DOCUMENT RESUME

ED 287 048 CE 048 538

AUTHOR Shrawder, Jack; And Others
TITLE Aviation Maintenance Technology. Course Content Guides. FAA Approved Curriculum.
INSTITUTION Alaska Univ., Anchorage.
PUB DATE 1 Oct 87
NOTE 266p.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC11 Plus Postage.
DESCRIPTORS *Aerospace Education; Air Transportation; *Aviation Mechanics; Aviation Technology; Course Content; Electronics; *Engines; Higher Education; Laboratory Procedures; *Technical Education; Welding

ABSTRACT

Course content guides are provided for the 30 courses in this aviation maintenance technology curriculum approved by the Federal Aviation Administration. Course titles are physics for technicians; aircraft information, regulations, and procedures; aircraft assembly; fundamentals of aircraft electronics; aircraft electrical components; aircraft sheetmetal; aircraft reciprocating engine theory and overhaul; aircraft reciprocating engine and propeller installation and operation; aircraft fuel systems; aircraft turbine engines; aircraft fluid power systems; aircraft electrical systems; aircraft bonded structures; aircraft auxiliary systems; aircraft inspection and troubleshooting; fundamentals of aircraft welding, covering, and finishing; and laboratory courses for all of these courses. Each course content guide consists of these components: a description of the course design (credits, hours, fees), activities, prerequisite knowledge and skills, evaluation, and a course outline. (YLB)

Course Content Guides

Aviation Maintenance Technology

FAA Approved Curriculum

University of Alaska Anchorage

1 October 1987

Asso. Prof. Jack Shrawder
Program Chairperson

1985 U.S. Secretary's Award Winner

Greg Parrish
UAA Math/Physics
2533 Providence Avenue
Anchorage, Alaska 99508
(907) 786-1348

PHY 110 PHYSICS FOR TECHNICIANS
90 HOURS

phy110.kw

FAR 147 APPENDIX B (GENERAL)

ITEM	LEVEL	
24	1	Extract roots and raise numbers to a given power.
25	2	Determine areas and volumes of various geometrical shapes.
26	3	Solve ratio proportion and percentage problems.
27	3	Perform Algebraic operations involving-addition, subtraction, multiplication and division of positive and negative numbers.
30	2	Use the principles of simple machines, sound, fluid, and heat dynamics.

COURSE CONTENT GUIDE

I. COURSE DESIGN

a. Overview: Physics 110 is a survey course lightly covering certain useful topics in basic mechanics, thermodynamics, electricity, magnetism, and the structure of matter. Emphasis will be determined by the needs of the vocational areas served, rather than by an intent to provide a balanced overview of physics. The lecture to lab ratio will vary from week to week as the topics dictate. Extreme emphasis will be placed on covering basic ideas in lecture before they are dealt with in individual lab exercises. At the time of this writing Physics 110 is intended primarily to serve the aviation program at ACC and to count toward the two year AAS degree here. It is also expected to apply toward the 4 year degree in aviation to be offered jointly by ACC and APU.

The student is responsible for providing everything personally used in the class. This includes paper, pencils, textbooks, and a basic calculator. These should total less than $75.00.

b. Credits: Students receive 4 credits for successful completion of this course.

c. Hours: The class is scheduled to meet 5 1/2 hours each week for fifteen weeks each semester, for a total of 78 hours when two holidays are accounted for.

d. The lecture/lab ratio will vary from week to week as the topics dictate. Nominally 3 hours each week will be lecture and 3 hours each week will be lab.

e. This course is required for completion of the AMT Associate Program or the AMT certificate program.

AAL-FSDO-63
APPROVED
Date Signature

f. This course, in conjunction with the AMT curriculum, prepares an individual for entry level positions in the Aviation Maintenance Field.

PHY 110 PHYSICS FOR TECHNICIANS

II. ACTIVITIES

The course will run with a traditional lecture format supplemented by selected laboratory exercises. At the time of writing no significant use of packaged computer or audio-visual material is planned. This could change as new material becomes available.

