree or any other academic qualification. Subject to the approval of the departmental PG Committee, students with other master's degree may be granted credit transfer of up to 6 credits on condition that these credits have not been used to earn another academic qualification, and that the courses must be at 4000-level or above.
  v) In addition, students must fulfill the school requirements on PhD programs stipulated in the section of *School of Engineering*.
- Take and pass ENGG 6770 Professional Development in Engineering and MECH 6770 Professional Development in Mechanical Engineering. Students may be exempted from certain ENGG 6770 events, subject to prior approval of the School. Part-time students may be exempted from a maximum of 50% of mini-workshops of MECH 6770, subject to prior approval of the Department. Students are expected to complete the Professional Development courses in their first two years of study. Subject to approval, part-time students may be given extension to complete the courses. HKUST MPhil graduates in Mechanical Engineering who have taken and passed ENGG 6770 before may be exempted from taking the same course, subject to prior approval from the Department Head and PG Coordinator.
- Full-time RPg students are required to take an English Language Proficiency Assessment (ELPA) Speaking Test administered by the Center for Language Education before the start of their first term of study. Students whose ELPA Speaking Test score is below Level 4, or who failed to take the test in their first term of study, are required to take LANG 5000 Foundation in Listening & Speaking for Postgraduate Students until they pass the course by attaining at least Level 4 in the ELPA Speaking Test

before graduation;

- Take LANG 5001 Postgraduate English for Engineering Research Studies. Students can be exempted from taking LANG 5001 with the agreement of the Department Head and PG Coordinator;
- The credits earned from ENGG 6770, MECH 6770, LANG 5000 and LANG 5001 cannot be counted toward the credit requirements;
- Pass an oral qualifying examination (QE) which can be attempted twice at most (with details as specified above);
- Take MECH 6090 Seminar in Mechanical Engineering for at least four terms. Subject to Department's approval, students can take MECH 6090 for less than four terms;
- Complete NANO 6010 Advanced Topics in Nano Science and Technology for one term. Students can use NANO 6010 to replace one term of registration of MECH 6090;
- Register in MECH 7990 Doctoral Thesis Research every regular term;
- Conduct research in nano area; and
- Present and oral defend the PhD thesis.

Energy Technology Concentration

Students who opt for the Energy concentration are required to:

- Fulfill credit requirements as follows:
  i) PhD students without a master's degree are required to take 24 credits of postgraduate courses (excluding courses from SBM and SHSS), of which 12 credits must be from MECH courses, 3 credits from ENEG courses and 3 credits from ENEG/MECH courses.
  ii) PhD students with a master's degree are required to take 12 credits of postgraduate courses (excluding courses from SBM and SHSS), of which 6 credits must be from MECH courses and 3 credits from ENEG courses.
  iii) Students deemed to be missing relevant background in Mechanical Engineering may be required to take extra MECH courses, which will be specified by the departmental Admissions Committee.
  iv) HKUST MPhil graduates in Mechanical Engineering may be granted credit transfer of up to 12 credits on condition that these credits have not been used in their MPhil degree or any other academic qualification. Subject to the approval of the departmental PG Committee, students who obtained master's degree from other universities may be granted credit transfer of up to 6 credits on condition that these credits have not been used to earn another academic qualification, and that the courses must be at 4000-level or above.

v) In addition, students must fulfill the school requirements on PhD programs stipulated in the section of *School of Engineering*.

- Take and pass ENGG 6770 Professional Development in Engineering and MECH 6770 Professional Development in Mechanical Engineering. Students may be exempted from certain ENGG 6770 events, subject to prior approval of the School. Part-time students may be exempted from a maximum of 50% of mini-workshops of MECH 6770, subject to prior approval of the Department. Students are expected to complete the Professional Development courses in their first two years of study. Subject to approval, part-time students may be given extension to complete the courses. HKUST MPhil graduates in Mechanical Engineering who have taken and passed ENGG 6770 before may be exempted from taking the same course, subject to prior approval from the Department Head and PG Coordinator.
- Full-time RPg students are required to take an English Language Proficiency Assessment (ELPA) Speaking Test administered by the Center for Language Education before the start of their first term of study. Students whose ELPA Speaking Test score is below Level 4, or who failed to take the test in their first term of study, are required to take LANG 5000 Foundation in Listening & Speaking for Postgraduate Students until they pass the course by attaining at least Level 4 in the ELPA Speaking Test before graduation;
- Take LANG 5001 Postgraduate English for Engineering Research Studies. Students can be exempted from taking LANG 5001 with the agreement of the Department Head and PG Coordinator;
- The credits earned from ENGG 6770, MECH 6770, LANG 5000 and LANG 5001 cannot be counted toward the credit requirements;
- Pass an oral qualifying examination (QE) which can be attempted twice at most (with details as specified above);
- Take MECH 6090 Seminar in Mechanical Engineering for at least four terms. Subject to Department's approval, students can take MECH 6090 for less than four terms;
- Complete ENEG 6010 Advanced Topics in Energy Technology for one term. Students can use ENEG 6010 to replace one term of registration of MECH 6090;
- Register in MECH 7990 Doctoral Thesis Research every regular term;
- Conduct research in energy area; and
- Present and oral defend the PhD thesis.

Scientific Computation Concentration

In addition to the existing program requirements, students who opt for the Scientific Computation concentration are required to:

(i) MPhil: Complete a minimum of 7 credits from the following course lists.
PhD: Complete a minimum of 10 credits from the follow course lists.

The credits earned under the concentration will be counted toward the total credit requirements of the programs.

Core Courses
MPhil: at least 3 credits
PhD: at least 6 credits

All students must take MATH 6915 and MATH 6916. Credits earned from MATH 6915 can be repeated for up to 2 credits.

COMP 5112	Parallel Programming
CIVL 5390	Finite Element Methods; or
MECH 5930	Finite Element Methods
CSIC 5001	Introduction to Advanced Computing Systems
CSIC 5011	Topological and Geometric Data Reduction and Visualization
CSIC 5031	Modeling, Optimization and Statistics
MATH 5311	Advanced Numerical Methods I
MATH 6915	Scientific Computation Seminar
MATH 6916	Student Seminars on Computation Related Research

Elective Courses

CHEM 5210	Computational Chemistry
CHEM 5220	Statistical Mechanics: Theory and Applications in Complex Systems
COMP 5212	Machine Learning
COMP 5213	Introduction to Bayesian Networks
COMP 5331	Knowledge Discovery in Databases
COMP 5421	Computer Vision
CSIC 5190	Special Topics in Scientific Computation
ELEC 5810	Introduction to Bioinformatics Algorithms
ELEC 5140	Advanced Computer Architecture
MATH 5350	Computational Fluid Dynamics for Inviscid Flows
MATH 5360	Weather, Climate and Pollution
MATH 5411	Advanced Probability Theory I
MATH 5431	Advanced Mathematical Statistics I
MECH 5230	Computational Fluid Dynamics and Heat Transfer
MECH 5280	Transport Phenomena and Its Application in Energy Systems
MSDM 5004	Mathematical Methods for Data Analysis
PHYS 5410	Numerical Modeling in Physics

(ii) Conduct research in the area of scientific computation.