

Survey Education at University Level.

O. J. MARSHALL

In the first four decades of this century the only educational facilities in the field of surveying in Ontario were at the University of Toronto and Queen's University. During that period, anyone wishing to pursue formal education in engineering and related fields beyond the levels of High Schools, Collegiate Institutes and Technical Schools was obliged to attend University. During most of that period a thorough course in higher surveying, geodesy and advanced astronomy was available at the University of Toronto as an option in the fourth year of the course in Civil Engineering. The option was never popular, and attracted no students at all after 1925. This was probably due mostly to the retirement (in 1930) of the late Prof. L. B. Stewart whose strong personality and international reputation had always brought some students. Incidentally, the letters appearing after his name were: O.L.S., D.L.S., D.T.S., but no indication of a degree from any University.

Development at University of Toronto.

From the late twenties until after the second World War almost no progress was evident in educational facilities for advanced surveying. The development of photogrammetry and topographic surveying by aerial methods eventually forced the issue by virtue of the need for accurate co-ordinated ground control surveys. So, perhaps it was not entirely by accident that in 1948 Dr. C. R. Young, then Dean of Engineering at Toronto asked the last graduate of Louis B. Stewart's "Astronomy and Geodesy Option" to organize a course at the Master's Degree Level.

In 1954 it was decided to offer most of the subject material of this graduate course as an option in the fourth year of the civil engineering curriculum. Very few people had been taking the post graduate course in surveying, and about half of them were members of the teaching staff in surveying at the University of Toronto who found it convenient to obtain their Master's degree while teaching. It was felt that by moving it back into the fourth year of the undergraduate course, the enrolment might increase. It would also attract those interested in the field but who were not willing to spend a year beyond graduation in further study.

This option course worked fairly well until 1962 when it was revised and more than doubled in scope, following a request from the Association. At that time it became necessary to start this specialization in the third year of the course, mostly because the basic course in surveying required of all civil engineering students was seriously curtailed. Over the years, the policy-setting group at the University of Toronto had been decreasing the time allotted to surveying subjects in the General Course in Civil Engineering. In order to maintain or increase the surveying content in the surveying option, it was necessary to re-introduce them into the third year. The general attitude (not shared by this writer) was that those who wanted to follow a surveying course

take this new option and those entering other Civil Engineering fields needed much less surveying instruction.

The graduates of this new option have the same status with the Association of Professional Engineers as has any other graduate of the Faculty of Applied Science and Engineering.

Present Status.

The present status of survey education in Ontario is presented in Table I. The figures in the main body of this table are total hours spent in lectures and laboratory, except for the last column which shows totals in units. The time equivalent of a unit is shown in a foot-note. A term at the University of Toronto is now about 13 weeks.

The Faculty Council has ruled that a full academic year in any engineering course at Toronto may not exceed 40 units, or an average of 20 units each term. For example, this could be made up of 15 hours of lectures plus 15 hours of laboratory per week. Using the rule set out at the bottom of Table I, 15 hours of laboratory time is equivalent to 5 units giving a total of 20 units. There are those who contend, particularly in American Universities, that a student should spend 2 hours of study time for each hour of lecture. Applying this rule, the student has a work load of up to 60 hours.

The last column of Table I gives a ready comparison of the total units in surveying at Universities in Ontario. It will be noted that the University of Ottawa with 11 units is the highest in surveying content outside of the Surveying Option Course at the University of Toronto. A week of field work in a survey camp, whether the camp is held "off campus" or "on campus" is a concentrated course running 7 to 8 hours a day, is considered to equal one unit. This is an arbitrary rule adopted by the writer for purposes of the comparison. For further comparison, Ohio State University in 1945 had 17 units in surveying in the civil engineering curriculum, the highest in the United States.

Table II shows the approximate division of the units in the Surveying option of the Civil Engineering course at Toronto into several commonly discussed categories. These categories are those normally used in University circles to divide the various subject areas of the course. It is the writer's belief that a very satisfactory course in Surveying would be achieved if the number of units allocated to Engineering and Surveying could be reversed, i.e., 45 units for the former and 52 for the latter.

Conclusions.

The apparent needs for survey education in Ontario at University level are adequately served for the present. The capacity at the University of Toronto for survey option students is presently about 30. However, the present enrolment in the option is running between 7 and 9. To increase it to 30 would require the addition of a few staff members. The senior staff is sufficient to cope with the increase. More equipment would be required and some additional space. The space problem at the University of Toronto involves not only room space but suitable outdoor space. The great open spaces are no longer great nor open on this campus and it is difficult to find sufficient space for a group of 60 to work on a 3 hour practice problem in the field.

SURVEYING CONTENT IN CIVIL ENGINEERING COURSEOntario Universities

University	1ST YR.		2ND YR.		3RD YR.		4TH YR.		FIELD WORK (Wks).	TOTAL		TOTAL UNITS ⁽¹⁾
	LECT. LAB.	(hours)	LECT. LAB.	(hours)	LECT. LAB.	(hours)	LECT. LAB.	(Hours)		LECT. LAB.	(hours)	
CARLTON	24- 0								2½	24-100	4.5	
GUELPH	26-39			26- 78						52-117	7.0	
LAKEHEAD	13- 0								2	13- 80	3.0	
McMASTER			26- 78							26- 78	4.0	
OTTAWA	24- 0		24- 24		12- 12				5	60-236	11.0	
QUEEN'S			24- 48						2	24-128	5.8	
ROYAL MILITARY COLLEGE			13- 47		26- 60		26- 94			65-201	10.0	
TORONTO			65-111		78-156		156-312		9	299-939	47.5 ⁽²⁾	
WATERLOO			26- 52							26- 52	3.3	
WESTERN									2	0- 80	2.0	
WINDSOR	52-52								2	52-132	7.3	

(1) 1 unit is equivalent to: 1 hour lecture a week for 1 term, or one 3 hour lab. per week 1 term, or 1 week of field work.

