PROGRAMME DOCUMENT
FOR
RESEARCH DEGREE PROGRAMMES

Department of Industrial and Systems Engineering

August 2018

THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

Please note:

(1) This Document should be read together with the "Research Student Handbook".
(2) This Programme Document is subject to review and changes which the programme offering Faculty/Department can decide to make from time to time. Students will be informed of the changes as and when appropriate.

****

The RC agreed that RPg students admitted after 1 July 2014 should all be governed by the Framework for Outcome-based RPg Programmes.

(A) The full programme titles

Doctor of Philosophy (PhD) / Master of Philosophy (MPhil)

(B) The programme offering and administrative host Department

Department of Industrial and Systems Engineering

(C) The awards to which the programme leads

Doctor of Philosophy (PhD) / Master of Philosophy (MPhil)

(D) Normal period of study, and modes of attendance

(1) Normal Period of Study

Mode of Study	**MPhil**	**PhD**	
		for students with a Master's degree containing a significant research component	**for students with a Bachelor's degree only**
Full-time	24 months	36 months	48 months
Part-time	48 months	72 months	96 months

(2) Maximum Period of Study

Mode of Study	**MPhil**	**PhD**	
		for students with a Master's degree containing a significant research component	**for students with a Bachelor's degree only**
Full-time	36 months	60 months	72 months
Part-time	60 months	84 months	108 months

(E) The programme structure: coursework credit and thesis requirements

PhD and MPhil students must satisfactorily investigate or evaluate a chosen area, demonstrate an understanding of the context and significance of the work, display sustained independent effort and original thought and present a clear, complete thesis of a quality worthy of publication. PhD students are also expected to produce evidence and argument supporting an original proposition that results in a significant contribution to knowledge of a subject.

The PhD or MPhil degree is awarded to students who, on completion of an approved programme of study and research, present theses that embody the results of their research and satisfy the examiners in an oral examination in matters relevant to the subject of the thesis. Students are also required to complete certain taught subjects before submitting their theses. These subjects aim to support the student's research work and are chosen by the student, with advice from the supervisor, from a wide range on offer. The minimum credit requirements for this compulsory coursework component for different categories of students are as follows:

Credit Requirement and Distribution

MPhil students	9 credits *(1 credit from HTI6081 + 2 credits from attending seminars + 6 credits from other subjects)*
Full-time PhD students with three-year normal study period Part-time PhD students with six-year normal study period	15 credits *(1 credit from HTI6081 + 3 credits from attending seminars + 2 credits from Practicums + 9 credits from other subjects)*
Full-time PhD students with four-year normal study period Part-time PhD students with eight-year normal study period	22 credits *(1 credit from HTI6081 + 4 credits from attending seminars + 2 credits from Practicums + 15 credits from other subjects)*

Points to note:

- Students should not enroll on subjects offered in the taught master/doctoral programmes.
- Credits which have already been used to contribute to an award should not be "transferred" to contribute to another award with the following exception:

  3-year PhD students will be allowed to apply to transfer one credit from their previous studies in HTI6081 and one credit from their previous attendance in seminars.

- All MPhil students need to complete their coursework with a qualifying GPA of 2.75 or above, and all PhD students need to complete their coursework with a qualifying GPA of 3.0 or above before submission of their thesis for examination.

(F) The rationale, aims and intended learning outcomes (ILOs) of the programme

Our research degree programmes aim at providing an intellectual environment with the provision of world-class research facilities and an appropriate curriculum to nurture qualified research students within the multidisciplinary field of Industrial and Systems Engineering, particularly in the related areas of Advanced Manufacturing Technology, Product and Process Design, Logistics Engineering, and Engineering Management. The high quality research programmes are primarily conducted through a framework of coursework together with supervision of a research project, which result in the completion of a dissertation. The desired outcomes of the PhD and MPhil programmes are differentiated. Upon the fulfillment of both coursework and dissertation components, the research programme will lead to the following learning outcomes:

(1) to possess core knowledge in the student's research area;
(2) (i) to contribute to the advancement of knowledge and technology in Advanced Manufacturing Technology, Product and Process Design, Logistics Engineering, or Engineering Management (for MPhil);
(ii) to demonstrate ability to discover new knowledge in one of the above target areas (for PhD);
(3) to be aware of research ethics;
(4) to be able to disseminate research findings and communicate effectively;
(5) to demonstrate independent research capability and critical thinking;
(6) to broaden the student's research horizon; and
(7) to possess the ability for continued professional development in Industrial and Systems Engineering.

(Please refer to Attachment 1 for further details.)

(G) The curriculum

(1) Coursework requirements

The requirements for the MPhil/PhD degrees are outlined below.

(i) Compulsory subjects for all research students

HTI6081 "Ethics: Research, Professional and Personal Perspectives" (1 credit)

This is a one-credit subject which will be counted towards the credit requirement. Students are required to pass this compulsory subject before they submit their thesis for examination. However, returning students will be allowed to carry over the grade obtained in the subject to the new RPg programme regardless of its level, provided that the grade was attained within five years of re-admission.

