



COURSE OUTLINE

COURSE: **Avionics Maintenance**

PROGRAM: 280.C0 Aircraft Maintenance Technology

DISCIPLINE: 280 Aeronautics

WEIGHTING: Theory: 0 Practical Work: 3 Personal Study : 1

Teacher(s)	Office	☎ Extension	✉ email
Rădulescu, Andrei	A-187	4648	andrei.radulescu@cegepmontpetit.ca

OFFICE HOURS

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Morning					
Afternoon					

Coordinator(s)	Office	☎ Extension	✉ Email or Website
Brodeur-Séguin, Judith	A-192	4103	j.segin-brodeur@cegepmontpetit.ca
Laurin, Nicholas	A-192	4665	Nicholas.laurin@college-em.qc.ca

CONTEXT OF THIS COURSE IN THE PROGRAM

This course is offered in the sixth term of the program. It is assumed that students who enrol in the course have passed the courses in their preceding sessions, in particular: 280-3D4 DC Avionics, 280-4A4 AC Avionics and 280-5B4 Radio Systems. Students who do not meet these conditions may still enrol in the course, the Avionics Department believes that these students will find it more difficult to pass the course.

In addition, students must have obtained a Restricted Radiotelephone Certificate prior to enrolling in this course in order to be able to test onboard radio equipment. Students who do not have the RRC radio license cannot perform certain laboratory activities that will result in a penalty in the evaluation.

By the end of this course, students will have developed:

- The ability to perform installation and repair work on aircraft with AC and DC electrical generation and distribution systems
- The ability to diagnose and repair basic problems involved in aircraft with AC and DC electrical generation and distribution systems.

Students must keep this course outline for the duration of their studies as it will be useful for the comprehensive assessment at the end of the program.

Transports Canada: This course outline meets the requirements of Training Organisation Certification Manual (MCF) of Transport Canada. The Department applies Transport Canada standard which allows a maximum absence of 5% for the course (theory and laboratory). The department compiles absences of all students enrolled in Aircraft Maintenance (280.03) and Avionics (280.04) according to Transport Canada requirements. The application of Transport Canada policies regarding absences is available on the college website and in the student agenda under the heading « Privilèges accordés par Transports Canada ».

COMPETENCIES OF THE EXIT PROFILE (STUDENT SKILL PROFILES)

Student will be able to perform repairs, maintenance and troubleshooting on electrical systems on aircraft.

MINISTRY OBJECTIVE(S) AND COMPETENCIES

025T To maintain direct-current circuits on an aircraft.

(training duration: 100 course periods)

Distribution of the 025T competence in the program:

3 rd session	280-3D4-EM: DC Avionics	55 periods out of 100
4 th session	280-4A4-EM: AC Avionics	30 periods out of 100
▶ 6 th session	280-6A3-EM: Avionics Maintenance	15 periods out of 100
Total:		100 periods

0263 To check the operation of simple alternating-current currents on an aircraft.

(training duration: 70 course periods)

Distribution of the 0263 competence in the program:

3 rd session	280-3D4-EM: DC Avionics	5 periods out of 70
4 th session	280-4A4-EM: AC Avionics	30 periods out of 70
4 th session	280-605-EM: Aircraft Instrumentation	5 periods out of 70
▶ 6 th session	280-6A3-EM: Avionics Maintenance	30 periods out of 70
Total:		70 periods

This course outline is the translation of "Plan de cours – 280-533-EM – Maintenance avionique". In case of any contradictions, the French version, which is the original, prevails.

TERMINAL OBJECTIVE OF THE COURSE (FINAL COURSE OBJECTIVE)

Maintain DC circuits on aircraft and verify simple AC circuits on aircraft.

TEACHING AND LEARNING STRATEGIES

The acquisition of the material, which is spread out over 15 laboratory sessions, will be facilitated by a series of exercises to better reflect the real conditions of a manufacturer operating in accordance with CAR561 and an approved maintenance organization operating in accordance with CAR 573. The various exercises are designed to incorporate the concepts of a quality assurance system that meets the criteria of the regulations mentioned above.

Particular emphasis will be placed on techniques to implement to avoid the 12 human factors usually found in aircraft maintenance.

At all times students will be required to pay attention to health and safety measures at work in order to acquire the reflexes needed to avoid accidents as much as possible.

COURSE PLAN

025T To maintain direct-current circuits on an aircraft.