III. PREREQUISITE KNOWLEDGE AND SKILLS

The entering student must be solidly competent in algebra at the Math 55 level. This may be as a result of either high school or college algebra courses. Math beyond this level would be extremely useful to the student, but the actual topics needed will be developed in class. No significant review of Math 55 topics (e.g. basic linear and quadratic equations) can be done in class; the student must enter already competent at these. Also, functional fluency and literacy in American English are required. (English is the language of international aviation, for example. Both for this course and for its primary service area, English is a must. No special class facilities or procedures are available for those who are not native English speakers.) The student is expected to be able to read any introductory physics text used for the course and to write clear lab reports. In addition to academic standards, the student must also satisfy all physical requirements for the appropriate service area. Since this course is not in any way a substitute for traditional introductory courses, it would serve no purpose to accept a student who could not function in one of the industrial programs served.

IV. EVALUATION

Department policy is to assign grades based on a combination of closed book exams, quizzes, and laboratory exercises (quizzes and/or writeups). It is the intent that these be as objective as reasonable possible, but some subjectivity will be present because of lab grading and partial credit on exams and quizzes. Timeliness of completing assignments will definitely affect the grade, as will attendance on certain critical days. Requirements of the service area(s) may force even more stringent attendance policies. The requirements for record keeping and attendance outlined in "Appendix B" will be met.

PHY 110 PHYSICS FOR TECHNICIANS

V. OUTLINE

1.0 Math and Units
- 1.1 Introduction to Geometry, Trigonometry, and Vectors
- 1.2 English and Metric Units

2.0 Solid Mechanics
- 2.1 Displacement, Velocity, and Acceleration
- 2.2 Newton's Laws of Gravity and Motion
- 2.3 Friction
- 2.4 Equilibrium
- 2.5 Work and Energy
- 2.6 Momentum and Collisions
- 2.7 Angular Motion

3.0 Fluid Mechanics
- 3.1 Static Pressure
- 3.2 Fluid Flow

4.0 Structure of Matter
- 4.1 The Bohr Atom
- 4.2 Crystal Structure

5.0 Vibratory Motion
- 5.1 Hooke's Law for Solids
- 5.2 Waves

6.0 Heat and Temperature
- 6.1 Temperature Scales
- 6.2 Heat Transfer
- 6.3 Unified Gas Law
- 6.4 Laws of Thermodynamics
- 6.5 Thermal Expansion

7.0 Electricity
- 7.1 Ohm's Law
- 7.2 Energy Transfer

8.0 Magnetism
- 8.1 Permanent Magnetism and Compasses
- 8.2 Electromagnetism

PHY 110 PHYSICS FOR TECHNICIANS

VI. INSTRUCTIONAL GOALS AND DEFINED OUTCOMES

There is only one goal in any true physics class; that is to gain a general understanding of certain topics at a given level. Although this class is geared toward vocational students, it is not designed to teach them their trade as such. Other courses exist to provide them with the specific job skills required. Physics 110 exists to provide a skeleton of scientific knowledge upon which the more specialized courses can build. While a student could learn to do many jobs on a purely rote basis, this would not give the breadth of knowledge that marks the advanced practitioner. The mastery of any profession requires the ability to acquire new information as it becomes available and to integrate it into the body of knowledge already held. Synthesis of separate pieces of information into a greater whole requires the ability to think and a solid framework of basic organization upon which to build. The goal of Physics 110 is to aid in the development of both of these. To this end certain specific outcomes can be identified.

Defined Outcomes:

1.1.1 Learn to define and use the three basic trigonometry functions with simple vector manipulations. Extract roots and raise numbers to a given power. Solve ratio proportion, and percentage manipulations. Perform Algebraic operations involving addition, subtraction, multiplication and division of positive and ntegative numbers.

1.1.2 Memorize and be able to evaluate with specific numbers such common geometrical formulae as the area of a circle, the volume of a cube, etc.

1.2.1 Become familiar with the English and ~~metric~~ METRIC systems of units.

2.1.1 Demonstrate a solid understanding of the three most common mechanical vectors and be able to work simple dynamical problems involving constant acceleration.