EIE6200 "Methodology for Engineering and Scientific Research" (3 credits)

(ii) Elective subjects

MPhil students are required to select one 3-credit subject of their own or related research discipline from the pool of Pg subjects offered by ISE/other PolyU Depts/other universities for RS, subject to approval from their Chief Supervisors.

PhD students who are holders of a Master's degree containing a significant research component are required to select two 3-credit subjects of their own or related research discipline from the pool of Pg subjects offered by ISE/other PolyU Depts/other universities for RS, subject to approval from their Chief Supervisors.

PhD students who are holders of a Master's degree without a significant research component are required to select four 3-credit subjects of their own or related research discipline from the pool of Pg subjects offered by ISE/other PolyU Depts/other universities for RS, subject to approval from their Chief Supervisors.

Electives offered by ISE (Each subject carries 3 credits)

Advanced Manufacturing Technology and Product & Process Design Disciplines	**Logistics Engineering and Engineering Management Disciplines**
ISE6602 Advanced Materials Processing Technologies	ISE6604 Design and Delivery of Knowledge Services
ISE6603 Computer Modeling and Virtual Analysis	ISE6605 Industrial Logistics Information Systems

Note: The subjects listed above are subject to availability of subject quota and change.

(iii) English language proficiency

In addition to the course requirements as set out above, all MPhil/PhD students, regardless of their fields of study, are required to attend the Research Language Skills Assessment which focuses on testing students' language skills, both for written and oral communication. Students are required to take and pass the specified remedial subjects before the submission of thesis.

(2) **Seminar attendance requirement**

Full-time students are required to attend at least 10 research seminars per year, in addition to workshops/conferences, and to submit a report, to the Chief Supervisor, of no less than 1,500 words (excluding references) on one of the attended seminars every year.

Part-time students are required to attend at least 10 research seminars per two years, in addition to workshops/conferences, and to submit a report, to the Chief Supervisor, of no less than 1,500 words (excluding references) on one of the attended seminars once every two years.

Research seminars may or may not be organised by the host department and are expected to last not less than an hour each. The topic of the seminar reported on should not be related directly to the thesis title of the student.

Chief Supervisors are required to assess the report (with a pass or failure grade). Students failing to submit a report to the satisfaction of their Chief Supervisor are required to make a re-submission until a pass grade is obtained. The Chief Supervisor has to pass the record of the seminars attended by their students and the report with a pass grade to the Research Office for custody at the end of each academic year.

The total credits to be earned by different categories of students will be:

MPhil		2 credits
ISE6606	Seminars I	
ISE6607	Seminars II	
PhD	**for students with a Master's degree containing a significant research component**	3 credits
ISE6606	Seminars I	
ISE6607	Seminars II	
ISE6608	Seminars III	
PhD	**for students with a Bachelor's degree only**	4 credits
ISE6606	Seminars I	
ISE6607	Seminars II	
ISE6608	Seminars III	
ISE6609	Seminars IV	

Students are recommended to complete one credit per year (for full-time students) or per two years (for part-time students) to fulfill the above-mentioned requirement, with an overall assessment grade of Pass or Fail. However, as deemed appropriate by the Chief Supervisor, they are allowed to complete at most two credits per year (for full-time students) or per two years (for part-time students) to fulfill the research seminar credit requirement.

(3) **Departmental training requirement**

(i) Departmental Training of 6 hours per week for Stipend Recipients

With regard to departmental training requirement, each MPhil/PhD student who receives stipend, shall receive certain training as assigned by the Head of Department in consultation with the Supervisor(s) within his/her department for up to six hours per week.

All MPhil/PhD students who are required to undertake teaching supporting activities are required to complete the training programme "Becoming an Effective Teaching Assistant" (BETA, or its equivalent) organised by the Educational Development Centre, English Language Centre/Chinese Language Centre (as required) before the commencement of any teaching supporting activities. BETA consists of several modules, including a language training module offered by the ELC titled "English for Instructional Purposes: Interacting, Eliciting and Questioning".

(ii) Training credit requirements for PhD students

All PhD students, irrespective of funding source and mode of study, must complete two training credits before thesis submission:

Subject code	Subject title	Number of credit
ISE6610	Practicum I	1
ISE6611	Practicum II	1

To earn one credit, students will be required to engage in teaching/research supporting activities assigned by the HoD/DoS or his/her delegate for 6 hours/week in any 13-week semester. Students are allowed to complete these two credits any time before thesis submission. They can choose to complete these two credits in two different semesters or within the same semester, subject to the approval of the Chief Supervisor. Stipend recipients are allowed to fulfill part of their departmental training requirement through the completion of these compulsory training credits.

The Chief Supervisor is required to:

(a) ensure that the activities are structured and can be assessed properly;

(b) submit, at the end of the Practicum session, to HoD an assessment report on the performance of the relevant student, with details of activities undertaken and an overall assessment grade of Pass or Fail.

(H) The curriculum map

(indicates how each intended learning outcomes of the programme is addressed by the constituent subjects)

Please refer to Attachment 2.