Element of the Ministry Objective	Learning Objectives	Transport Canada Reference
4. Diagnose and correct defects	1. Collect data for circuits and systems	22.3.11. 22.3.32. 22.3.43.
	2. Perform tune-up according to the inspection	
	3. Perform systems tests	
	4. Analyze the data collected	22.3.27
	5. Correct defects while respecting safety procedures	22.3.15 22.3.40
	6. Write a report	
6. Repair and replace wires and terminals.	1. Select tools, equipment and required accessories in compliance with standards, procedures and specifications.	
	2. Determine the sequence of operation.	
	3. Perform crimping operations	22.3.33. 22.3.39.
	4. Carry out final assembly	
	5. Check work	
	6. Store equipment and clean up	
	7. Record information	

0263 To verify simple alternating-current circuits on an aircraft.

Element of the Ministry Objective	Learning Objectives	Transport Canada Reference
3. Check the AC electrical generation and distribution on an aircraft.	1. Check the AC generation system of an aircraft whose primary generation is continuous.	22.3.9 22.3.27 22.3.41 22.3.42 22.3.45
	2. Check the AC distribution system on an aircraft whose primary generation is DC and whose secondary generation is AC.	22.3.9 22.3.27 22.3.41 22.3.42 22.3.45
	3. Check the AC distribution system on an aircraft with AC primary generation and DC secondary generation	22.3.9 22.3.27 22.3.41 22.3.42 22.3.45
	4. Diagnose defects (snags) in the AC generation and distribution system on an aircraft with DC primary generation: - Piston single-engine - Piston twin-engine - Turbine single-engine - Turbine twin-engine	22.3.34 22.3.45
	5. Diagnose defects (snags) in the electrical generation and distribution system on an aircraft with AC primary generation: - Generation System: 115 Volts, 400 Hertz and 26 Volts 400 Hertz without putting alternators in parallel - Generation system: 115 Volts, 400 Hertz and 26 Volts 400 Hertz with putting alternators in parallel - Variable frequency AC power system	22.3.34 22.3.45
	6. Test auxiliary power systems.	

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Element of the Ministry Objective	Learning Objectives	Transport Canada Reference
	7. Test emergency power system	
4. Perform maintenance on an electric engine.	1. Follow the usual inspection procedures.	
	2. Follow overhaul procedures.	
5. Diagnose and correct defects.	1. Collect data on circuits and systems.	22.3.11 22.3.32 22.3.43
	2. Perform verification tune-up	
	3. Test systems	
	4. Analyze collected data	22.3.27
	5. Correct defects	22.3.15 22.3.40
	6. Write a report	22.3.15 22.3.40
7. Replace modular units	1. Plan the work	22.3.27 22.5.36
	2. Perform installation activities	
	3. Check installation for compliance	
	4. Perform operation tests	
	5. Analyze collected data	
	6. Record information in work orders	

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Term Calendar

Periods		Content	Personal Study	Objectives
Week 1	3	Introduction to the course <ul style="list-style-type: none"> • Presentation of the Course Outline • Review of health and safety measures in the laboratories and hangars • Review of the 12 human factors involved in aircraft maintenance • Use of the manufacturer's manuals • Preparing work cards • Review of plugging in AC and DC Ground Power Units on aircraft • Introduction to different crimping methods and electrical harness manufacturing • 		025T : 4.1., 6.6. 0263 : 5.3.
(Weeks 2, 3, 4 and 5	12	Perform and inspect crimping and harnessing <ul style="list-style-type: none"> • Description, identification and use of tools for marking wires, stripping and crimping • Using documentation provided by the tool and connector manufacturers • Checking tool calibration • Wire identification marking to comply with applicable standards • Creating a harness with connectors and terminals following an installation document. • Creating a shielded wire using thermal sleeves • Attaching the harness wires by lacing techniques with waxed cord and plastic tie-wraps • Inspecting connector and harness wire crimping • Explanation of the contact problems encountered • Installing harness in a structure and using appropriate fasteners • Final inspection of the harness on the structure • 	Occupational Health and Safety (OHS) Rules Review of Manufacturer's Process AC.43-13.	025T : 6.1., 6.2., 6.3., 6.4., 6.5, 6.6., 6.7.
		Create an antenna cable. <ul style="list-style-type: none"> • Identifying appropriate coaxial cable • Identifying coaxial connectors • Identifying required tools • Creating a coaxial cable with BNC connectors • Inspecting created cable and checking electrical compliance • 	OHS Rules Theory review of antennas and radio frequency AC.43-13.	025T : 6.1., 6.2., 6.3., 6.5., 6.6.

