

280-5B4-EM FALL 2022 Avionics Department

COURSE PLAN

COURSE: Radio communication and navigation systems

PROGRAM: 280.D0 Avionics techniques

DISCIPLINE: 280 Aeronautics

WEIGHTING: Theory: 2 Practice: 2 Personal study: 2

Teacher(s)	Office	🕿 post	⊠ email
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PERIOD OF AVAILABILITY TO STUDENTS

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Morning	9				
Afternoo	n				

Department Coordinators	Office	🕿 post	⊠ email or website
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1. PLACE OF THE COURSE IN THE STUDENT'S EDUCATION

This course is in the fifth session of the curriculum.

No course is an absolute prerequisite for this course.

This course is part of a program approach. Several elements have therefore been previously acquired during the previous stages of the program, notably in the courses:

- 280-354-EM: Electrical Systems I
- 280-404-EM: Electrical Systems II

Students who do not meet these requirements may still take the course, but the Avionics Department considers that they may have more difficulty in passing it.

This course is not an absolute prerequisite for any other course. However, this course is part of a program approach. Many of the skills developed in this course will be reinvested in subsequent stages of the program, particularly in the course:

280-533-EM: Avionics Maintenance

This course outline should be kept by the student throughout their studies as it will be useful at the time of the integration activity.

Transport Canada: This course outline meets the Transport Canada requirements as outlined in the Training Control Manual (TCM). The department follows the Transport Canada standard of 5% absences from courses (theory and laboratory). The department compiles absences for students enrolled in the *Aircraft Maintenance Techniques* (280.C0) and *Avionics Techniques* (280.D0) programs according to Transport Canada requirements. The application of Transport Canada's policy on the control of absences is available on the *My Success at ÉNA* website under the heading "Privileges granted by Transport Canada".

In the event of a conflict between this syllabus and Standard 566 of the Canadian Aviation Regulations or the CFSM, the latter shall prevail.

2. COMPETENCY OF THE GRADUATE'S PORTRAIT

Perform maintenance on aircraft systems.

3. DEPARTMENTAL OBJECTIVE(S) (CODE AND STATEMENT)

0265	Verify the operation of communication, navigation and instrumentation systems.
	Provided the student has successfully completed courses from previous semesters,
	competency 0265 will be completed upon successful completion of this course.

4. FINAL COURSE OBJECTIVE

Upon completion of this course, the student will be able to verify the basic operation of avionics systems on aircraft.

5. LEARNING OBJECTIVES

- 1. Gathering information on the functioning of the systems.
- 2. Turn on the aircraft systems.
- 3. Check the status of the systems.
- 4. Compare the operation of the systems with the pre-set parameters.
- 5. Transmit information.

6. COURSE PLANNING

Theoretical part of the course sequence

		MODE OF OPERATION		RESOURCES AND
Course	Objectives	Contents	Learning activities	TECHNOLOGICAL TOOLS (URL link)
1	Introduction to avionics systems Explain the role and basic operation of systems: General principle of operation of aeronautical radio communication. Identify system components: Locate appropriate equipment.	Presentation of the course outline and sequence (0.5per) Introduction to airborne radio communication and radio navigation systems. (0.25per) Presentation of the avionics systems present in different aircraft and helicopter cockpits. (0,25per)	 Lectured presentations Interactive questions Examples of situations 	PowerPoint
2 - 3	Phenomena related to electromagnetic waves. Explain the role and basic operation of systems: • Electromagnetic waves and their properties • Phenomena related to electromagnetic waves	Propagation of electromagnetic waves	 Lectured presentations Interactive questions Examples of situations Demonstrations 	PowerPoint
4	Minitest 1	Minitest 1 - Avionic systems and electrom	nagnetic waves (15 mn)	Review all the material seen