(I) Subject descriptions

Please refer to Attachment 3.

(J) Learning Outcomes Assessment Plan (LOAP)

Please refer to Attachment 4.

Attachment 1

Intended Learning Outcome of Individual MPhil Programme against the University's Policy & Guidelines on Learning Outcomes for Graduates of MPhil Programmes*

Programme Title: Master of Philosophy

Hosted by: Department of Industrial and Systems Engineering

Institutional Learning Outcomes	Intended Learning Outcomes of Individual Research Degree Programme
Research and Scholarship Excellence MPhil graduates of PolyU should demonstrate advanced competence in research methods, possess in-depth knowledge and skills in their area of study and attain the ability to apply their knowledge and act as leaders in analyzing and solving identified issues and problems in their area of study. They should also be able to disseminate/communicate effectively their research findings in publications, conferences and classrooms.	The research degree programme is designed in such a way to enable the student: (1) to possess core knowledge in the student's research area; (2) to contribute to the advancement of knowledge and technology in Advanced Manufacturing Technology, Product and Process Design, Logistics Engineering, or Engineering Management; (3) to be aware of research ethics; (4) to be able to disseminate research findings and communicate effectively.
Originality MPhil graduates of PolyU will be versatile problem solvers with good mastery of critical and creative thinking methodologies. They can generate practical and innovative solutions to problems in their area of study.	(2) to contribute to the advancement of knowledge and technology in Advanced Manufacturing Technology, Product and Process Design, Logistics Engineering, or Engineering Management; (5) to demonstrate independent research capability and critical thinking.
Lifelong Learning Capability MPhil graduates of PolyU will have an enhanced capability for continual professional development through inquiry and reflection on knowledge in their area of study.	(6) to broaden the student's research horizon; (7) to possess the ability for continued professional development in Industrial and Systems Engineering.

* The University's "Learning Outcomes for Graduates of Research Postgraduate Programmes – Policy and Guidelines" is available at the RO website (www.polyu.edu.hk/ro) > Download Corner.

Intended Learning Outcome of Individual PhD Programme against the University's Policy & Guidelines on Learning Outcomes for Graduates of PhD Programmes*

Programme Title: **Doctor of Philosophy**

Hosted by: **Department of Industrial and Systems Engineering**

Institutional Learning Outcomes	Intended Learning Outcomes of Individual Research Degree Programme
Research and Scholarship Excellence PhD graduates of PolyU should demonstrate state-of-the-art expertise and knowledge in their area of study, possessed superior competence in research methodologies and contribute as leaders in creating new knowledge through analysis, diagnosis and synthesis. They should also be able to disseminate/communicate their research ideas and findings effectively and efficiently in publications, conferences and classrooms.	The research degree programme is designed in such a way to enable the student: (1) to possess core knowledge in the student's research area; (2) to demonstrate ability to discover new knowledge in Advanced Manufacturing Technology, Product and Process Design, Logistics Engineering, or Engineering Management; (3) to be aware of research ethics; (4) to be able to disseminate research findings and communicate effectively.
Originality PhD graduates of PolyU will be able to think out of the box. They will be innovative problem solvers with excellent mastery of critical and creative thinking methodologies. They will create original solutions to issues and problems pertaining to their area of expertise and the society in general.	(2) to demonstrate ability to discover new knowledge in Advanced Manufacturing Technology, Product and Process Design, Logistics Engineering, or Engineering Management; (5) to demonstrate independent research capability and critical thinking.
Lifelong Learning Capability PhD graduates of PolyU will demonstrate the ability to engage in an enduring quest for knowledge and an enhanced capability for continual academic/professional development through self-directed research in their area of study.	(6) to broaden the student's research horizon; (7) to possess the ability for continued professional development in Industrial and Systems Engineering.

* The University's "Learning Outcomes for Graduates of Research Postgraduate Programmes – Policy and Guidelines" is available at the RO website (www.polyu.edu.hk/ro) > Download Corner.

Attachment 2

Curriculum Map for Individual Research Degree Programme

(Please put a "√" in the relevant box where the subject helps to fulfill the specific programme outcome.)

Programme Outcomes	**Subject: "Ethics: Research, Professional and Personal Perspectives" (HTI6081)**	**Subject: "Methodology for Engineering and Scientific Research" EIE6200**	**All discipline elective subjects**	**Research Language Skills Assessment results / remedial subjects by ELC/ENGL**	**Subject on teaching skills by EDC**	**Thesis**	**Seminar attend-ance require-ment**	**Conference/ Journal paper publications**	**Research Degree Graduate Survey**
(1) To possess core knowledge in the student's research area		√	√			√			√
<u>MPhil</u> (2) To contribute to the advancement of knowledge and technology in Advanced Manufacturing Technology, Product and Process Design, Logistics Engineering, or Engineering Management						√		√	

PhD (2) To demonstrate ability to discover new knowledge in one of the above target areas						√		√	
(3) To be aware of research ethics	√								√
(4) To be able to disseminate research findings and communicate effectively				√	√	√		√	√
(5) To demonstrate independent research capability and critical thinking		√				√		√	√
(6) To broaden the student's research horizon							√		√
(7) To possess the ability for continued professional development in Industrial and Systems Engineering	√					√			

Attachment 3

The Hong Kong Polytechnic University

Subject Description Forms

The Hong Kong Polytechnic University

Subject Description Form

Please read the notes at the end of the table carefully before completing the form.

