

# The Hong Kong Polytechnic University

## Subject Description Form

<b>Subject Code</b>	AMA3710
<b>Subject Title</b>	Abstract Algebra
<b>Credit Value</b>	3
<b>Level</b>	3
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	AMA1751 or equivalent
<b>Objectives</b>	This subject introduces fundamental structures in abstract algebra and develops students' ability to read and write rigorous mathematical proofs.
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ul style="list-style-type: none"> <li>(a) describe concepts and basic facts in elementary number theory and polynomials;</li> <li>(b) understand the notions of rings and fields and recognise standard examples;</li> <li>(c) understand the notion of groups and properties of key examples such as symmetric groups and dihedral groups;</li> <li>(d) follow the proofs of theorems and apply theorems appropriately in problems;</li> <li>(e) construct rigorous mathematical proofs in abstract algebra.</li> </ul>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p><u>Elementary number theory for integers and polynomials</u> Division algorithm, Euclidean Algorithm, Fundamental Theorem of Arithmetic, Congruence, Chinese Remainder Theorem</p> <p><u>Ring</u> Definition, examples including number systems and polynomials, commutative rings, integral domains, direct product of rings, ideals, principle ideal domains, equivalence relations and quotient rings, ring homomorphisms and isomorphisms, first isomorphism theorem</p> <p><u>Fields</u> Definition, examples including infinite and finite fields, field of fractions, extension fields</p> <p><u>Groups</u> Definition, notions of order, cyclic groups and abelian groups, examples including symmetric groups, dihedral groups and matrix groups, cosets and subgroups, Lagrange's Theorem, group homomorphisms and isomorphisms</p>

<b>Teaching/Learning Methodology</b>	Concepts, theorems, examples and techniques of abstract algebra will be taught in lectures and students will learn the skills of problem solving in the tutorials.																																													
<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	<table border="1" data-bbox="570 327 1369 789"> <thead> <tr> <th data-bbox="570 327 824 520" rowspan="2">Specific assessment methods/tasks</th> <th data-bbox="824 327 971 520" rowspan="2">% weighting</th> <th colspan="5" data-bbox="971 327 1369 457">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th data-bbox="971 457 1036 520">a</th> <th data-bbox="1036 457 1117 520">b</th> <th data-bbox="1117 457 1198 520">c</th> <th data-bbox="1198 457 1279 520">d</th> <th data-bbox="1279 457 1369 520">e</th> </tr> </thead> <tbody> <tr> <td data-bbox="570 520 824 583">1. Assignments</td> <td data-bbox="824 520 971 583">20%</td> <td data-bbox="971 520 1036 583">✓</td> <td data-bbox="1036 520 1117 583">✓</td> <td data-bbox="1117 520 1198 583">✓</td> <td data-bbox="1198 520 1279 583">✓</td> <td data-bbox="1279 520 1369 583">✓</td> </tr> <tr> <td data-bbox="570 583 824 653">2. Test</td> <td data-bbox="824 583 971 653">20%</td> <td data-bbox="971 583 1036 653">✓</td> <td data-bbox="1036 583 1117 653">✓</td> <td data-bbox="1117 583 1198 653">✓</td> <td data-bbox="1198 583 1279 653">✓</td> <td data-bbox="1279 583 1369 653"></td> </tr> <tr> <td data-bbox="570 653 824 722">3. Examination</td> <td data-bbox="824 653 971 722">60%</td> <td data-bbox="971 653 1036 722"></td> <td data-bbox="1036 653 1117 722">✓</td> <td data-bbox="1117 653 1198 722">✓</td> <td data-bbox="1198 653 1279 722">✓</td> <td data-bbox="1279 653 1369 722">✓</td> </tr> <tr> <td data-bbox="570 722 824 789">Total</td> <td data-bbox="824 722 971 789">100 %</td> <td colspan="5" data-bbox="971 722 1369 789"></td> </tr> </tbody> </table> <p data-bbox="570 835 1369 1104">Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: The subject focuses on knowledge, skills and understanding of <b>Abstract Algebra</b>, thus, Exam-based assessment is the most appropriate assessment method, including 60% examination. Continuous Assessment methods comprising tests and assignments (40%) are included to keep the students in progress. A written examination is held at the end of the semester.</p>						Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					a	b	c	d	e	1. Assignments	20%	✓	✓	✓	✓	✓	2. Test	20%	✓	✓	✓	✓		3. Examination	60%		✓	✓	✓	✓	Total	100 %					
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<b>Student Study Effort Expected</b>	Class contact:																																													
	▪ Lectures					26 Hrs.																																								
	▪ Tutorials					13 Hrs.																																								
	Other student study effort:																																													
	▪ Homework and self-study					78 Hrs.																																								
	▪ Total student study effort					117 Hrs.																																								
<b>Reading List and References</b>	<p data-bbox="553 1562 1377 1625">Thomas W. Judson. <i>Abstract Algebra: Theory and Applications</i>, Open Source.</p> <p data-bbox="553 1640 1377 1703">John B. Fraleigh, Neal Brand. <i>A First Course in Abstract Algebra</i>, 8<sup>th</sup> Ed. Pearson</p> <p data-bbox="553 1717 1377 1780">Joseph Gallian. <i>Contemporary Abstract Algebra</i>, 7<sup>th</sup> Ed. Cengage Learning, 2009</p> <p data-bbox="553 1795 1377 1858">David S. Dummit, Richard M. Foote. <i>Abstract Algebra</i>, 3<sup>rd</sup> Ed. Wiley</p> <p data-bbox="553 1873 1377 1936">Joseph Rotman. <i>A First Course in Abstract Algebra With Applications</i>, 3<sup>rd</sup> Ed. Prentice Hall.</p>																																													