2.2.1 Learn to state and use Newton's three laws of motion both to work simple numerical problems and to analyze possible outcomes of physical situations.

2.2.2 Demonstrate a general understanding of Newton's Law of Gravity.

2.3.1 Know the two physical causes of friction and be able to use these numerically in problems involving solids at low relative speeds.

2.3.2 Understand that the common "laws of friction" cannot be applied randomly to fluids.

2.4.1 Demonstrate understanding of the two conditions of equilibrium by successfully working simple statics problems.

2.5.1 Distinguish between work, potential energy, and kinetic energy.

2.5.2 Demonstrate an ability to work simple problems by conservation of energy or by "energy accounting".

2.6.1 Define learn momentum as a vector and relate it to linear impulse.

2.6.2 Work very simple problems by conservation of momentum.

PHY 110 PHYSICS FOR TECHNICIANS

2.6.3 Identify the three types of collisions according to elasticity and work problems involving totally inelastic collisions.

2.7.1 Demonstrate the ability to identify the angular equivalents of force, displacement, velocity, acceleration, momemtum, work and energy; and to understand analogies between linear and angular motion.

2.7.2 Demonstrate an understanding of centripetal force and how it relates to Newton's First Law of Motion.

3.1.1 Demonstrate ability to calculate static pressures due to fluids of constant density and to undestand how the general idea can even qualitatively explain atmospheric pressure.

3.1.2 Generally understand Pascal's Principle and its limitations when applied to air or water.

3.2.1 Understand Bernoulli's Principle and how it makes hydraulics possible.

4.1.1 Be able to describe the general structure of the Bohr atomic model.

4.2.1 Know the common states of matter and how solids can be subdivided into various crystalline and noncrystalline classes.

5.1.1 Generally understand the concepts of stress, strain and modulus in the logitudinal case.

5.2.1 Understand the fundamental wave equation.

5.2.2 Demonstrate a general knowledge of resonance.

6.1.1 Be able to define and use the three most common temperature scales.

6.2.1 Know the three methods of heat transfer.

6.3.1 Learn to state and use the Unified Gas Law.

6.4.1 Have an overview of the major concepts fo thermodynamics.

6.5.1 Be able to work simple thermal expansion problems.

7.1.1 Know the formula developed by Ohm to define resistance and demonstrate the ability to "solve" simple D.C. circuits with it.

7.2.1 Demonstrate an understanding of the electric circuit as a device to relocate energy from one region and form to another.

8.1.1 Be familiar with the simple definition of the magnetic field and how we use a compass to define its direction.

8.2.1 Be aware that magnetism is an offshoot of electricity.

VII PROJECTS

2.1.1 Vector Force Resolution Project

2.3.2 Friction Project

2.7.1 Balance of Torques Project

5.2.2 Sound Resonance Project

6.2.1 Specific Heat Project

6.5.1 Liner Expansion Project

FAR 147 APPENDIX B (GENERAL)

ITEM	LEVEL	
11	3	Weigh Aircraft.
12	3	Perform complete weight and balance check and record data.
20	2	Start, ground operate, move, service, and secure aircraft.
21	2	Identify and select fuels.
28	3	Write descriptions of aircraft condition and work performed.
29	3	Complete required maintenance forms, records, and inspection reports.
31	3	Select and use FAA and manufacturers' aircraft maintenance specifications, data sheets, manuals and publications, and related Federal Aviation Regulations.
32	3	Read technical data.
33	3	Exercise mechanic privileges within the limitations prescribed by Part 65 of this chapter.

COURSE CONTENT GUIDE

I. COURSE DESIGN

a. Overview: Beginning with historical background, the student will learn of the government's involvement in aviation maintenance. The student will be familiarized with the policies and procedures of the Aviation Maintenance Technology Program, ACC and the FAA approved program. The student will gain knowledge in maintenance publication, maintenance forms and records, technicians' privileges and limitations, aircraft weight and balance, and aircraft ground operation and fuel servicing.

b. The student will receive 3 credits for successful completion of the course.

c. Hours: The class is scheduled to meet 6 hours per week for 15 weeks each semester (5400 min.) in class. In addition (2700 min.) outside work is expected for total student involvement of (8100 min.).