Subject Code	ISE6602
Subject Title	Advanced Materials Processing Technologies
Credit Value	3
Level	6
Pre-requisite / Co-requisite/ Exclusion	A degree in Engineering or a related discipline. Basic knowledge in manufacturing and materials science is expected. Exclusion: "Advanced Manufacturing Technology" (code: ISE551)
Objectives	The objectives of this subject are to provide the students with: 1. an understanding of the principles, capabilities, limitations and applications of commonly used advanced materials processing technologies; and 2. an in-depth knowledge of precision materials removal and laser processing technologies.
Intended Learning Outcomes *(Note 1)*	Upon completion of the subject, students will be able to: a. be able to select appropriate advanced materials processes for a given product or component recognising material, size, precision, and surface quality requirements. b. be able to conduct theoretical and experimental analysis for advanced materials removal and laser processing technologies.
Subject Synopsis/ Indicative Syllabus	1. Overview of Advanced Materials Processing Technologies Outline of advanced materials processing techniques: Precision Materials Removal Processes; Precision Forming; Microwave Technology; Advanced

<table>
<tr><td>(Note 2)</td><td>Surface Engineering Processes; Joining Technologies.

2. <u>Precision Removal Processes</u>
Ultra-precision machining, theories, principles and applications. Micro Electro-discharge machining. Physio-chemical machining, Surface metrology of machined components.

3 <u>Laser Materials Processing</u>
Fundamentals of industrial lasers. Laser materials interaction theories. Laser processing for various industries such as metals, non-metals, photovoltaic, bio-medical applications.</td></tr>
<tr><td>Teaching/Learning Methodology

(Note 3)</td><td>The subject is taught through a combination of lectures, seminars, laboratory exercises and tutorial assignments. The lectures introduce the student to in-depth knowledge in the current practices of advanced material processing technologies. Laboratory work and tutorial exercises provide opportunities for the student to learn and practice using guiding materials.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes

(Note 4)</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% Weighting</td><td colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td></td><td></td><td></td><td></td></tr>
<tr><td>1. Assignments</td><td>15%</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>2. Laboratory exercises</td><td>15%</td><td>✓</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>3. Test</td><td>20%</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>4. Final examination</td><td>50%</td><td>✓</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Total</td><td>100%</td><td colspan="6"></td></tr>
</table>
Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The assignments, which are administered periodically throughout the subject, are designed to facilitate students to reflect on, and apply knowledge learnt.

The laboratory exercises are designed to assess students' problem-solving skills in advanced materials processing technologies.</td></tr>
</table>

Student Study Effort Expected	Class contact:	
	▪ Lecture	26 Hrs
	▪ Seminars	3 Hrs
	▪ Tutorials	4 Hrs
	▪ Laboratory Exercises	6 Hrs
	Other student study effort:	
	▪ Assignments	20 Hrs
	▪ Preparation for laboratory exercises, assignments, reports, test and examination	56 Hrs
	Total student study effort:	115 Hrs
Reading List and References	1. Cheng Kai, *Machining Dynamics-Fundamentals, Applications and Practices*, Springer, 2009. 2. Davim Paulo J., *Machining – Fundamentals and Recent Advances*, Springer, 2008. 3. Dornfeld David, Lee Dae-Eun, *Precision Manufacturing*, Spinger, 2008. 4. Grzesik, Wit, *Advanced Machining Processes of Metallic Materials*,, Elsevier, 2008. 5. Hassan Ei-Hofy, *Advanced Machining Processes-Nontraditional and Hybrid Machining Processes, McGraw-Hill*, 2005 6. Ikawa, N., Donaldson, R.R., Komanduri, R., K nig, W., Aachen, T.H., McKeown, P.A., Moriwaki, T., and Stowers, I.F. *"Ultra-precision Metal Cutting - The Past, the Present and the Future,"* Annals of the CIRP, Vol. 40, No.1, p.587 (1991). 7. Shaw M.C., *Principles of Abrasive Processing*, Oxford University Press, 1996. 8. Journal of Lasers Applications. 9. Journal of Materials Processing Technology.	

Note 1: Intended Learning Outcomes
Intended learning outcomes should state what students should be able to do or attain upon completion of the subject. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/ Indicative Syllabus

The syllabus should adequately address the intended learning outcomes. At the same time over-crowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology
This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method
This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method purports to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.

The Hong Kong Polytechnic University

Subject Description Form

Please read the notes at the end of the table carefully before completing the form.