		MODE OF OPERATION		RESOURCES AND
Course	Objectives	Contents	Learning activities	TECHNOLOGICAL TOOLS (URL link)
4 - 5	Antennas and their operating principles Identify the components of the systems: Recognize antennas and how they work. Identify oscillating circuits, oscillators and synthesizers.	 Principle of operation of the antennas. The power in RF. Definitions of Bel, decibel and dBm. Introduction to the basics of radio circuits (qualitative approach): Filters: high-pass, low-pass, band-pass, band-stop. The amplifier circuits. The oscillator circuits. The synthesizers. 	Lectured presentations Interactive questions Examples of situations Demonstrations	PowerPoint
6	Written Exam 1	Exam 1 - Avionics and electromagnetic v	vaves	Review all the material seen
7 - 8	Aeronautical radio communication. Explain the role and basic operation of systems: General principle of operation of aeronautical radio communication. General principle of operation of the intercommunication system	Block diagram of a transceiver. Modulation and types of modulation used in aeronautics The operating principle of a VHF-AM transceiver. Frequency band. Separation between channels. Examples of audio systems (audio consoles.)	 Lectured presentations Interactive questions Examples of situations Demonstrations 	PowerPoint
9	Logic doors and digital electronics. Explain the role and basic operation of systems: General operating principle of digital communication. Describe the interconnections of avionics systems	Basic principles of digital electronics (qualitative approach)	 Lectured presentations Interactive questions Examples of situations Demonstrations 	PowerPoint
10	Minitest 2	Minitest 2 - Aeronautical and digital radio	communication (15 mn)	Review aeronautical and digital radio communication
10 11 12	Aeronautical radionavigation. Explain the basic role and operation of systems: General principle of operation of aeronautical radionavigation.	Short Range Navigation Systems (elements): Satellite navigation system (GNSS) (elements) Identification and positioning systems (elements)	 Lectured presentations Interactive questions Examples of situations Demonstrations 	PowerPoint
13	Minitest 3	Minitest 3 - Aeronautical Radionavigation	(15 min)	Revise radio navigation

	MODE OF OPERATION			RESOURCES AND
Course	Objectives	Contents	Learning activities	TECHNOLOGICAL TOOLS (URL link)
13 14	Display. Explain the role and basic operation of systems: • Describe the different types and methods of display.	Electronic flight data display systems. (EFIS, HUDS, synthetic vision) EICAS systems. Flight Management System (FMS) interfaces. Radar altimeter GPWS, EGPWS, TAWS, RAAS. Weather radar. Lightning detection.	 Lectured presentations Interactive questions Examples of situations Demonstrations 	PowerPoint
15	Final exam	Final exam		Review all the material seen

Sequence of the practical part of the course

		MODE OF OPERATION		RESOURCES AND
Course	Objectives	Contents	Learning activities	TECHNOLOGICAL TOOLS (URL link)
1	Introduction to the course and reminder of health and safety measures. Perform basic technical operations including starting up aircraft systems Locate appropriate equipment. Identify appropriate execution procedures. Respect the instructions of execution.	In the laboratory: introduction to safety rules and working methods in the laboratory, in the hangars and on the runways. At the hangars (reminders): safety measures, GPU connection and electrostatics	 Lectured presentations Interactive questions Examples of situations Powering up a DC aircraft Powering up an AC aircraft 	PowerPointGPUsAircraftMaintenance manuals
2	Preparation for the Radiotelephone Operator's Restricted Certificate Exam. Explain the basic role and operation of systems: Explain the general principle of operation of aeronautical radio communication. Identify appropriate execution procedures. Respect the instructions of execution.	 Analysis of the difficulties encountered when studying the CIR21 document. Exercises of radio communication. Questionnaire. 	 Lectured presentations Interactive questions Examples of situations 	PowerPointCircular CR-21
3	Written exam radio license	Examination for the restricted aeronautic	al radiotelephone operator's certificate.	Review PowerPoint and CR- 21
4	Installation and removal of avionics devices. Perform basic technical operations including the installation and removal of avionics devices • Gathering information on the functioning of the systems. • Locate appropriate equipment. • Identify appropriate execution procedures. • Respect the instructions of execution	At the hangars. Learn the techniques of removal and installation of avionics (Allen key, chassis, DZUS).	Lectured presentations Interactive questions Examples of situations Aircraft experiments Installation and removal of Allen key system Installation and removal of DZUS fastening system	 PowerPoint Aircraft Maintenance manuals Working cards