Ken Weyand
UAA Aviation Maintenance Technology
2811 Merrill Field Drive
Anchorage, Ak. 99501

A T 160 AIRCRAFT INFORMATION, REGULATIONS AND PROCEDURES

d. The 88 hours of instruction accounts for two holidays and is devoted entirely to formal classroom presentations.

e. This course is required for completion of the Associate of Applied Science degree or Certificate program in Aviation Maintenance.

f. Lab Fee: Lab fees for this course are outlined in appendix A.

g. This course, in conjunction with the AMT curriculum, prepares an individual for entry level position in the aviation maintenance field.

II. ACTIVITIES

Formal lecture and demonstrations will precede preplanned, structured lab exercises that allow the students to observe and practice the tasks necessary to build skill, and self-confidence in reading and interpreting regulations and maintenance data and in performing aircraft weight and balance. Students will also gain the necessary knowledge by performing aircraft ground operations and fuel servicing.

III. PREREQUISITE KNOWLEDGE AND SKILLS

Basic reading and writing skills required.

IV. EVALUATION

a. Class attendance is mandatory. Effects of absences and methods of make up are outlined in Appendix B.

b. Final grades are computed from quizzes, tests reports, lab projects and shop technique.

V. COURSE OUTLINE

1.0 Overview - History of Aviation Maintenance
  1.1 The Federal Government Involvement - 1926 to present
  1.2 The Aviation Act of 1957
  1.3 Aviation Maintenance today and in the future
  1.4 Relationships between aviation maintenance and related fields.

A T 160 AIRCRAFT INFORMATION REGULA IONS AND PROCEDURES

2.0 Program Orientation
- 2.1 Policies and procedures
  - a. FAA approval
  - b. Attendance
  - c. Building operation
  - d. Aviation community involvement
  - e. AMT students club
- 2.2 Campus education support

3.0 Aviation Maintenance Publications
- 3.1 Federal aviation regulations
- 3.2 Federal publications
  - a. Type certificates
  - b. Inspection aids
  - c. Advisory circulars
- 3.3 Manufacturers' data
- 3.4 Industry standards
- 3.5 Military standards
- 3.6 Vendor data
- 3.7 Airline transportation association (ATA specification 100 numbering system
- 3.8 ACC aviation library equipment and materials usage
- 3.9 Periodicals and professional associations

4.0 Privileges and Limitations of Aviation Maintenance Technicians
- 4.1 Legal and ethical responsibilities
- 4.2 FAR 65
- 4.3 FAR 43
- 4.4 Classification of aircraft repairs
- 4.5 FAR 145
- 4.6 FAR's 91, 121, 135
- 4.7 Economic considerations

5.0 Maintenance Forms and Records
- 5.1 FAA forms
- 5.2 Pertinent maintenance records
- 5.3 Inspection recording forms
- 5.4 Transfer of ownership maintenance documentation upon transfer of ownership
- 5.5 Maintenance release - return to service
- 5.6 Computerized maintenance records

6.0 Aircraft Weight and Balance
- 6.1 Definition of terms
- 6.2 Weight and balance data
  - a. Manufacturers' data
  - b. Aircraft specifications/type certificate data sheets.
  - c. Aircraft conformity inspection and equipment list
- 6.3 Aircraft preparation for weighing

6.4 Weighing procedures
6.5 Weight and balance calculations
6.6 Weight and balance extreme conditions
6.7 Recording weight and balance data

7.0 Ground Operation and Fuel Servicing
7.1 Fuel identification and selection
7.2 Start, ground operate, move, fuel service and secure aircraft.

VI. INSTRUCTIONAL GOALS AND DEFINED OUTCOMES

1.0 Overview

Instructional Goal Know the history of aviation maintenance. Know the federal government's involvement from 1926 to the present time. Know the Aviation Act of 1957 as it relates t aircraft maintenance. Know how the aviation maintenance industry interacts and relates to other career fields.

Defined Outcome The student will know the history of aviation maintenance and have an understanding of what is to be expected in the future. The student will relate to the Aviation Act of 1957 as it pertains to the maintenance of aircraft.