Subject Code	ISE6603
Subject Title	Computer Modelling and Virtual Analysis
Credit Value	3
Level	6
Pre-requisite / Co-requisite/ Exclusion	Knowledge of CAD and finite element method is advantageous.
Objectives	The objectives of this subject are to provide the students with: 1. a knowledge of computer modelling theories and technologies of geometric computation in engineering design; 2. the skills for solving engineering problems using virtual simulation approaches and computer analysis tools.
Intended Learning Outcomes *(Note 1)*	Upon completion of the subject, students will be able to: a. apply meshing and triangulation technologies in computer modelling; b. determine intersection of geometry and apply the technologies of computational geometry in computer modelling; c. apply geometric and physics based technologies to perform virtual simulation and analysis; d. apply Finite Element Analysis (FEA) in solving advanced engineering problems.
Subject Synopsis/ Indicative Syllabus *(Note 2)*	1. <u>Mesh Modelling</u> Mesh generation, Mesh data structures, Topology decomposition, Voronoi diagram, Triangulation. 2. <u>Geometric Modelling</u> Smoothing, Subdivision, Intersections. 3. Virtual Simulation

<table>
<tr><td></td><td>Free-from deformation, physics based simulation, mass-spring systems.

4. <u>Finite Element Analysis (FEA)</u>
Non-linear problems, Dynamic Problems.</td></tr>
<tr><td>Teaching/Learning Methodology
(Note 3)</td><td>A mixture of lectures, assignments and projects are used to deliver various topics on the subject. The lectures introduce the student to in-depth knowledge in the current practices of advanced computer modeling technologies. The assignments provide opportunities for student to learn. The projects allow students to study with guided materials. It also provides the opportunity for students to apply virtual analysis in a practical situation and to enhance students' self-learning ability.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes
(Note 4)</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% Weighting</td><td colspan="4">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Assignments</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Projects</td><td>40%</td><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>3. Test</td><td>30%</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="4"></td></tr>
</table>

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Assignments are used to assess students' understanding mesh generation technologies in computer modeling, and their ability to apply these to computer-aided design. It is also designed to develop students' understanding in geometric design, and the ability of applying virtual analysis tools in improving product design.

Projects are assigned to assess whether students can apply simulation technologies and FEA in solving engineering problems.

A test is given to assess students' understanding of computer modeling technologies. It also assesses students' understanding of the existing computation technologies for geometric design, simulation and FEA technologies in computer design.</td></tr>
<tr><td>Student Study</td><td>Class contact:</td><td></td></tr>
</table>

Effort Expected	▪ Lectures	20 Hrs
	▪ Tutorials	10 Hrs
	▪ Laboratory work	9 Hrs
	Other student study effort:	
	▪ Assignments	20 Hrs
	▪ Projects	30 Hrs
	▪ Preparation for the test	20 Hrs
	Total student study effort:	109 Hrs
Reading List and References	1. Moaveni, S., *Finite Element Analysis: Theory and Application with ANSYS,* Pearson Prentice Hall, c2008. 2. Frey P.J., *Mesh generation: application to finite elements,* John Wiley & Sons, c2008. 3. Ho-Le K., *Finite element mesh generation methods: a review and classification*, Comput. Aid. Des., 20, pp. 27–38, 1988. 4. Jim P., Thomas F. and Torras C, *Collision Detection Algorithms for Motion Planning*, Robot Motion Planning and Control, pp.1-53, 1998. 5. Dyn N., Levin D. and Gregory J., *A butterfly subdivision scheme for surface interpolation with tension control,* ACM Transactions on Graphics, Vol. 9, No. 2, pp. 160-169, 1990. 6. Sederberg T.W. and Parry S.R., *Free-Form Deformation of Solid Geometric Models*, Proceedings of SIGGRAPH ‘86, Computer Graphics Vol. 20, No. 4, pp. 151-159, 1986. 7. Terzopoulos D., Platt J., Barr A., Fleischer K., *Elastically Deformable Models*, In Proc. SIGGRAPH'87, Computer	

	Graphics, Vol. 21, No. 4, pp. 205-214, 1987.

Note 1: Intended Learning Outcomes
Intended learning outcomes should state what students should be able to do or attain upon completion of the subject. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/ Indicative Syllabus
The syllabus should adequately address the intended learning outcomes. At the same time over-crowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology
This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method
This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method purports to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.

The Hong Kong Polytechnic University

Subject Description Form

Please read the notes at the end of the table carefully before completing the form.

Subject Code	ISE6604
Subject Title	Design & Delivery of Knowledge Services
Credit Value	3
Level	6
Pre-requisite / Co-requisite/ Exclusion	N/A
Objectives	This subject aims to provide research students with the latest conceptual development of knowledge management systems, system design, deployment and support, knowledge discovery and data mining. It also relates them to enterprise engineering in a corporate environment. Special emphasis will be placed on technologies and systems that support advanced search, Web 2.0, process management, collaboration, knowledge service, and learning. The emergence and impact of cloud computing for enhancing knowledge sharing and collaboration, and the leverage of social software and social media for research purposes will also be covered. A wide variety of industrial case studies and practical applications in a business environment are also included.
Intended Learning Outcomes *(Note 1)*	Upon completion of the subject, students will be able to: a. develop capability and in-depth understanding of some core theories and concepts in Knowledge Management (KM); b. demonstrate an overall understanding of the prevailing methods and common technologies related to KM and learning; c. demonstrate the ability to adopt and align various knowledge systems for a specific purpose; d. familiarize through working knowledge and develop skills to

