

AES1011| Mathematics Skills I

Course Syllabus — Mathematics Skills I (AES-1011)

Credit Hours: 3 Credit hours

Prerequisites: None

QFE Level: 5

Knowledge: Comprehensive, specialized knowledge within a broad field of work or discipline, including an understanding of the underlying theoretical and abstract concepts with significant depth in some areas. A broad understanding of allied knowledge and theories in related fields of work or disciplines including related regulations, standards, codes, conventions and procedures. An understanding of information assembly, retrieval methods and logical problem-solving techniques from a range of sources. Recognition of sources of current knowledge and the integration of concepts from related fields. Literacy to comprehend and/or produce coherent texts covering complex relations from an array of information and contexts. Numeracy covering an array of mathematical procedures and representations and contexts.

Skills: Technical, creative and conceptual skills appropriate to solving a wide-range of problems associated with a field of work or discipline that include a comprehensive range of specialist cognitive and practical skills appropriate to diagnosing and implementing solutions to abstract, familiar and nonroutine problems within a field of work or discipline. Use of appropriate information retrieval methods and tools and techniques associated with the field of work or discipline.

Comprehensive communication and information technology skills to present, explain and/or critique complex matters. Literacy skills to comprehend and/or produce, from array of information, coherent texts covering complex relations. Numeracy skills to select, apply, reflect and communicate an array of mathematical procedures and representations and contexts

Competence:

Autonomy and responsibility: Can take responsibility for coordinating the implementation of appropriate approaches to complex work procedures and processes, resources or learning, including leading teams within a technical or paraprofessional activity. Can exercise coordination and/or supervision in routine, familiar and some nonroutine work or learning contexts. Can coordinate technical, design processes in routine, familiar, nonroutine and an array of contexts with support available, if required. Can express an internalized, personal world view, in the context of an understanding of socio-cultural relationships.

Role in context: Can function with autonomy in technical and coordination contexts and support paraprofessional roles under guidance can function both independently and in a coordination role with multiple groups. Can take responsibility for coordinating the development of individuals and groups. Can review and develop the performance of self and others.

Self-development: Can evaluate own learning and identify learning needs in a familiar environment. Can take responsibility for and plan own learning within a managed and nonroutine environment. Can comprehend and observe ethical standards.

Course Description

This course covers the basic knowledge and skills of mathematical techniques and practices required to solve problems in engineering technology. It encompasses recognizing and performing operations with whole numbers and fractions (also in decimal and percentage forms), exponent and power calculations, and solving problems that involve using algebraic expressions, and linear algebraic equations.

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Instructor: Prof. Anthony Hechanova, Anthony.Hechanova@adpoly.ac.ae

Schedule and Duration: AY2021-2022 Semester 2 CRN 2287 starts 17 January 2022 and ends 18 February 2022. 5 weeks in modular format with AES1012 Mathematics Skills II, and AES1016 Physics Principles. 2 hours lecture/day from 3 p.m. until 4:50 p.m. on Mondays, Tuesdays, Wednesdays and Thursdays; and, 10 a.m. to 11:50 a.m. on Fridays. The course delivery is online remote until approved by the Ministry of Education to be on campus. Summative assessments (e.g., Midterm and Final exams) are on campus.

Course Objectives

The overall objective of this course is to develop student understanding and skills of mathematics from which students can demonstrate knowledge and skills of basic mathematical calculations, exponents and power calculations, algebraic calculations and solve basic technical problems using algebraic expressions.

Textbook

1. ACAD Basic Curriculum, Mathematics, General Physics Corporation, Elkridge, Maryland, 2003.

Attendance

The course delivery is online remote and may be on campus if approved. Sessions start on the hour. Students arriving after the session starts will be counted absent. Students may receive warnings and potential penalties from the Student Services Office or their sponsor if they reach 5%, 10%, and 15% absence. It is the responsibility of the student to keep track of their attendance and not rely on warnings from the Student Services Office. After 15% absence, students will receive a FA (fail due to absence) grade.

Academic Honesty Policy

Students must conduct their studies at ADPoly honestly, ethically, and in accordance with accepted standards of academic conduct. Any form of academic conduct which is contrary to these standards is academic misconduct, for which ADPoly may penalize the student.

Specifically, it is academic misconduct for a student to:

- Present copied, falsified, or improperly obtained data as if it were the result of laboratory work, field trips, or other investigatory work;
- Include in the student's individual work material which is the result of significant assistance from another person if that assistance was unacceptable according to the instructions or guidelines for that work;
- Cheat or attempt to cheat; or
- Plagiarize (knowingly presenting the work or property of another person as if it were one's own)

Abu Dhabi Polytechnic considers cheating or attempting to cheat a serious offense that will result in disciplinary action taken against involved individuals. Students caught cheating or attempting to cheat will earn an "F" grade in the course.

