Attachment 4

**The Hong Kong Polytechnic University**

**Subject Description Form**

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

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| **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. |
| **Objectives** |

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| 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.
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| **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***(Note 2)* | 1. Overview of Advanced Materials Processing Technologies

 Outline of advanced materials processing techniques: Precision Materials Removal Processes; Precision Forming; Microwave Technology; Advanced Surface Engineering Processes; Joining Technologies. 1. Precision Removal Processes

 Ultra-precision machining, theories, principles and applications. Micro Electro-discharge machining. Physio-chemical machining, Surface Metrology of machined components.3 Laser Materials Processing Fundamentals of industrial lasers. Laser materials interaction theories. Laser processing for various industries such as metals, non-metals, photovoltaic, bio-medical applications. |
| **Teaching/Learning Methodology** *(Note 3)* | 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.  |
| **Assessment Methods in Alignment with Intended Learning Outcomes***(Note 4)* |

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| Specific assessment methods/tasks | % Weighting | Intended subject learning outcomes to be assessed (Please tick as appropriate) |
| a | b |  |  |  |  |
| 1. Assignments | 20% | ✓ | ✓ |  |  |  |  |
| 2. Laboratory exercises  | 15% | ✓ |  |  |  |  |  |
| 3. Mid-term Test | 20% | ✓ | ✓ |  |  |  |  |
| 4. Mini-project | 20% | ✓ | ✓ |  |  |  |  |
| 5. Final Test  | 25% | ✓ | ✓ |  |  |  |  |
| Total  | 100% |  |

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.  |
| **Student Study Effort Expected** | Class contact: |  |
| * Lecture
 | 26 Hrs |
| * Seminars
 | 3 Hrs |
| * Tutorials
 | 4 Hrs |
| * Laboratory Exercises
 | 6 Hrs |
| Other student study effort: |  |
| * Assignments
 | 25 Hrs |
| * Preparation for laboratory exercises, reports, mini-project, and tests
 | 51 Hrs |
| Total student study effort:  | 115 Hrs |
| **Reading List and References** |

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| 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. |

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*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.