	design, plan, assess, develop and implement knowledge management systems and derive a customized roadmap for deployment of such technologies/systems in an organisational context.
Subject Synopsis/ Indicative Syllabus *(Note 2)*	This subject provides students with the following key topics: 1. An overview of theory and concepts of KM, nature and representation of knowledge, knowledge processes, and knowledge audit; 2. The origin, evolution, and role of Knowledge Management Systems (KMS), the deployment of a KMS, and associated business models; 3. Core KM technologies: search, categorization/taxonomy, and classification systems, collaborative systems, process management systems, enterprise knowledge portals, web 2.0, advanced search, social software and artificial intelligence for KM. 4. Personal knowledge management: skills, technologies, and synergy with enterprise knowledge management; 5. Cloud computing and the orchestration and delivery of knowledge Services 6. Learning management systems, and personal learning environments 7. Case studies drawn from commercial, industrial and research applications.
Teaching/Learning Methodology *(Note 3)*	A mixture of lectures, in-class activities, laboratory, case studies, workshop and a mini-project will be used to deliver the various topics in this subject for the attainment of learning outcomes. Some of which will be covered in a problem-based format where this enhances the learning objectives. Others will be covered through directed study in order to enhance the students' ability of "learning to learn". The mini-project will be used to integrate these topics and thus demonstrate to students how the various theory, concept, methods and tools are inter-related and how they can be applied in real life situations. Cross fertilization of ideas and experiences of students in knowledge engineering and management through class discussions and presentations are highly encouraged and should form an important component in the teaching/learning process of this subject. Students are expected to each operate his/her Personal Learning Environment as well as demonstrate the use of various KMS and social systems to support research purposes.

Assessment Methods in Alignment with Intended Learning Outcomes

(Note 5)

Specific assessment methods/tasks	% Weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			
		a	b	c	d
1. Assignments	25%	✓	✓		
2. Laboratories	10%		✓	✓	
3. Mini-project	25%	✓	✓	✓	✓
4. Extended Personal Learning Environment & Network	15%		✓	✓	
5. End-of-Semester Test	25%	✓	✓	✓	✓
Total	100 %				

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Continuous assessment comprises assignments, a quiz, a mini-project, and an end-of-semester test. All assessment components require students to apply what they have learnt to realistic work applications.

To assess students' learning related to learning outcomes (a) and (b), assignments are given that require students to apply KM concepts and methods to solve real-life problem scenarios.

The laboratory exercise allows students to familiarize with the skill and techniques in using KM systems and tools (learning outcomes (b) and (c)

Each student is expected to establish an extended Personal Learning Environment that incorporates key features for supporting learning and research (b) and (c).

Students are required to complete a mini-project, which helps them to integrate and apply the concepts, theories, and skills learnt in the course to plan, assess, and develop a KM system and implement knowledge management projects to address industrial problems (i.e., learning outcomes (a) to (d)).

A final end-of-semester test is given to assess students' understanding of the concepts and knowledge necessary for analysing and solving problems related to the subject (i.e., learning outcomes (a) to (d)).

Student Study	Class contact:	

Effort Expected	▪ Face-to-face and online lectures/tutorials/presentations 3 hours per week x 7 weeks	21 hours
	▪ Workshop and Laboratory 3 hours per week x 2 weeks	6 hours
	▪ Extended Personal Learning Environment & Network	12 hours
	Other student study effort:	
	▪ Study and self learning including mini-project and preparation for mini-project presentation	35 hours
	▪ Assignment and report writing	22 hours
	▪ Preparation for Test	10 hours
	Total student study effort	106 hours
Reading List and References	References: 1. Alavi, M and Leidner, D, E., Knowledge Management and Knowledge Management Systems: Conceptual Foundation and Research Issues, INSEAD Working Paper No. 99/34 (1999) 2. Amrit Tiwana, The Knowledge Management Toolkit: Orchestration IT, Strategy, and Knowledge Platforms, 2nd Edition, Prentice Hall (2003). 3. Karl Wiig, People-Focused Knowledge Management: How Effective Decision Making Leads to Corporate Success, Butterworth-Heinemann, 2004. 4. Liebowitz, J. (Editors), Knowledge Management Handbook, CRC Press, Boca Raton, 1999 5. Rao, M. 2005, *Knowledge Management Tools and Techniques*, Elsevier Butterworth-Heinemann, Amsterdam 6. McElroy, M. 2003, *The New Knowledge Management*, KMCI Press, Amsterdam 7. Thomas, Davenport & Laurence Prusak, "Working Knowledge: How Organizations Manage What They Know," Harvard Business School Press, 1998.	

Note 1: Intended Learning Outcomes

Intended learning outcomes should state what students should be able to do or attain upon completion of the subject. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/ Indicative Syllabus
The syllabus should adequately address the intended learning outcomes. At the same time over-crowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology
This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method
This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method purports to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.

