

# ORION ACADEMY

## AVIAITON STEM COURSE OUTLINE

The following outline is an example of a two-semester elective general aerospace education course of 18 weeks semester.

### SEMENSTER 1

#### I. Introduction to Aerospace (3-4 weeks)

- A. Preview: Introduction; The Aerospace Age
- B. Aviation; Astronautics
- C. The Impact of Aerospace; Progress; The Aerospace Manufacturing Industry
- D. The Air Transport Industry; Industry and Aerospace Affairs
- E. General Aviation; Military Aerospace Power; Aerospace Research
- F. Education for the Aerospace Age; Aerospace Age Careers.
- G. Summary

#### II. Theory of Flight (6-8) weeks

- H. Preview; Introduction; Purpose
- I. Wind and Wing; Newton's Laws; Bernoulli's Principal
- J. Forces of Flight; Density; Wing. Angle of Attack; Lift; Drag
- K. Throttle, stick, and rudder; Stability: Maneuvers; Gusts; Load Factors

L. High-Speed Flight; Shock Waves; Design; Aircraft Structure; Flight Control Members

M. Hydraulic and Electrical Systems; Aircraft Instruments

N. Station Numbering; Weight and Balance

O. Summary

#### III. Aircraft Powerplants (5-7 weeks)

A. Preview and introduction to AC power plants, review of physics of simple machines; energy and its use in the powerplant

B. Internal combustion engines; turbojet engines; experimental engines

C. Aircraft systems; carburetion system. fuel injection system; the supercharger

D. Powerplants and electrical systems; starter; ignition; magneto; condenser; distributor; solenoids

E. Heat energy and mechanical energy horsepower; fuel.

- F. Lubrication and cooling; reduction of friction; oil systems; cooling-air and liquid
  - G. The propeller; thrust; fixed pitch; variable pitch; hydraulic props; electrical props
  - H. Instruments and controls; pressure and temperature gauges; remote indicating systems; engine control systems
  - I. Summary
- II. Airports, Airways, and Electronics (5-7 weeks)
- A. Preview of unit; Airport growth and Development; Airport Marking System
  - B. The charting of airports and airways; Charts; Symbols and information; Airport classification
  - C. Electronics and aviation; Induction; Transfer of Electrical energy; Magnetism; Radio-Frequency; Waves; Transformers; Tubes; Stages of transmission; Future electronics
  - D. Importance of Airports; Operation, Airport administration; Airport services; Air traffic control; Supplemental airlines; Government operations
  - E. Air traffic control facilities; All weather flight; Radio aids and electronic devices; Traffic control; Instruments; Dependency of Aircraft on Electronics
- F. Regulation of air traffic, Part I
  - G. Regulation of air traffic Part II; Visual Flight Rules (VFR); Instrument Flight Rules (IFR)
- SEMENSTER 2
- III. Navigation and Weather (5-7 weeks)
- A. Introduction; Weather and flying; Types of navigation
  - B. Time; Distance; Direction; Longitude and Latitude; Maps - Projections, Characteristics, Use; Magnetic influences; Navigation charts and instruments; Global Positioning Satellites (GPS)
  - C. Pilotage
  - D. Dead reckoning
  - E. Radio flight and celestial navigation; Four-course radio range in navigation; Radio navigation instruments; Celestial navigation; Global Positioning Satellites (GPS)
  - F. The weather
  - G. Air masses, fronts, and weather hazards; Weather reports
  - H. Summary and critique of problems
- IV. The Challenge of Aerospace Power (4-6 weeks)

- A Introduction; Nature of Aerospace Power; Elements of Aerospace strength; Factors of aerospace power
- B. Military aerospace counter-force capability
- C. The aerospace industry
- D. Airline transportation; Civil and military relationship and control; public services; revenue
- E. Airports and community needs; Advantages; Problems
- F. Research and development organization; Progress problems; Future development; Space medicine
- G. Education and aerospace power; Definition; Importance

- 7. Visits to planetariums, observatories and museums.

The elective course is given substance and meaning through practical activities such as:

1. Field trips to aerospace industries and flying activities.
2. Orientation flights in civil aircraft and/or flight simulations
3. Communications instruction and practice.
4. Visits to military installations.
5. Visits to space centers.
6. Use of resource personnel and materials from national organizations associated with aviation, space, and the military.