AM-00.01 — Use Space Academy without “going back to school”

Version PDF de travail - contenu du cours HTML canonique

Course compass

Guiding question: How can a complete beginner learn space science without completing years of abstract prerequisites before understanding a rocket?

Markers: MEASURED · CONVENTION · CALCULATED · TEACHING ASSUMPTION · APPROXIMATION

• understand the concept

• do a simple calculation

• explain every symbol

• check a result

Essential answer

Use Space Academy without “going back to school”. The question to solve is: How can a complete beginner learn space science without completing years of abstract prerequisites before understanding a rocket? Markers: MEASURED · CONVENTION · CALCULATED · TEACHING ASSUMPTION · APPROXIMATION understand the concept do a simple calculation explain every symbol check a result? The path begins with a concrete problem: why a rocket produces thrust, why a satellite keeps falling around Earth, or how to aim at a moving target. Mathematics appears when it becomes useful. The rest of the course turns that idea into an auditable line of reasoning: explicit units, stated assumptions, reproducible calculations, order-of-magnitude checks and interpretation limits. A result is useful only when the reader can explain what it measures, where every input came from and which engineering decision it can support.

Starting synthesis: derivations, examples, limitations and sources are developed in the course body.

Key terms before you start

unit · order of magnitude · assumption · approximation · percentage

1 — Start from a real question

The path begins with a concrete problem: why a rocket produces thrust, why a satellite keeps falling around Earth, or how to aim at a moving target. Mathematics appears when it becomes useful.

You do not need to memorize an entire syllabus before continuing; prerequisites are introduced just in time.

2 — Six depths of reading

Each concept moves from intuition to words and units, first calculation, mission case, and engineering-level limitations. A beginner can stop early; an advanced reader can continue.

This prevents metaphors from replacing science: analogy opens the door and the real model follows.

3 — Progress is not a school grade

A lesson can be not started, in progress, or acquired. “Acquired” is a learning marker, not a professional qualification.

Progress can be exported to a small backup file in addition to browser storage.

4 — The question that should become automatic

For every number: where did it come from? For every symbol: how is it read? For every operation: why add, multiply, or divide? For every model: when does it stop being good enough?

The goal is to reconstruct reasoning rather than recite formulas.

Three complete examples: change one assumption to understand

Before each calculation, identify where every number comes from and whether it is measured, conventional, assumed, or calculated.

Example A — 4 lessons out of 20

If a small path contains 20 steps and 4 are acquired, 4 ÷ 20 = 0.20. Multiply by 100 to get 20%.

CALCULATED: 20% means 4 of 20 steps here, not “20% engineer”.

Example B — 15 out of 60

15 ÷ 60 = 0.25, then ×100 = 25%. The same percentage can represent more lessons in a longer path.

CONVENTION: the percentage is a progress indicator defined by the site.

Example C — weighted progress

A future module may distinguish opened lessons from acquired concepts or heavier projects. Those indicators answer different questions.

APPROXIMATION: no single percentage measures real competence.

Inverse calculation

To recover acquired steps from a percentage, multiply the total by the corresponding fraction: 20% of 35 = 0.20 × 35 = 7.

Common trap and result check

Trap: confusing “I opened the page” with “I understood it.” Progress is a navigation aid, not an automatic medal.

Always check units, order of magnitude, and physical meaning before accepting a result.

Exercises and answers

Understand

Explain the relationship in your own words.

Change an assumption

Modify one input and predict the direction of change before calculating.

Verify

Name two checks after a calculation.

Primary and educational sources

• NASA Glenn - Guide to Rockets

• NASA Science - Basics of Space Flight: Gravity & Mechanics

• NIST - International System of Units (SI)