The Hong Kong Polytechnic University

Subject Description Form

Please read the notes at the end of the table carefully before completing the form.

Subject Code	ISE6605
Subject Title	Industrial Logistics Information Systems
Credit Value	3
Level	6
Pre-requisite / Co-requisite/ Exclusion	Basic Logistics Operation Knowledge
Objectives	The objectives of this subject are to provide the students with the ability to: 1. understand the principles of industrial logistics information systems; 2. describe the concepts of operations research for solving industrial logistics optimization problems; 3. understand data manipulation along a supply chain; 4. understand forecasting and data mining techniques in industrial logistics operations.
Intended Learning Outcomes *(Note 1)*	Upon completion of the subject, students will be able to: a. demonstrate their understanding of industrial logistics information systems; b. demonstrate the concept of operations research for solving industrial logistics optimization problems; c. explain data manipulation along a supply chain; d. select appropriate techniques to achieve logistics intelligence.
Subject Synopsis/ Indicative Syllabus *(Note 2)*	The syllabus includes the following topics 1. <u>Introduction to Industrial Logistics Information Systems</u> Principles of industrial logistics information systems. Relationships in

<table>
<tr><td></td><td>data warehousing.

2. <u>Concepts and Strategies for adopting Forecasting and Data Mining Techniques to achieve Logistics Intelligence</u>

Forecasting and data mining techniques for industrial logistics operations. Handling the critical steps required for success in knowledge discovery tasks. Evaluating industrial logistics operations and enhancing the efficiency of such operations using suitable tools.

3. <u>Case Studies</u>

Application of industrial logistics operation control systems; strategic logistics planning; vehicle scheduling and routing.</td></tr>
<tr><td>Teaching/Learning Methodology
(Note 3)</td><td>A mixture of lectures, tutorial exercises, and laboratory exercises is used to deliver the various topics in this subject. Some material is covered using a problem-based format where this advances the learning objectives. Other material is covered through case studies to enhance students' "learning to learn" ability. Some case examples, largely based on consultancy experience, are used to integrate these topics and demonstrate to students how the various techniques are interrelated and applied in logistics operations.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes
(Note 4)</td><td>
<table>
<tr><th rowspan="2">Specific assessment methods/tasks</th><th rowspan="2">% Weighting</th><th colspan="4">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th></tr>
<tr><th>a</th><th>b</th><th>c</th><th>d</th></tr>
<tr><td>1. Assignments</td><td>30 %</td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>2. Laboratory exercises</td><td>10 %</td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>3. Test</td><td>30 %</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>4. Projects</td><td>30 %</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="4"></td></tr>
</table>

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The assignments are designed to assess students' ability to apply their knowledge of industrial logistics information systems.

The laboratory exercises are designed to assess students' understanding</td></tr>
</table>

	of industrial logistics information systems. The projects involve case studies through which students' understanding of the working principles, design concepts, and selection of industrial logistics information systems can be assessed. The test is designed to assess students' understanding of the topics and whether they can present the concepts clearly.	
Student Study Effort Expected	Class contact:	
	▪ Lectures 3 hours/week for 6 weeks	18 Hrs
	▪ Tutorials 3 hours/week for 3 weeks	9 Hrs
	▪ Laboratories 3 hours/week for 4 weeks	12 Hrs
	Other student study effort:	
	▪ Assignment preparation	40 Hrs
	▪ Presentation preparation and report writing	25 Hrs
	▪ Test preparation	23 Hrs
	Total student study effort	127 Hrs
Reading List and References	1. Harrison, A. 2008, *Logistics Management and Strategy: competing Through the Supply Chain*, Harlow: Financial Times/Prentice Hall. 2. Roiger, R. 2003, *Data Mining: A Tutorial-based Primer Boston*, Addison Wesley. 3. Witten, I.H. 2011, *Data Mining: Practical Machine Learning Tools and Techniques* (3rd edition), Burlington, MA : Morgan Kaufmann. 4. Gudehus, T. and Kotzab, H. 2012, *Comprehensive Logistics,* Springer Berlin Heidelberg: Berlin, Heidelberg.	

Note 1: Intended Learning Outcomes
Intended learning outcomes should state what students should be able to do or attain upon completion of the subject. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/ Indicative Syllabus
The syllabus should adequately address the intended learning outcomes. At the same time over-crowding of the syllabus should be avoided.

Note 3: Teaching/Learning Methodology

This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method

This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method purports to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.