2.0 PROGRAM ORIENTATION

Instructional Goals Know the operation policies and procedures of the Aviation Complex , AMT program and the Anchorage Community College (ACC). Know the building operation and its intended use, tool room operation, clean-up responsibilities, hangar usage and management. Know the purpose and charter of the AMT student club. Know the aviation community's involvement in the AMT program.

Defined Outcome The student will follow the policies and procedures of the Aviation Complex, AMT program and ACC.

Instruction Goal Know the interface between the FAA approval and ACC. Know the approved attendance requirements established in Appendix "B" of the approved curriculum.

Defined Outcome The student will explain and comply with the FAA approved AMT program and the interface between the FAA and ACC. The student will follow the established attendance requirements in appendix "B" of the approved curriculum.

3.0 Aviation Maintenance Publications

Instructional Goal Know the use of FAA and manufacturers' maintenance specifications, type certificate data sheets, manuals and related Federal Aviation Regulations (FAR's).

Defined Outcome The student will locate reference data, use information from manufacturers' manuals, identify and relate regulations governing airworthiness certificates, select and use technical standard orders (TSO's), use reference manuals and other publications. The student will select and use supplementary type certificates and airworthiness directives. Read, understand and relate technical information. The student will have a working knowledge of the FAR's that relate to the maintenance of aircraft and airworthiness standards.

Instructional Goals Know the use of industry and military standards.

Defined Outcome The student will locate, select and use the standards used by industry and military.

Instructional Goal Know the use of Airline Transportation Association (ATA) specification 100 numbering system.

Defined Outcome The student will locate selected maintenance information using specification 100 numbering system.

4.0 PRIVILEGES AND LIMITATIONS OF THE AVIATION MAINTENANCE TECHNICIAN

Instructional Goal Know the legal and ethical responsibilities in the maintenance of aircraft. Know the classification of aircraft repairs.

Defined Outcome The student will interpret the appropriate FAR's in explaining the legal and ethical responsibilities of the technician. FAR's to include Part 65 and the applicable provisions of Parts 43 and 91.

Instructional Goal Know the classification of aircraft repairs.

Defined Outcomes The student will interpret regulations governing repairs and alterations.

Instructional Goal Know the function and operation of repair stations.

Defined Outcome The student will interpret regulations governing repair stations.

5.0 MAINTENANCE FORMS AND RECORDS

Instructional Goal Know the use and function of FAA forms. Know which maintenance documents are necessary for transfer of ownership. Know the use and function of pertinent maintenance records, inspections, recording forms and maintenance releases.

Defined Outcome The student will write descriptions of aircraft condition and work performed. The student will write a description of a major/minor repair and routine maintenance on appropriate FAA forms. The student will make maintenance record entries. The student will prepare and use inspection guides. The student will evaluate aircraft records for compliance with Federal Aviation's Regulations. The student will complete required maintenance forms, records, and inspection reports.

6.0 AIRCRAFT WEIGHT AND BALANCE

Instructional Goal Know weight and balance data as referred to in the manufacturers' data and FAA Aircraft Specifications/Type Certificate Data Sheets. Know the function of an aircraft conformity inspection and equipment list as it relates to the aircraft weight and balance data.

Defined Outcome The student will interpret weight and balance data from the manufacturer and the FAA. The student will refer to the manufacturers' required equipment lists and perform a conformity inspection.

Instructional Goal The student will know aircraft preparation, and procedures for weighing.

Defined Outcome The student will demonstrate preparation of aircraft for weighing and the weighing procedures.

Instructional Goal Know how to locate, interpret and apply weight and balance information. Solve weight and balance problems. Compute the effects of modifications and equipment changes.

Defined Outcome The student will locate, interpret and apply weight and balance information, solving weight and balance problems. The student will compute forward and aft loaded center of gravity problems and compute effect of equipment changes and loading schedules. The student will perform complete weight and balance check and record data.

7.0 GROUND OPERATION AND FUEL SERVICING

Instructional Goal Know aviation fuels identification and selection.