THE EDUCATION UNIVERSITY OF HONG KONG

Course Outline

Part I

Programme Title	**:**	Doctor of Education (Mathematics Education – Directed Study)
Programme QF Level	**:**	7
Course Title	**:**	Research on ICT in Mathematics Education
Course Code	**:**	MTH8124
Department	**:**	Mathematics and Information Technology
Credit Points	**:**	3
Contact Hours	**:**	39 hours
Pre-requisite(s)	**:**	MTH7122 or MTH7123
Course Level	**:**	Applied Stage

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:

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

This course aims to give candidates an overview of the current research in the use of ICT (Information and Communication Technology) in the teaching and learning of mathematics from an international perspective. Epistemological theories (e.g. semiotic mediation, instrumental genesis, variation, etc.) will be visited to provide an opportunity to critically reflect upon major issues exploring the pedagogical potentials of ICT. The roles of ICT environments in mathematics education like Dynamic Geometry, Spreadsheet, CAS (Computer Algebra System), and Graphing Tools will be explored. The focus is on empowering teaching and learning of mathematics in an ICT-rich environment that promotes change in classroom practices and design of mathematically meaningful tasks.

2. Course Intended Learning Outcomes ($CILO_s$)

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

- $CILO_1$ Develop a critical understanding and knowledge to articulate emergent philosophies and key principles for integrating ICT into the mathematics classroom;
- $CILO_2$ Synthesize ideas from a critical analysis of specific ICT educational environments for the effectiveness in promoting teaching and learning of school mathematics;
- $CILO_3$ Demonstrate the ability to use an understanding of the development of mathematical concepts and of pedagogical issues when undertaking research on ICT in mathematics education;
- $CILO_4$ Critically analyze the roles and responsibilities of teachers and students in ICT-rich environments by examining current research with reference to literature.

3. Content, CILOs and Teaching & Learning Activities

Course Content	CILOs	Suggested Teaching & Learning Activities
Learning processes with technology, impact of technology on the teaching and learning of mathematics	*CILO1,2,3,4*	▪ Lecturer-led Q&A ▪ Guided Research Activities
Research and development on specific ICT environments like dynamic geometry environments	*CILO1,2,3,4*	▪ Lecturer-led Q&A ▪ Guided Research Activities
Issues related to the use of ICT as a pedagogical tool: curriculum, assessment, teacher conceptions, change in classroom practice, etc.	*CILO1,2,3,4*	▪ Lecturer-led Q&A ▪ Guided Research Activities
ICT task designs relate to the epistemological and cognitive aspects of the teaching and learning of mathematics	*CILO1,2,3,4*	▪ Lecturer-led Q&A ▪ Guided Research Activities

4. Assessment

Assessment Tasks		Weighting (%)	CILO
(a)	A presentation on the articulation of self-selected readings and on possible future research directions	20	*CILO1,2,3,4*
(b)	An analytical and critical essay of around 4000 words on one of the topics in the Content Themes	80	*CILO1,2,3,4*

5. Required Text(s)

Nil

6. Recommended Readings

Cuban, L. (2001). *Oversold and Underused: computers in the classroom*, Cambridge, MA: Harvard University Press.

English, L., Bussi M. B., Jones G. A., Lesh R. A. & Tirosh, D. (Eds.) (2002). *Handbook of International Research in Mathematics Education*, Lawrence Erlbaum Associates.

Guin, D., Ruthven, K., & Trouche, L. (Eds.) (2005). *The Didactical Challenge of Symbolic Calculators: turning a computational device into a mathematical instrument*, Springer.

Hoyles, C., & Sutherland, R. (1989). *Logo Mathematics in the Classroom*, London, Routledge.

*Heid, K. & Blume, G. (Eds.). (2008), *Research on Technology and the Teaching and Learning of Mathematics (Volume 1): Research and Syntheses*, IAP.

*Heid, K. & Blume, G. (Eds.). (2008), *Research on Technology and the Teaching and Learning of Mathematics (Volume 2): Cases and Perspective*, IAP.

*Hoyles, C. and Lagrange, J. -B. (Eds.) (2009). *Mathematics Education and Technology-Rethinking the Terrain The 17th ICMI Study. Series: New ICMI Study Series* , Vol. 13. Springer: New York.

Keitel, C., & Ruthven, K. (Eds.) (1993). *Learning from Computers: mathematics education and technology*, Berlin: Springer-Verlag (NATO ASI Series F, vol 121).

Laborde, J. (Eds.) (1996). *Intelligent Learning Environments: the case of geometry*, Berlin: Springer-Verlag (NATO ASI Series F, vol 117).

*Noss, R., & Hoyles, C. (1996), *Windows on Mathematical Meanings: learning cultures and computers*, Dordrecht: Kluwer.

Oldknow, A. & Taylor, R. (2003), *Teaching Mathematics Using ICT*, London and New York: Contiuum.

Papert, S. (1980). *Mindstorms: children, computers, and powerful ideas*, New York: Basic Books.

Sutherland, R. & Mason, J. (Eds.) (1995). *Exploiting Mental Imagery with Computers in Mathematics Education*, Berlin: Springer-Verlag (NATO ASI Series F, vol 138).

Those marked with (*) are highly recommended.

7. Related Web Resources

http://www.unige.ch/math/EnsMath/Rome2008/

http://www.geogebra.org/cms/

http://www.dynamicgeometry.com/

8. Related Journals

International Journal of Computers for Mathematical Learning
The International Journal for Technology in Mathematics Education

Educational Studies in Mathematics

9. 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.

10. Others

Nil

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Annex

TPg Courses with other Study Modes

Programme Title	**:**	Doctor of Education (Mathematics Education – Directed Study)
Course Title	**:**	Research on ICT in Mathematics Education
Course Code	**:**	MTH8124
Offering Unit	**:**	Mathematics and Information Technology
Credit Points	**:**	3

Delivery mode:

☐ **Online learning as the primary delivery mode**

Range of classroom-based contact hours (0-15)	**Range of hours for online learning (24-39)**	**Total No. of-Contact Hours**
		39

☑ **Directed study mode**

Range of classroom-based contact hours (4-15)	**Range of guided independent learning hours (24-35)**	**Total No. of-Contact Hours**
6	33	39