

MATHEMATICS EDUCATION IN SINGAPORE POLYTECHNIC

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Singapore Polytechnic

Mathematics is a fundamental subject essential to most of the engineering courses read in the Singapore Polytechnic. The main aim of teaching mathematics is to provide students with an adequate knowledge on the subject to serve as a tool in the learning of various engineering subjects and to solve technical problems encountered during the course of study. It can also serve as a foundation for their future work involving computation. Through the study of mathematics in the institution, the students will be able to develop a logical and systematic approach to the formulation and solution of technical problems.

Mathematics to suit various courses are provided by the Mathematics and Science Division. Most of the mathematics taught in the Polytechnic entail three hours of learning per week (including lectures and tutorials). For a three-year Diploma course in Singapore Polytechnic, mathematics is taught from one year to three years according to the needs of various courses (see Table I). Topics covered in mathematics are generally engineering oriented: Differentiation and Integration, Series, Fourier Series, Vectors and Complex Numbers, Matrices, First and Second Order Differential Equations, Laplace Transform and Statistics.

Table I

Duration of Mathematics Education	
<i>Duration</i>	<i>Courses</i>
One Year	Building, Land Surveying, Chemical Process Technology
Two Years	Civil Engineering, Structural Engineering, Marine Engineering
Three Years	Electrical Engineering, Electronics Engineering, Mechanical Engineering, Production Engineering

During lectures, generally speaking, emphasis is placed on building up students' knowledge and skills in mathematical techniques and the amount of theorem proving is kept to the minimum. It is not our intention to train technicians to become

mathematics graduates adapt at juggling with mathematical symbols. They should at least be able to handle and manipulate mathematical formulae and equations used in engineering. At all times, we try wherever possible, to relate mathematics to engineering topics.

For the past few years, a total of twelve staff (out of thirty-one) attended the Polytechnic Part-Time Technician Engineering Courses and were awarded the Technician Diploma in various engineering fields. Staff equipped with engineering knowledge would find it easier to introduce the mathematical techniques via practical examples and thus link mathematics to engineering topics.

Quite often, a mathematics lecturer teaching first year has to face a class of students with different mathematical proficiency and background, ranging from grade 1 to grade 6 for different syllabi of the GCE 'O' level Elementary Mathematics (modern syllabus and traditional syllabus). A large percentage of students also took Additional Mathematics (see Table II). We are therefore left with the difficulty of pitching the level and content of our material to suit our first year student population. This situation is even more severe for part time courses, as some of the students have left school many years ago. Difficulties are also encountered during this session because of the admission of GCE 'A' level students to the second year of the course.

Table II

Wide range of student ability

	<i>Modern Syllabus</i>	<i>Traditional Syllabus</i>	<i>Additional Mathematics</i>
Full Time	89%	11%	91%
Part Time	29%	71%	45%

The mathematics lectures are usually backed up by tutorial sessions. During tutorial sessions, lecturers could clarify the concepts and methods delivered in the lectures and reinforce, through exercises, the knowledge and skills the students have learned. It is common practice that more attention is directed towards weaker students in order to help them to alleviate their deficiencies.

The normal class size in the Singapore Polytechnic is about 45 students. In recent years, steps have been taken to reduce the class size and attempts have also been made to split a class into two for tutorials.

The most common method of the presentation of mathematics lectures is the traditional lecture by one lecturer using chalk and talk. Another method in use is team

teaching. Two lecturers from the Division share the lecture course, each lecturer covers certain topics of his own specialization.

The method of assessment of student performance is through an examination at the end of the academic session. Examination questions normally are of traditional type in which the student usually has a choice of questions. In recent years, both objective questions and traditional questions have been introduced in some mathematics papers with the intention to increase the effectiveness of measuring mathematical knowledge and skills attained by the students. After the examination, staff members are encouraged to collect data from scripts and apply Item Analysis to evaluate the examination paper for future improvement.

As computer programming will be introduced for most of the Diploma courses in the next session, greater emphasis will be placed on the teaching of numerical methods in the future.

Cert Ed. ('O' level, Tamil)

Those offering		
Group A Teaching	UP Level mathematics	80 hours of mathematics content out of 80 hours of Group A Teaching Subject Mathematics pedagogy course
Subject Mathematics (in preparation for teaching at primary level)		Same course as that for the Cert Ed ('O' level, General)