(2) The total of 47.5 units for University of Toronto is made up as follows:
 General Civil Engineering Course II Year + Camp = 8.9 units
 Additional for Survey Option III and IV Year = 38.6 units
 Total 47.5 units

UNIVERSITY OF TORONTO

Civil Engineering - Survey Option

Curriculum is divided into 5 classifications as shown.
All figures are in units, 1 unit being 1 hour lecture
or 1-3 hour laboratory each week for 1 term.

	<u>Science</u>	<u>Mathematics</u>	<u>Engineering</u>	<u>Surveying</u>	<u>Humanities</u>
I YEAR	21	11	4		4
II YEAR		7-1/2	21	8	4
III YEAR		5-1/2	17-1/2	10+5	
IV YEAR		4	9-1/2	18+4	11
	21	28	52	45	19

In the surveying content of the general civil engineering course, the University of Toronto with 8.9 units still compares favourably with other Universities in Ontario. The quality of instruction at Toronto is probably somewhat above the Ontario average since the staff involved in teaching surveying there include six men of relatively senior rank who teach only surveying subjects. This is possibly only because these people are needed to serve the students in the surveying option and the graduate students in this field.

DISCUSSION

MR. D. ENDLEMAN: Professor Marshall in his report, which I think is an excellent report, made the statement in his conclusions that the apparent needs for survey education in Ontario at university level are adequately served for the present. Yet in our recent Ontario Land Surveyor's Report we find that the number of Ontario Land Surveyors are actually decreasing in number, which means that we are not keeping pace as far as our Association is concerned. I wonder if Professor Marshall could possibly explain the difference between these two statements.

PROFESSOR MARSHALL: I can make a very short statement in explanation of that and I have made this statement once or twice before in front of a meeting of the Ontario Land Surveyors Association. The University is quite ready to take in 30 students a year, and if you can get 30 students into your Association, this is probably enough to satisfy your needs - send them in - we'll graduate them.

MR. F. GOOCH: If a person is taking say 2 years engineering in a College, say like Carlton, would it be any problem in switching to the 3rd or 4th year, say if a student did become interested in the survey option and wanted to go to Toronto - would he have much of a problem. I'm thinking if a person came to me to enquire - perhaps he had worked with me and he thought he'd be very interested in going to his third year and his marks were well qualified.

PROFESSOR MARSHALL: There would be no particular problem in taking in a student from any University in Ontario to the third year in a Civil Engineering course; it would be necessary that he had been taking Civil Engineering, and that his course was somewhere nearly the equivalent of what we do at Toronto in the first two years. Not in detail, but in the general material covered, then if he came into the third year at the University of Toronto, he would very likely be asked to go to our first survey camp, so he starts school five weeks early in his third year. And then if he takes the surveying option, he has another camp of four weeks preceding his fourth year.

MR. YATES: Professor Marshall, you said also a student will graduate how many will end up in legal land surveying. I know it's a very hard question to answer, but in talking to some of the students that are in the course presently, they're all going to end up in geodesy or photogrammetry.

PROFESSOR MARSHALL: I'm supposed to be confining my remarks to facts tonight, and this one might be argumentative. I think you've heard a fairly good answer to that one already this afternoon.

MR. F. PEARCE: Mr. Chairman, I notice in an analysis of the curriculum of the Civil Engineering option course and Mr. Marshall made some mention that there should be 52 units and suggested there might be some interchange in the units from 52 to 45 in the survey course. There are, in the makeup of the survey option, some common subjects to option 1A, which is structural and 1B which is surveying. What steps does the Association have to take in order to change the common option course to a smaller number of engineering subjects and strengthen the surveying 1B option course to eliminate some of the engineering courses that are still in it?

PROFESSOR MARSHALL: These are fourth year subjects and I don't know whether this will answer your question completely, but I think it will be at least a partial answer. We had discussed and we may be able to get this through without any urging on the part of the Association, the possibility of taking out structural engineering (2) course No. 122 from the fourth year entirely and thus deleting that much engineering from the fourth year. In order to get this done, we would have to add a little bit of time, but very little to Structural Engineering (1), which is at the bottom of the table describing the third year subjects. Now this is the sort of thing that we managed to do at the University from time to time through the urging of those of us who take surveying. We might do more with some urging by this Association, but as the Association at whatever rank was advised at the time they sent in a Brief to the university and don't have the Association send this urging to me - send it farther up - it will get to me soon enough. This I might say would be neither tactful nor diplomatic, and if any of you are interested, I'll tell you the difference between them.

MR. LEITCH: Professor Marshall, have you ever considered taking very diverse subjects that would be of more practical value to the surveyors in general, that is possibly Business Administration and some Psychology, so that the surveyors would realize the value of the work to the general public and could then assess their work more astutely than they do at present?

PROFESSOR MARSHALL: I think the University does a fairly good job, to give a fairly well rounded course including some reasonable part of the student's time spent in the humanities as indicated by the table on the left page of my paper. Now whether this is psychology or not, I'm not sure - I suspect it is not called psychology. As for Business Administration, most of our engineering graduates who want to enter that field, go back to the University for a graduate course in Business Administration. Sticking to facts again, I think most of the things that Surveyors and/or engineers want in their educational background is available at the university, but certainly not all of it in 4 years. We're limited to this number of units, and I've tried to tell you why the units should not go higher. I agree with the Faculty Council thoroughly that 20 units is enough. We have to give these fellows some time to think - once in a while we wonder whether they spend their spare time thinking or some other way, but at least we should give them time to think if they want to.