**THE EDUCATION UNIVERSITY OF HONG KONG**

**Course Outline**

**Part I**

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

**Programme QF Level : 6**

**Course Title :** Algebra and Number Theory

**Course Code :** MTH6128

**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

**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**

This course provides an introductory overview of basic Number theory and Modern Algebra. It provides an opportunity for students to learn algebraic structures in Mathematics and to develop students’ ability to apply the strategies, techniques and theorems learned in this course to solve problems in Mathematics, and to appreciate the beauty, unity and necessity of abstraction of mathematical concepts.

1. **Course Intended Learning Outcomes** (CILOs)

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

CILO1 Demonstrate an ability to prove results in modern algebra.

* + - * 1. Show understanding of mathematical reasoning.
        2. Show understanding of various fundamental theorems and techniques in Mathematics.
        3. Show comprehension of how real life objects are described by mathematical abstraction.

CILO2 Demonstrate an understanding of the basic properties of groups, subgroups, and various specific groups and their properties.

1. Show understanding of group structures and basic properties.
2. Show comprehension of various group examples such as permutation groups, cyclic groups, symmetric groups, and transformation groups.

CILO3 Demonstrate an understanding of classical results on groups.

1. Show understanding of normal subgroups, isomorphisms and homomorphisms.
2. Show comprehension of applying group theory to real life problems.

CILO4 Demonstrate an understanding on the basic properties of rings.

1. Show understanding of the ideas of rings and examples of them such as integer rings and polynomial rings.
2. Show understanding of the relation between groups and rings.
3. **Content, CILOs and Teaching & Learning Activities**

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| **Course Content** | **CILOs** | **Suggested Teaching & Learning Activities** |
| Introduction to Number theory: Primes and Divisibility and Division Algorithm, Congruence modulo n | *CILO1* | Lectures, group discussions and e-learning |
| Group theory: Binary operations, Semi-groups, Monoids and Groups | *CILO1,2,3* |
| Group theory: Subgroups, Homomorphisms, normal subgroups and Isomorphism theorem of groups | *CILO1,2,3* |
| Rings: Integral Domains, Fields, and Homomorphisms | *CILO1,3,4* |

1. **Assessment**

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| **Assessment Tasks** | | **Weighting (%)** | **CILO** |
| (a) | Two assignments (15% each) on solving problems using the techniques learned in the course | 30 | *CILO1,2,3* |
| (b) | Written examination on the content materials | 70 | *CILO1,2,3* |

1. **Required Text(s)**

Nil

1. **Recommended Readings**

Durbin, John R. (2009). *Modern Algebra: an Introduction*. John Wiley & Sons.

Gilbert, J. (2002). *Modern Algebra with Applications*. John Wiley & Sons.

Nicolson, W. Keith (2012). *Introduction to Abstract Algebra* (4th edition). Wiley, Hoboken.

Solow, Daniel (2005). *How to Read and Do Proofs: an Introduction to Mathematical Thought Processes*. John Wiley & Sons.

Papick, Ira J. (2007). *Algebra Connections: Mathematics for Middle School Teachers*. Pearson Prentice Hall, New Jersey.

Pomersheim, J., Marks, T. & Flapan, E. (2010). *Number theory: a lively introduction with proofs, applications, and stories*. Wiley, Hoboken.

Usiskin, Z. et al. (2003). *Mathematics for High School Teachers: An Advanced Perspective*. Pearson, New Jersey.

Zazkis, R. & Campbell, S. (Eds) (2006). *Number theory in mathematics education: perspectives and prospects*. Lawrence Erlbaum Associates Publishers, Mahwah.

1. **Related Web Resources**<http://www.math.niu.edu/~beachy/abstract_algebra/study_guide/contents.html>

<http://www.maths.tcd.ie/~dwilkins/Courses/311/>

<http://en.wikiversity.org/wiki/Introduction_to_Abstract_Algebra>

1. **Related Journals**

Nil

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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