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Periods		Content	Personal Study	Objectives
Week 6	3	Verify the AC secondary electrical generation of an aircraft with Dc primary electrical system <ul style="list-style-type: none"> • find appropriate procedure in the manufacturer's technical manuals • Perform the operational check following the maintenance manual procedures • Review of troubleshooting techniques • Fill-in a work card 	OHS Rules. Review methods to fill out work cards. Use of manufacturer's technical documentation. ATA100 System. AC.43-13.	0263 : 3.1., 3.2.,-3.4.
Weeks 7 to 12 will be done in rotation and in groups of two.				
Weeks 7 to 12	3	Operational check-up of fire-detection system <i>(Laboratory #7 in rotation)</i> <ul style="list-style-type: none"> • Open a work card on failure of the radio communication systems on an aircraft. • Find the involved circuit(s) in the technical documentation. • Perform the operational check-up following the maintenance manual procedures • Open the access panels to allow access to the system components, as needed; write new work card and log book entry for opening access panels. • Close work cards related to the work that was performed. 	OHS Rules. Review methods to fill out work cards. Use of manufacturer's technical documentation. ATA100 System. AC.43-13.	025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6.
Weeks 7 to 12	3	Repair and/or install wires, terminals, connectors and ground contacts on an aircraft. <i>(Laboratory #8 in rotation)</i> <ul style="list-style-type: none"> • Identify work to be carried out. • Open a work card (NRWC-Non Routine Work Card). • Determine a work sequence. • Find appropriate technical documentation. • Perform tasks. • Visually inspect the installation or repair. • Operational Check of the installed or repaired circuits. • Close the work card. 	OHS Rules. Use manufacturer's technical documentation. ATA100 system AC.43-13.	025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6., 6.1., 6.2., 6.5., 6.6., 6.7.

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Periods		Content	Personal Study	Objectives
Weeks 7 to 12	3	<p>Troubleshoot DC electrical power generation and distribution systems (<i>Laboratory #9 in rotation</i>)</p> <ul style="list-style-type: none"> • Open a work card (NRWC) on failure of the DC electrical power generation and distribution system on an aircraft. • Find the circuit(s) involved in the technical documentation. • Locate the involved components and circuits on the aircraft. • Develop a strategy for measuring and troubleshooting. • Open the access panels or allow access to the involved components, as needed ; write new work card and log book entry for opening access panels. • Conduct tests and take measures leading to resolving the problem(s). • Identify the cause of the identified problem(s). • Check affected circuit(s) with operating tests which may include a run-up. • Close work cards related to the work that was performed. • 	<p>OHS Rules. Review methods to fill out work cards. Use of manufacturer's technical documentation. ATA100 System. AC.43-13.</p>	<p>025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6.</p>
	3	<p>Perform maintenance on a DC starter-generator (<i>Laboratory #10 in rotation</i>)</p> <ul style="list-style-type: none"> • Find maintenance procedure in the supplier's documents (CMM-<i>Component Maintenance Manual</i>). • Fill out work card. • Conduct inspection and maintenance following manufacturer's specifications. • Complete the work card and an authorized release certificate « Form One ». 	<p>OHS Rules. Use of manufacturer's technical documentation. ATA100 System.</p>	<p>0263 : 4.1, 4.2.</p>

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Periods		Content	Personal Study	Objectives
Weeks 7 to 12	3	<p>Troubleshoot AC secondary electrical power generation and distribution systems (Laboratory #11 in rotation)</p> <ul style="list-style-type: none"> • Open a work card on failure of the AC electrical generation and distribution system on an aircraft that has primary DC power. • Find the involved circuit(s) in the technical documentation. • Locate affected components and circuits on the aircraft. • Develop a strategy for measuring and troubleshooting. • Open the access panels or allow access to the affected components, as needed; write new work card and log book entry for opening access panels. • Conduct tests and measures leading to resolving the problem(s). • Identify the cause of the identified problems. • Check affected circuit(s) with operating tests which may include a run-up. • Close work cards related to the work that was performed. 	<p>OHS Rules. Review methods to fill out work cards. Use of manufacturer's technical documentation. ATA100 System AC.43-13</p>	<p>0263 : 3.1, 3.2, 3.4, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6</p>
Weeks 7 to 12	3	<p>Radio systems troubleshooting on a DC electrical system aircraft Replace modular units. (Laboratory #12 in rotation)</p> <ul style="list-style-type: none"> • Open a work card to replace one or several LRU (Line Replacement Units) on board an aircraft. • Identify the location of the LRU(s) to replace on board an aircraft. • Replace the LRU(s) according to the appropriate manuals. • Perform operating test of the replaced LRU(s). • Close the work card. • Complete the appropriate label on the device or devices removed from the aircraft. • 	<p>OHS Rules. Review the study guide for the Restricted Raditelephone Operator's Certificate. Review of avionics systems and their location in the aircraft.</p>	<p>025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6. 0263 : 7.1., 7.2., 7.3., 7.4., 7.5., 7.6.</p>
Weeks 13	6	<p>Run-up and regulators adjustment.</p> <ul style="list-style-type: none"> • Perform GCU adjustment on King Air. • Documents research for Piper Aztec and Cessna 337 • Work will be done in teams of two 	<p>Questionnaire on check-up procedures Evaluation of applying the procedures</p>	<p>025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6. 0263 : 3.5., 5.1., 5.2., 5.3., 5.4., 5.5., 5.6.</p>