		MODE OF OPERATION		RESOURCES AND
Course	Objectives	Contents	Learning activities	TECHNOLOGICAL TOOLS (URL link)
5	Perform basic technical operations including the installation and removal of avionics devices Gathering information on the functioning of the systems. Locate appropriate equipment. Identify appropriate execution procedures. Respect the instructions of execution	Laboratory: Hazardous Product Knowledge Check (HPC). Learn antenna installation techniques and how to make the seal using PRC.	 Interactive questions Examples of situations Demonstrations Workshop experiments Installation of antennas (on a metal plate or aircraft fuselage). 	Maintenance manuals WHMIS Material Safety Data Sheets
6	Introduction to the diagnostic system and electronic circuit breakers Perform basic technical operations including circuit breaker and diagnostic system checks: Turn on the aircraft systems Locate appropriate equipment. Identify appropriate execution procedures. Respect the instructions of execution.	OMS- Fault - CB - CS100 Demo	 Interactive questions Examples of situations Demonstrations Aircraft experiments Laboratory report 	Aircraft Maintenance manuals
7	Antennas and standing wave rates Perform basic technical operations including checking standing wave rates: Turn on the systems Locate appropriate equipment. Identify appropriate execution procedures. Respect the instructions of execution	Laboratory: Size of an antenna as a function of frequency. Impedance matching. Verification of the VSWR in different situations. Handling of the ICS system	 Interactive questions Examples of situations Demonstrations Workshop experiments Laboratory report 	ModelsMaintenance manuals
8	General principle of operation of the intercommunication system. Perform basic technical operations including testing of intercom and PA systems: Turn on the systems Locate appropriate equipment. Identify appropriate execution procedures. Respect the instructions of execution	At the hangars: Operation and verification of intercom and PA systems.	 Interactive questions Examples of situations Demonstrations Aircraft experiments Laboratory report 	Aircraft Maintenance manuals
9	Types and methods of display. Perform basic technical operations including EFIS verification: Turn on the systems Locate appropriate equipment. Identify appropriate execution procedures. Respect the instructions of execution	EFIS Demo - CS-100	 Interactive questions Examples of situations Demonstrations Aircraft experiments Laboratory report 	Aircraft Maintenance manuals

		MODE OF OPERATION		RESOURCES AND
Course	Objectives	Contents	Learning activities	TECHNOLOGICAL TOOLS (URL link)
10	Introduction to digital systems Explain the role and basic operation of digital systems: Turn on the systems. Identify appropriate components. Identify appropriate execution procedures. Respect the instructions of execution.	Design a landing gear warning system, using the instructional material,	 Interactive questions Examples of situations Demonstrations Workshop experiments Laboratory report 	Didactic booklets
11 12	Introduction to avionics systems and antennas Identify system components: Locate appropriate equipment.	At the hangars: identification of antennas and avionics systems	 Interactive questions Examples of situations Demonstrations Aircraft experiments Laboratory report 	Aircraft Maintenance manuals
13 14 15	Troubleshoot communication and radionavigation systems Perform basic technical operations Proper use of equipment; Compliance with testing procedures; Appropriate use of avionics equipment; Accuracy of the base data readings taken Compliance with health and safety regulations; Cleanliness of the work area.	In rotation over 3 weeks: Activity1: Verify the location of ELT beacons on various aircraft and helicopters. Opening of a work card in order to perform a functional test. Perform a functional test (under the supervision of the teacher). Final drafting of the working map. Test of VHF-COM systems and audio console. Practical tests performed with a hand-held transceiver (restricted radiotelephone operator's certificate required to perform the tests). Activity 2: Test of systems, VOR, ILS, CDI, HSI and audio console. Student use of the TIC T30D portable testers. Activity Three: Test of the transponder systems (modes A and C) and DME. Use of TR220 portable testers by students.	 Interactive questions Examples of situations Demonstrations Aircraft experiments Laboratory report 	Aircraft Maintenance manuals Work card

CALENDAR OF ROTATING LABS

Week	Lab # 1/3	Lab # 2/3	Lab # 3/3
13	Team 1	Team 2	Team 3
14	Team 3	Team 1	Team 2
15	Team 2	Team 3	Team 1

