# 3. SYLLABUS

## UNIT A1: The Language of Mathematics

**Objective:** (1) To understand the first notion of set language.

(2) To understand the first notion of logic.

| Detailed Content | Time Ratio | Notes on Teaching |
|---|---|---|
| **1.1 Set language** | 5 | Basic terminology to be introduced includes set, element, subset, mother set, power set, empty (void) set, equal sets, disjoint sets, universal set, intersection, union, complement, and product of sets. It should be noted that in ushering in the foregoing concepts, just informal treatment is expected and teachers are encouraged to adopt an adequately wide spectrum of simple and factual examples of daily life nature to support their teaching. Conventionally used symbols and notations should be clearly taught. The following are for reference.<br>(1) Sets are generally denoted by capital letters and elements by small letters. The sets of numbers listed below are commonly denoted by the accompanying symbols:<br>the set of all natural numbers **N**<br>the set of all integers **Z; I**<br>the set of all rational numbers **Q**<br>the set of all real numbers **R**<br>the set of all complex numbers **C**<br>(2) Sets are usually presented either in tabular form i.e. with all the elements listed out like A = { 2, 4, 6, 8, 10 } or in propositional form { x:p (x) } like A = { x:x ≤ 10, x is an even and positive integer }<br>(3) Just simple and straight forward operation rules on intersection, union and complement may be introduced to substantiate students' learning. It is advisable to use Venn diagrams to offer intuitive understanding of the rules as it is probably the first time for the students to come across terms like commutative, associative and distributive etc. |

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| Detailed Content | Time Ratio | Notes on Teaching |
|---|---|---|
| **1.2 Simple logic** | 5 | Basic terminology to be introduced includes statement/proposition, truth value, conjunction, disjunction, negation, conditional and biconditional, equivalent statements, equivalence, implication, quantifiers, examples and counter-examples. The use of truth table to manifest the meaning of the above connectives is an advisable approach. It is anticipated that more emphasis will be directed to the teaching of conditional and biconditional in the form of "if-then" and "if-and-only-if" which are very widely used in the study of mathematics. Teachers should also touch upon "theorem" and "converse". In teaching this topic, teachers should provide adequate relevant daily life statements for illustration in the first place and then students should be encouraged to give examples of their own. It must be noted that class discussion with the students is helpful in bringing around the concept and using it as a tool. The pure analytical approach is not desirable.<br>To reinforce students' understanding regarding 'sufficient condition', 'necessary condition' and 'necessary and sufficient condition', teachers may lead a discussion with them using simple examples as follows which consist of two propositions and teachers may proceed to investigate with students which condition(s) is (are) applicable:<br>(1) x and y are integers; xy is an integer.<br>(2) x and y are even; x+y is even.<br>(3) x and y are even; x+y and xy are even.<br>The equation $ax^2 + bx + c = 0$ has equal roots; $b^2 - 4ac = 0$.<br>Furthermore, the fact that $(p \to q) \equiv (\sim q \to \sim p)$ should be elaborated (commonly known as contrapositive) with reference to some simple results like the above-mentioned examples. Also teachers may demonstrate some proofs using the method of contradiction. For example, to prove $\sqrt{2}$ is irrational is a commonplace. |
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