**THE EDUCATION UNIVERSITY OF HONG KONG**

**Course Outline**

**Part I**

**Programme Title :** Master of Arts in Mathematics and Pedagogy

**Programme QF Level :** 6

**Course Title :** Mathematical Thinking and Assessment

**Course Code :** MTH6116

**Department :** Mathematics and Information Technology

**Credit Points :** 3

**Contact Hours :** 39

**Pre-requisite(s) :** NIL

**Medium of Instruction :** English supplemented with Chinese

**Course Level :** 6

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**Part II**

The University’s Graduate Attributes and seven Generic Intended Learning Outcomes (GILOs) represent the attributes of ideal EdUHK graduates and their expected qualities respectively. Learning outcomes work coherently at the University (GILOs), programme (Programme Intended Learning Outcomes) and course (Course Intended Learning Outcomes) levels to achieve the goal of nurturing students with important graduate attributes.

In gist, the Graduate Attributes for Undergraduate, Taught Postgraduate and Research Postgraduate students consist of the following three domains (i.e. in short “PEER & I”):

* **P**rofessional **E**xcellence;
* **E**thical **R**esponsibility; **&**
* **I**nnovation.

The descriptors under these three domains are different for the three groups of students in order to reflect the respective level of Graduate Attributes.

The seven GILOs are:

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| --- |
| 1. Problem Solving Skills |
| 2. Critical Thinking Skills |
| 3. Creative Thinking Skills |
| 4a. Oral Communication Skills |
| 4b. Written Communication Skills |
| 5. Social Interaction Skills |
| 6. Ethical Decision Making |
| 7. Global Perspectives |

1. **Course Synopsis:**Mathematical thinking is an important domain for studying cognitive development in children and an essential topic of formal instruction in schools. Mathematical achievement changes markedly as children progress through school, and differences among individuals often are striking. This course is designed to enable students to understand how children gain mathematical knowledge, and to further their own mathematical development. It focuses on the models of mathematics learning and cognitive development, as well as the assessment of students’ understanding and applications of mathematical concepts.
2. **Course Intended Learning Outcomes** (CILOs)

*Upon successful completion of this course, students should be able to:*

CILO1 :Know and understand students’ mathematical thinking and doing.

CILO2 : Foster students’ mathematical thinking in some selected topics.

CILO3 : Assess students’ understanding and applications of mathematical concepts through process-oriented tasks and formative assessments.

1. **Content, CILOs and Teaching & Learning Activities**

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| --- | --- | --- |
| **Course Content** | **CILOs** | **Suggested Teaching & Learning Activities** |
| Models of cognitive development and its relevance to mathematical thinking, including Piaget’s Model, Vygotsky’s Model, Information-Processing Model, and Dweck’s Mindset Theory. | *CILO1* | lectures, discussions,  small group presentations and directed studies using  on-line materials |
| Mathematics Learning: Models and Implications, including the work of Colburn, Gagne, Bruner and Skemp. | *CILO2* |
| Development of Mathematics Understanding: Preschool Period, Elementary School Period and Middle School Period. | *CILO1, 2* |
| Assessment of Students’ Understanding and Applications of Mathematical Concepts using Process-oriented Tasks and Formative Assessments. | *CILO3* |

1. **Assessment**

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| --- | --- | --- | --- |
| **Assessment Tasks** | | **Weighting (%)** | **CILO** |
| a. | Quiz | 15 | *CILO1,2* |
| b. | A group presentation on application of selected theories in mathematics learning. | 15 | *CILO1,2,3* |
| c. | A critical essay of about 3000 words on an approved student chosen topic pertinent to some of the ideas of the course, normally in the form of a mini-research project into some aspect of classroom or professional practice. | 70 | *CILO1,2,3* |

1. **Required Text(s)**Nil
2. **Recommended Readings**
3. Must-read publications

**Desoete, A., & Veenman, M. (Eds.) (2006). *Metacognition in mathematics education*.** New York : Nova Science.

Kamii, C., & Housman, L. B. (2000) *Young Children Reinvent Arithmetic : Implications of Piaget's Theory*. New York: Teachers College Press.

**Kaur, B., & Wong, K. H. (Eds) (2011). *Assessment in the mathematics classroom*.** Singapore : World Scientific.

Royer, J. (Ed.) (2003). *Mathematical Cognition: Current Perspectives on Cognition, Learning, and Instruction*. Charlotte: Information Age Publishing.

1. Other references

Campbell, J. (Ed.) (2004). *The Handbook of Mathematical Cognition*. Taylor & Francis, UK: Psychology Press.

Cowan, P. (2006). *Teaching mathematics : a handbook for primary and secondary school teachers*. London: Routledge.

English, L. D. (Ed.) (1997). *Mathematical Reasoning*. Malwah, N. J.: Lawrence Erlbaum Associates.

**Leder, G. C. (Ed.) (1992). *Assessment and learning of mathematics.*** Hawthorn, Vic.: Australian Council for Educational Research.

Martinez, J., & Martinez, N. C. (2006). *Activities for Mathematical Thinking: Exploring, Inventing, and Discovering Mathematics*. Upper Saddle River, N. J.: Prentice Hall.

Martinez, J., & Martinez, N. C. (2007). *Teaching Mathematics in Elementary and Middle School: Developing Mathematical Thinking*. Upper Saddle River, N. J.: Prentice Hall.

**Sakshaug, L., Olson, M., & Olson, J. (2002). *Children are mathematical problem solvers*.** Reston, Va.: National Council of Teachers of Mathematics.

[**陳鼎興.**](http://library.ied.edu.hk/search/a%7b215f23%7d%7b216274%7d%7b215433%7d./a11%7b215f23%7d13%7b216274%7d16%7b215433%7d/-2,-1,0,B/browse) **(2001)：《數學思維與方法 : 硏究式教學》， 南京，東南大學出版社。**

1. **Related Web Resources**<http://www.flaguide.org/cat/math/math/math1.php>

<http://mathforum.org./brap/wrap/>

<http://www.cut-the-knot.com/front.shtml>

1. **Related Journals**

Mathematics Teaching in Middle Schools

Mathematical Thinking and Learning

Teaching Children Mathematics

The Journal of Mathematical Behavior

1. **Academic Honesty**

The University adopts a zero tolerance policy to plagiarism. For the University’s policy on plagiarism, please refer to the *Policy on Academic Honesty, Responsibility and Integrity with Specific Reference to the Avoidance of Plagiarism by Students* (<https://www.eduhk.hk/re/modules/downloads/visit.php?cid=9&lid=89>). Students should familiarize themselves with the Policy.

1. **Others**

Nil

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