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Course Learning Outcomes (CLOs)

Upon successful completion of the course a student should be able to:

- CLO 1:** Perform basic calculations on whole numbers
- CLO 2:** Solve problems involving fractions
- CLO 3:** Perform decimal and percentage calculations
- CLO 4:** Perform calculations involving exponents, powers and radicals
- CLO 5:** Perform algebraic operations
- CLO 6:** Simplify and evaluate algebraic expressions
- CLO 7:** Solve linear equations
- CLO 8:** Solve algebraic word problems

Course Topics:

- CT 1: Whole numbers.** The decimal system, basic mathematical operations (addition, subtraction, division, multiplication), calculator operations and exercise.
- CT 2: Fractions.** Definition of fractions, basic mathematical operations that involve fractions, changing the form of fractions, and fraction calculations with calculators, decimals and percentage.
- CT 3: Exponents and powers.** Calculations with exponents and powers, special exponents and radicals, performing exponents and power calculations using calculators.
- CT 4: Algebraic operations.** Algebraic expressions, operations with algebraic expressions, and problem solving using algebraic expressions.

ABET Student Outcomes

The Higher Diploma in Nuclear Technology program student outcomes (SO) are taken from the 2019 ABET (Accreditation Board for Engineering and Technology) standard. Student Outcome 2 is from the associate degree standard and Student Outcomes 1, 3, 4, and 5 from the bachelor degree standard.

- SO1. An ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline;
- SO2. An ability to design solutions for well-defined technical problems and assist with the engineering design of systems, components, or processes appropriate to the discipline;
- SO3. An ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature;
- SO4. An ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and
- SO5. An ability to function effectively as a member as well as a leader on technical teams.

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Table 1: Relation Course Topics (CTs) to Course Learning Outcomes (CLOs)

	CT1	CT2	CT3	CT4
CLO1	H	M	M	M
CLO2		H	M	M
CLO3		H	M	M
CLO4			H	M
CLO5				H
CLO6				H
CLO7				H
CLO8				H

H: High, M: Moderate, L: Low

Table 2: Relation Course Learning Outcomes (CLOs) to Students Outcomes (SOs*)

	SO1	SO2	SO3	SO4	SO5
CLO1	H	M			
CLO2	H	M			
CLO3	H	M			
CLO4	H	M			
CLO5	H	M			
CLO6	H	M			
CLO7	H	M			
CLO8	H	M			
Average	H	M			

H: High, M: Moderate, L: Low

* SOs correspond to the ABET Student Outcomes (see above).

Assessments: Daily problem sets, quizzes, modular exams, and final exam.

Grading policy:

Homework	10%
Quizzes	10%
Midterm exam (4)	64%
Final exam (1)	16%
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Total	100%

Note: this course requires a minimum performance of 80% to pass the course.

Week-by-Week Teaching Plan

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Topic	Content	Textbook Reference
1. Whole numbers	The decimal system, basic mathematical operations (addition, subtraction, division, and multiplication), binary numbers, and exercise.	[1] Chapter 1 Pages 1-19
2. Fractions	Definition of fractions, basic mathematical operations that involve fractions, changing the form of fractions, and fraction calculations with calculators, decimals and percentage.	[1] Chapter 2 Pages 1-25 [1] Chapter 3 Pages 1-29
3. Exponents and power	Calculations with exponents and powers, special exponents and radicals, performing exponents and power calculations using calculators.	[1] Chapter 4 Pages 1-21
4. Algebraic operations	Algebraic expressions, operations with algebraic expressions, and problem solving using algebraic expressions.	[1] Chapter 5 Pages 1-15 [1] Chapter 6 Pages 1-17 [1] Chapter 7 Pages 1-10 [1] Chapter 8 Pages 1-10

Week	Chapter	Topic	Content	Page
1	1.1-1.5	Course Introduction and whole numbers	Course schedule, course rules, the decimal system	Chapter 1 Page 1
1	1.6-1.8	Whole numbers	Basic mathematical operations (addition, subtraction, division, and multiplication), binary numbers, and exercise.	Chapter 1 Pages 2-19
1	2.1-2.3	Fractions	Definition of fractions, basic mathematical operations that involve fractions, and changing the form of fractions.	Chapter 2 Pages 1-25
Modular Exam 1 (Monday, 24 January 2022)				
2	3.1	Decimals and percentage	Decimal fractions and operations, percentage and how to convert between decimal and percentages, problem solving using percentage, the concept of average or mean value, significant digits and operations with significant digits.	Chapter 3 Pages 1-29
2	4.1-4.6	Exponents and powers	Square and square roots, operations with exponents and powers, operation with radicals, special exponents and radicals, performing exponents and power calculations using calculators.	Chapter 4 Pages 1-21
Modular Exam 2 (Monday, 31 January 2022)				

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3	5.1-5.9	Algebraic Operations I	Introduction to algebra, hierarchy of mathematical operations, signed numbers and operation with signed numbers, algebraic expression and terms, and algebraic expression operations.	Chapter 5 Pages 1-15
3	6.1-6.4	Algebraic Operations II	Multiplication and division of algebraic expressions and factoring.	Chapter 6 Pages 1-17
Modular Exam 3 (Monday, 7 February 2022)				
4	7.1-7.5	Algebraic equations	Solving algebraic and fractional equations, ratio and proportion	Chapter 7 Pages 1-10
4	8.1-8.3	Problems solving with algebra	Basic approach in problem solving with algebra, problems solving that involve money and motions.	Chapter 8 Pages 1-10
Modular Exam 4 (Monday, 14 February 2022)				
5	1.1-8.3	Final Examination	(Thursday, 17 February 2022)	Chapters 1-8