7. SUMMATIVE EVALUATION PROCEDURES

Course of the theoretical part of the course

Deadline (date)	Description of the evaluation activity	Context of realization and mode of evaluation	Learning objective(s)	Evaluation criteria	Weight (%)
Week 4	Mini test 1. (15 minutes max)	✓ Questionnaire provided in class at the time of the exam. ✓ Multiple choice or essay questions dealing with situational situations. ✓ No documentation ✓ Individual	1	Accuracy of component identification Appropriate interpretation of the operation Clear explanation of operating principles Fair assessment of symptoms Precise identification of	4
Week 6	Exam 1 (1 hour)	✓ Questionnaire provided in class at the time of the exam. ✓ Multiple choice or essay questions dealing with situational situations. ✓ No documentation ✓ Individual	1	breakage opportunities Conformity of technical operations when taking measurements Clarity of information registration	18
Week 10	Mini test 2. (15 minutes max)	✓ Questionnaire provided in class at the time of the exam. ✓ Multiple choice or essay questions dealing with situational situations. ✓ No documentation ✓ Individual	1		4
Week 13	Mini test 3. (15 minutes max)	✓ Questionnaire provided in class at the time of the exam. ✓ Multiple choice or essay questions dealing with situational situations. ✓ No documentation ✓ Individual	1		4
Week 15	Exam 2 (2 hours)	Questionnaire provided in class at the time of the exam. Multiple choice or essay questions dealing with situational situations. No documentation Individual	1		30

Subtotal: 60%.

Conduct of the practical part of the course

Deadline (date)	Description of the evaluation activity	Context of realization and mode of evaluation	Learning objective(s)	Evaluation criteria	Weight (%)
Week 3	Written exam Radiotelephone Operator's License Examination, Aeronautical Category	✓ Questionnaire provided in class at the time of the exam. ✓ Multiple choice questions dealing with situational scenarios. ✓ No documentation ✓ Individual	1	- Accuracy of responses	5
Week 4	Evaluation activity Removal and installation of radios, recording their types, models, locations and serial numbers.	✓ Individual report. ✓ Work card	1, 2, 3	 Accuracy of component identification Compliance of technical verification operations Appropriate interpretation of the operation Clarity of information registration 	5
Week 7	Evaluation activity ROS - Audio Console - ICS	✓ Individual report.	1, 2, 3, 4, 5	 Appropriate use of technical information Compliance of technical verification operations Sound planning Compliance of technical operations Clarity of information registration 	5
Week 8	Evaluation activity Intercom - PA	✓ Individual report.	1, 2, 3, 4, 5	 Appropriate use of technical information Compliance of technical verification operations Sound planning Compliance of technical operations Clarity of information registration 	5
Weeks 13 - 15	Evaluation activity Identify the locations of ELT beacons on different types of aircraft and perform a test of one of them (Part 1, 1/3).	 ✓ Assessment of ELT knowledge (3 question quiz). ✓ Individual report. ✓ Work card; 	1, 2, 3, 4, 5	 Appropriate use of technical information Compliance of technical verification operations Sound planning Compliance of technical operations Clarity of information registration 	3
Weeks 13 - 15	Evaluation activity Verification of radiocommunication systems (part 2, 1/3).	✓ Team report	1, 2, 3, 4, 5	 Appropriate use of technical information Compliance of technical verification operations Sound planning Compliance of technical operations Clarity of information registration 	3
Weeks 13 - 15	Evaluation activity Verification of radio navigation systems (2/3).	✓ Team report	1, 2, 3, 4, 5	Appropriate use of technical information Compliance of technical verification operations Sound planning Compliance of technical operations Clarity of information registration	7

Weeks 13 - 15	Evaluation activity Verification of radio navigation and pulse identification systems (3/3).	✓ Team report	1, 2, 3, 4, 5	Appropriate use of technical information Compliance of technical verification operations Sound planning Compliance of technical operations Clarity of information registration	7
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Subtotal: 40% TOTAL: **100% OF THE TOTAL**

Extracurricular activities of an aeronautical nature.

