SYLLABUS OF THE LECTURES IN ENGINEERING AT THE OWENS COLLEGE: TOGETHER WITH A SERIES OF EXAMPLES RELATING TO THE VARIOUS SUBJECTS INCLUDED IN THE COURSE

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INTRODUCTION.

ENGINEERING has been so recently introduced among the subjects systematically taught in Colleges and Universities, that the system of teaching it is only now beginning to assume a definite shape; and as yet there is no well-arranged text-book such as those which furnish great help in the teaching of the older and more thoroughly systematized subjects.

It is hoped that this Syllabus will in some measure bridge over the difficulty by enabling the students of Owens College to form some idea of the range and nature of the work which lies before them, as well as by assisting them in arranging their notes and saving their time in the Classes. Examples are inserted in juxtaposition to the subjects to which they primarily relate, so that the students may obtain from them a clue to the particular object of each part of the course.

The Course of Instruction in Engineering is given in five Classes, called generally:

1. The First Year's Engineering Class.
2. The Second Year's Class.
3. The Third Year's Class.
4. The Geometrical and Mechanical Drawing Class.
5. The Practical Surveying Class.

And in addition to the Lectures on Geometrical Drawing, the students have a Course of Practical Instruction in Drawing, comprising:

1. The drawing of parts of machines from given dimensions.
2. The making of maps and sections of tracts of country from surveyors' note-books.
3. The use of Geometrical Drawing in arranging and designing the parts of machines, and how to work out various mechanical problems by the Graphic Method.
4. The taking out of quantities and the forming estimates from drawings.
5. The designing of bridges, machines, and engineering structures generally.
6. The intersection of surfaces, and the representation of objects in skew projection and perspective.

An additional Course of Lectures, treating more fully of the elementary part of Practical Geometry, is given by Mr. Millar.

The instruction in Practical Surveying comprises:

1. The surveying of a tract of country with the chain only, and the method of keeping the note-book.
2. The use of the level-instrument.
3. The surveying by angular measurements, and the use of the theodolite.
4. The ranging of curves, and the setting out of works on the ground from designs on the map.

The subjects as contained in this Syllabus are in accordance with the requirements of the Victoria University for the Degree of B.Sc.

FIRST YEAR'S ENGINEERING CLASS.

SYLLABUS AND EXAMPLES.

PRELIMINARY.

1. The objects and methods of engineering, and the necessity for exact information.

MEASUREMENT.

2. Definition of measurement.

3. Standards and units.

4. The operations of measurement.

5. The accuracy of measurements.

6. The nature of quantities to be measured.

Ex. 1. What is the standard of length in Great Britain?
2. Describe the manner in which errors in measurement tend to accumulate, and hence the necessity for preserving a standard.
3. Take 20 slips of paper; make two marks on the edge of one of them, and from these mark off the same distance on the edge of another, and from these on another, and so on through the 20 slips; and then compare the first with the last.

The Measurement of Distances.

7. The methods of measuring long distances, such as are necessary for land surveying, and the accuracy with which these measurements can be made.

8. The methods of measuring short distances on maps and drawings, and their relative accuracy.

9. The methods of measuring the dimensions of objects generally.

Ex. 4. Describe the best known means of measuring a base-line on the ground.

5. What is the greatest accuracy to which distances can be measured under the following circumstances:—

(1) On paper, with an ordinary scale?
(2) On the ground, with a chain?
(3) On the ground, with the greatest care?
(4) On solid objects, with gauges and callipers?

6. Explain how it is that there is always a disadvantage in measuring short lines.

7. What methods are adopted to check measurements so as to insure accuracy?

Areas on Flat Surfaces.

10. The areas of certain geometrical figures.

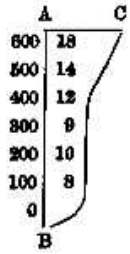
11. The areas of irregular polygons.

12. The areas included between irregular curved boundaries.

13. Simpson's rule.

14. The planimeter.

Ex. 8. Find the area bounded by the lines *AB*, *BC*, *AC* by Simpson's rule. *AB*=600 feet.



9. The three sides of a triangle are 763, 472, 687 links respectively. Calculate the area in acres, roods, and perches.

10. If the foregoing measurements had been made with a chain 4 inches too long, what would be the true area?

11. State and describe the different methods by which the area of an irregular field may be computed.

12. If 40 acres are represented on a map by 2·25 square inches, what is the scale in inches to a mile?

13. If the map of a field plotted to the scale of 6 inches to a mile has an area of 3·375 square inches, what is the area of the field in acres, roods, &c.?

Areas of Curved Surfaces.

15. The cylinder, the sphere, and the cone.

16. Irregular surfaces, such as ships' sides, mouldings, and pipes.

17. The formation of estimates which depend on the measurement of areas.

Ex. 14. What is the area of a right frustum of a cone the base of which is 1 inch in diameter, the top ½ inch, and the altitude ½ inch?

15. What is the area of each portion of a sphere of 1 inch diameter cut off by a plane which passes within ¼ inch of the centre?

16. What would be the cost of pointing a semicircular arch of 20 feet span, if its length was 12 feet and the cost of the work 2d. per square foot?

17. What would be the weight of a cylindrical boiler, with hemispherical ends, 3 feet in diameter and 18 feet long, if the plates were ¼ inch thick and the iron of which it was composed weighed 480 lbs. per cubic foot?

Volumes.

18. The volume of certain regular geometrical solids.

19. The volume of polyhedral solids.

20. The prismoidal formula.

21. The volume of solids bounded by irregular curved surfaces, such as the displacement of ships and the contents of pipes and reservoirs.

22. The representation of volumes by areas, and the application of Simpson's rule.

23. The formation of estimates which depend on volumes.

Ex. 18. What will be the weight of a ring made of round iron 1 inch in diameter, if its mean diameter is 8 inches?

19. How many cubic feet of water will it take to fill a pipe ½ mile long and 9 inches in diameter?

20. How many cubic feet of water will it take to fill a cylindrical boiler, with hemispherical ends, 3 feet in diameter and 20 feet long?

21. What is the volume of a regular pyramid 3 inches high on a hexagonal base having a side of 1 inch?

22. Calculate the volume of a railway-cutting, the surface being level across and the breadth at the bottom 27 feet, if the depth of the cutting at the successive chain-(100 feet) pegs was as follows:—0, 7, 12, 13, 11, 8, 3, 0.

Angles.

24. The angles between lines on a drawing. The protractor.

25. Angles between distant objects. The sextant.

26 Azimuthal angles and altitudes. The compass.

27. The theodolite.

Ex. 23. Describe the prismatic compass.

24. Explain the principle of the sextant geometrically.

25. What is the object of the theodolite?

26. Name all the adjustments to be made in the theodolite, and point out the difference in the Y and transit instruments.

27. Make a sketch of a theodolite, and name all the parts.

28. Describe the method of reading an angle (*ABC*) with the theodolite.

29. Why are two verniers always used?

30. Explain the principle of the vernier by a sketch.

31. How can you ascertain whether the horizontal axis of a theodolite is in adjustment?

32. If a line has been set out on a level plane by poles at equal distances apart, and instead of being straight is an arc of a circle, what part of the theodolite used in setting it out would need adjustment?

33. Show that in measuring angles with the theodolite it is essential that the line of collimation should move in a vertical plane when the telescope is turned about the horizontal axis. Describe the means provided in the instrument for securing this object, and the tests which you would apply in order to find if it was in adjustment in this respect.