Pre-University Remedial Program for the 2014 EC ESSLCE Examinees

Mathematics Module for Natural Science stream

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Ministry Of Education
Mathematics Course outline for Natural Sciences

This course outline is designed taking into account the following points:

1. The time limit.
2. Avoiding repetition of topics
3. Avoiding some topics that are part of the Freshman Mathematics modules.

Course outline

Chapter 1: **Solving Equations and Inequalities (12 hrs)**

- 1.1. Equations involving exponents and radicals
- 1.2. System of linear equations in two variables
- 1.3. Equations involving absolute values
- 1.4. Inequalities involving absolute values
- 1.5. System of linear inequalities in two variables
- 1.6. Quadratic equations and inequalities
- 1.7. Simplification of rational expressions and solving rational equations

Unit Summary

Review Exercises

Chapter 2: **Relations and Functions (10 hrs)**

- 2.1. Definition and examples of relations
- 2.2. Definition and examples of functions
- 2.3. Classification of functions (one to one, onto, even and odd) and inverse of functions
- 2.4. Operations on functions and composition of functions
- 2.5. Types of functions
  - 2.5.1. Polynomial functions
    - 2.5.1.1. Theorems on polynomial functions (Division, remainder, factor and location theorems)
    - 2.5.1.2. Graphs of polynomial functions
  - 2.5.2. Rational functions and their graphs
  - 2.5.3. Exponential functions and their graphs
  - 2.5.4. Logarithmic functions, graphs of logarithmic functions and equations involving logarithms
  - 2.5.5. Power function, Absolute value function, Signum function and greatest integer function
  - 2.5.6. Trigonometric functions (Sine, Cosine and Tangent) and their graphs.

Unit Summary

Review Exercises

Chapter 3: **Geometry and Measurement (10 hrs)**

3.1. Theorems on triangles
3.2. Special quadrilaterals
3.3. Circles
3.4. Regular Polygons
3.5. Congruency and Similarity
3.6. Areas of Triangle and parallelogram
3.7. Surface area and volume of solid figures (Prism, Cylinder, Cone and Sphere)
3.8. Frustum of pyramids and cones
Unit Summary
Review Exercises

Chapter 4: **Coordinate Geometry (8 hrs)**

4.1. Distance between two points
4.2. Division of a line segment
4.3. Equation of a straight line
4.4. Distance between a point and a line and between two lines.
4.5. Conic Sections
Unit Summary
Review Exercises

Chapter 5: **Vectors and Transformation of the Plane (10 hrs)**

5.1. Introduction to vectors and scalars
5.2. Representation of vectors
5.3. Operations on vectors
5.4. Transformation of the plane (Reflection, Translation, Rotation)
Unit Summary
Review Exercises

Chapter 6: **Matrices and Determinant (8 hrs)**

6.1. Definition of Matrices and types of matrices
6.2. Determinant and its properties
6.3. Inverse of a square matrix
6.4. Solving system of linear equations with two and three variables
Unit Summary
Review Exercises

Chapter 7: **Limit and Continuity (8 hrs)**

7.1. Limit of functions
7.2. Continuity of functions
7.3. Intermediate value theorem
Unit Summary
Review Exercises

Chapter 8: **Derivative and its Application (11 hrs)**

8.1. Definition of derivative and its geometric interpretation
8.2. Rules of differentiation
8.3. Derivatives of special functions (exponential, logarithmic and trigonometric)
8.4. Extreme values of functions
8.5. Minimization and Maximization problems
Unit Summary
Review Exercises

Chapter 9: **Integration and its Application (11 hrs)**

9.1. Integration as a reverse process of derivative
9.2. Techniques of integration (Substitution, by partial fractions and by parts)
9.3. Definite integral and Fundamental theorem of calculus
9.4. Area of a region under a curve and between two curves
Unit Summary
Review Exercises

Chapter 10: **Further on Trigonometry (8 hrs)**

10.1. The functions $y = \sec x$, $y = \cos ecx$, and $y = \cot x$
10.2. Graphs of some trigonometric functions
10.3. Inverse of trigonometric functions
10.4. Applications of trigonometric functions
Unit Summary
Review Exercises

Text Books:

The text books for the course are the Mathematics text books from grade 9 -12 that are currently under use. The table below indicates the chapters one has to refer or cover from the existing Mathematics text books for each chapters of the remedial course for Natural Sciences.

Chapter	Reference Material(s)
1	Grade 9 (Unit 2), Grade 10 (Unit 3) , Grade 11(Unit 2)
2	Grade 9 (Unit 4), Grade 10 (Unit 1, Unit 2 and Unit 5), Grade 11(Unit 1)
3	Grade 9 (Unit 5), Grade 10 (Unit 6, Unit 7)
4	Grade 10 (Unit 4), Grade 11 (Unit 3)
5	Grade 9 (Unit 7), Grade 11 (Unit 8), Grade 12 (Unit 6)
6	Grade 11 (Unit 6)
7	Grade 12 (Unit 2)
8	Grade 12 (Unit 3, Unit 4)
9	Grade 12 (Unit 5)
10	Grade 11 (Unit9)

The outcomes (or objectives) of each Chapter are the same as the objectives (with few exceptions) that are stated under each unit in the text books.

Recommendations:

1. The course has to be offered for 96 hours (5 hrs/week for 20 weeks).
2. Better to have at least one model examination in cluster.
3. Soft copies of the text books must be available for students online and hard copy at the library.
4. To check their understanding of the subject matters, we encourage students to solve problems of previous years national examination questions related to the topics they covered.

Mode of Delivery:

- Gap Lecture
- Tutorials/ Exercise sessions
- Individual Presentations
- Group Work