In order to increase their knowledge of the aviation environment, the Avionics Department strongly advises students to actively participate in the development of and take part in any extracurricular activities of an aeronautical nature such as visits (industries, operators, airports, air traffic management, military bases, museums, theme parks, etc.), conferences or events organized both within and outside the National School of Aerotechnics.

8. MANDATORY EQUIPMENT REQUIRED

Safety clothing and equipment in accordance with NEST standards.

9. BIBLIOGRAPHY

Canadian Aviation Regulations: available on the Transport Canada website (http://www.tc.gc.ca/aviationcivile/ServReg/Affaires/RAC/menu.htm).

10. CONDITIONS FOR SUCCESS IN THE COURSE

(1) Note of passage

The passing grade for a course is 60% (PIEA, section 5.1m).

(2) Attendance at summative evaluations

Attendance at summative evaluation activities is mandatory (IEP, section 5.2.5.1).

(3) Delivery of the work

Work required by a professor must be submitted on the date, place, and time specified. Penalties for tardiness are established according to departmental rules (PIEA, section 5.2.5.2).

Penalties for late work are: Unless agreed upon with the instructor, late work is penalized at a rate of 10% per day late, and a grade of zero will be assigned to the work beginning on the sixth day late. Work required by week 15 may not be turned in late.

See the "Departmental Rules" section at: https://mareussite.cegepmontpetit.ca/ena/mon-parcours/mon-programme/regles-departementales/

(4) Material presentation of the work

The student must respect the "Normes de présentation matérielle des travaux écrits" adopted by the Cégep. These standards are available at http://rmsh.cegepmontpetit.ca/normes-de-presentation-materielle-des-travaux-ecrits-du-cegep/.

<u>Penalties for failure to meet standards are</u>: When an assignment turned in is deemed unacceptable due to presentation, grading of that assignment will be delayed until the assignment is turned in within the standards set by the instructor. In this case, the penalties for late submission of work will apply.

See the "Departmental Rules" section at: https://mareussite.cegepmontpetit.ca/ena/mon-parcours/mon-programme/regles-departementales/

(5) Quality of the French language

The assessment of language quality (PIEA, section 5.3.1) must meet the criteria and values established by the department. The departmental procedure for evaluating the quality of French is: https://mareussite.cegepmontpetit.ca/ena/mon-parcours/mon-programme/regles-departementales/

11. HOW TO PARTICIPATE IN THE COURSE

Laboratory Safety and Use of Premises:

Student occupancy of laboratory space and use of laboratory equipment must be under the supervision of a professor or technician, unless otherwise specified.

Any student whose behavior in the lab presents a risk to others present will, after warning by the instructor, be excluded from the lab until the case is reviewed by the instructor and the Avionics Department Coordinator.

Safety glasses and shoes must be worn by all (faculty and students) for all lab sessions, whether the session is in the workshop, the hangars, or one of the school's technical libraries.

Students are encouraged to consult the website for rules specific to this course: https://mareussite.cegepmontpetit.ca/ena/mon-parcours/mon-programme/regles-departementales/

As stated in Section 5.3.4 of the PIEA, attendance is evidence of the student's commitment to his/her studies. The instructor must record absences in the electronic absence management system or on a logbook for the student to review.

12. INSTITUTIONAL POLICIES AND RULES

All students enrolled at the École nationale d'aérotechnique of Cégep Édouard-Montpetit must be aware of the content of certain institutional policies and regulations and comply with them. These include the Institutional Policy on the Evaluation of Learning (PIEA), the Institutional Policy on the French Language (PILF), the Policy for a Harassment and Violence-Free Learning and Working Environment (PPMÉTEHV), the Conditions of Admission and Academic Progress, and the Procedure for Handling Student Complaints in the Context of Educational Relations.

The full text of these policies and regulations is available on the College's website at http://www.cegepmontpetit.ca/ena/a-propos-de-l-ecole/reglements-et-politiques. In the event of a discrepancy between the texts appearing elsewhere and the full text, the latter is the only legal and applied version.

APPENDIX

None.