The Hong Kong Polytechnic University

Subject Description Form

Subject Code	EIE6200
Subject Title	**Methodology for Engineering and Scientific Research**
Credit Value	3
Level	6
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	This subject aims to equip students with the methodologies necessary for conducting engineering and scientific research. The objectives of this subject include: (i) To enable students to have a broad concept on the philosophy of research (ii) To introduce students with the methods and process for the design and formulation of a research study, as well as the different types of scientific research approaches and methods (iii) To familiarize students with the methods for validating and presenting research results
Intended Learning Outcomes	Upon completion of the subject, students will be able to: 1. identify and select appropriate research problems; 2. formulate research objectives, analyze the problem, state hypotheses; 3. identify the safety and ethical issues in a research study; 4. identify, select appropriate research methods and develop process for conducting research; 5. appreciate published literature and write research paper; and 6. make professional presentations of research results and defend the propositions and claims.
Subject Synopsis/ Indicative Syllabus	Keyword Syllabus This subject provides students with the following key topics: 1. Research Philosophy and Ethics in Engineering Research Overview of research philosophy and purposes such as positivism/interpretivism, significance of research in society, etc.; importance of research ethics; professional codes and policies of research ethics in engineering; ethical decision making in research; safety considerations in research; case studies. 2. Scientific Research Methods

<table>
<tr><td></td><td>Observation and description; cause and effect; analysis and synthesis; hypothesis, deduction, induction, testing of hypothesis; system modeling; action research, design-based approach; mathematical, modelling, and numerical computations; probability, randomness and logic.

3. Conducting a Research
Process for developing research plan; formulation of research problem; feasibility and significance studies; critical review of literature; design experiments and apparatus; measurement of human information, questionnaire design; quantitative vs qualitative research or mixed methods, empirical research; classification and sampling; analysis of experimental data; errors of measurement, validity, reliability, and uncertainty analysis of research findings; reporting research results.

4. Writing and Presentation Techniques
Tools for preparing research document; preparing research proposal; research paper writing and style; thesis writing and style; making oral and poster presentations.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>• To help the students understand the importance of academic honesty and learn ways to ensure that the work and behavior at PolyU are acceptable in this regard, students are required to complete the Online Tutorial on Academic Integrity not later than Week 5. The Online Tutorial is part of the subject completion requirement. Students who fail to complete the Online Tutorial will fail this subject.
• Formal classroom lectures will be given to introduce the concepts in research philosophy, ethics and safety in research, scientific research methods, methodologies when conducting a research, as well as writing and presentation techniques. They support the intended learning outcome 1 to 6.
• A workshop will be given to familiarize students the tools for preparing research documents. It supports the intended learning outcome 6.
• Each student is required to complete a mini-project in which the student will select a problem of his/her interest, conduct a literature search, generate/collect research data, and finally prepare research papers. A mini-conference will be held at the end to allow students to practice making oral and poster presentations of the papers they developed in the mini-project. Students will also work as the reviewer of the conference to give critical comments on the paper submissions. They support the intended learning outcome 1 to 6.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>In addition to the assessment methods below, students are required to complete the Online Tutorial on Academic Integrity not later than Week 5. The Online Tutorial is part of the subject completion requirement. Students who fail to complete the Online Tutorial will fail this subject. This assessment method assesses the intended learning outcome 3.
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>1. Mini-project: research proposal, research paper.</td><td>45</td><td>√</td><td>√</td><td></td><td>√</td><td>√</td><td></td></tr>
</table>
</td></tr>
</table>

	2. Mini-conference: Oral and poster presentations, paper reviews	45					√	√
	3. Case study report – Significance of research	10			√			
	Total	100 %						

Assessment:

Continuous Assessment 100%

Principal course assignments will include the following:

- Students will go through the whole process of a research project in a mini-project. The problem can be a well known one and should be of student's interest. Student submissions for this mini-project may include
  - a research proposal
  - the final research paper

  Students also need to demonstrate they can use the tools taught in the class to prepare the research paper.
- Students will participate in a mini-conference in which students will make oral and poster presentations of the research papers they developed in the mini-project. Students will also work as a reviewer of a conference to make critical comments to paper submissions.
- Students will go through a critical analysis of the research they are carrying out to identify the significance in their project. Students are required to submit a case study report to discuss their findings.

Student Study Effort Expected		
	Class contact:	
	▪ Lecture	20 Hrs.
	▪ Class activity	19 Hrs.
	Other student study effort:	
	▪ Self study / Mini-project	66 Hrs.
	Total student study effort	105 Hrs.

Reading List and References

Indicative Reading

1. Kristin Shrader-Frechette, Ethics of Scientific Research, Lanham, Md.: Rowman & Littlefield, 1994.

2. E. Bright Wilson, Jr., An Introduction to Scientific Research, New York: Dover Publications, 1990.

	3. Kenneth S. Bordens and Bruce B. Abbott, Research Design and Methods - A Process Approach, 8th Edition, McGraw Hill (2008). 4. John W. Creswell, Research Design – Qualitative, Quantitative, and Mixed Methods Approaches, SAGE (2009). 5. John W. Creswell, Dr. Vicki L. Plano Clark , Designing and Conducting Mixed Methods Research, SAGE (2008). 6. W. James Bradley and Kurt C. Schaefer, The Uses and Misuses of Data and Models: The Mathematization of the Human Science, SAGA Publications, Inc., 1998. 7. Mark L. Mitchell and Janina M. Jolley, Research Design Explained, 6th Edition, Thomson Wadsworth (2007). 8. John D. Sterman, Business dynamics: Systems thinking and modeling for a complex world, McGraw-Hill, 2000.