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Periods		Content	Personal Study	Objectives
Weeks 14		<p>Modification of the harness using a Service Bulletin</p> <ul style="list-style-type: none"> • Modify the harness realised during weeks 2 to 5 using information from the SB. • Retrieve and apply the norms and standards defined by the technical documentation. • Retrieve and use appropriate tools. <p>Individual evaluation.</p>	<p>Revise the manufacturing procedures.</p> <p>AC 21-99 (CASA).</p> <p>AC.43-13 (FAA).</p> <p>AWB 02-9 (CASA).</p>	<p>025T : 6.1., 6.2., 6.3., 6.4., 6.5, 6.6., 6.7.</p>
Week 15	3	<p>Theoretical Exam on avionics practices in the industry.</p> <ul style="list-style-type: none"> • Avionics tools and their use knowledge. • Avionics components and their use knowledge • Avionics tasks in the industry. • Being able to put a diagnostic on the state of avionics systems <p>DURATION: 75 minutes per student</p>		<p>025T : all</p> <p>0263 : all</p>

ROTATION SCHEDULE (Weeks 7 to 12)

Week	Team 1	Team 2	Team 3	Team 4	Team 5	Team 6
7	Lab 7	Lab 8	Lab 9	Lab 10	Lab 11	Lab 12
8	Lab 12	Lab 7	Lab 8	Lab 9	Lab 10	Lab 11
9	Lab 11	Lab 12	Lab 7	Lab 8	Lab 9	Lab 10
10	Lab 10	Lab 11	Lab 12	Lab 7	Lab 8	Lab 9
11	Lab 9	Lab 10	Lab 11	Lab 12	Lab 7	Lab 8
12	Lab 8	Lab 9	Lab 10	Lab 11	Lab 12	Lab 7

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SYNTHESIS OF SUMMATIVE EVALUATION METHODS

Description of Evaluation Activity	Context	Learning Objective(s)	Evaluation Criteria	Due Date (date assignment is due or exam given)	Weighting (%)	
Precautions to take with AC and DC ground connections	Report / Individual questionnaire	025T:4.1., 6.6. 0263 :5.3.	<ul style="list-style-type: none"> Correct follow-up of work procedures Proper use of measuring instruments Correct interpretation of measured values Correctness and clarity of answers Follow-up end-of-work procedures 	Laboratory 1	2	
Carrying out and inspecting crimping and harnessing	Individual evaluation of the work performed: <ul style="list-style-type: none"> Identifying and respecting wire dimensions Crimping Thermal sleeves Installing harness Attitude/OHS. 	025T: 6.1., 6.2., 6.3., 6.4.,6.5, 6.6., 6.7.		Laboratory 2 to 5	20	
AC secondary generation distribution and the emergency power system	Individual evaluation of work performed	0263 : 3.1., 3.2., 3.4.		Laboratory 6	5	
Fire-detection system check-up	Work performed in teams. Reports written individually Individual evaluations for radio communication.	025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6.		Laboratory 7 (in rotation)	5	
Repairing and/or installing grounding on an aircraft	Evaluation of troubleshooting in teams	025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6., 6.1., 6.2., 6.5., 6.6., 6.7.		Laboratory 8 (in rotation)	5	
Troubleshooting DC electric generation and distribution systems	Evaluation of troubleshooting in teams	025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6.		Laboratory 9 (in rotation)	5	
Maintenance of a starter-generator	Individual evaluation of work performed	0263 : 4.1, 4.2.		Laboratory 10 (in rotation)	5	
Troubleshooting AC electric generation and distribution systems	Evaluation of performed tasks in teams	0263 : 3.1, 3.2, 3.4, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6		Laboratory 11 (in rotation)	5	
Radio systems troubleshooting Replacing modular units	Evaluation of troubleshooting in teams	025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6.		Laboratory 12 (in rotation)	5	
Run-up and regulators adjustment	Individual evaluation – report and work	0263 : 3.1, 3.2, 3.6., 3.7		Week 13	5	
Modification of the harness using a Service Bulletin	Individual evaluation	025T : 6.1., 6.2., 6.3., 6.4., 6.5, 6.6., 6.7.		Week 14	13	
Theoretical exam on avionics practices	Individual written evaluation of work performed (exam)	025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6. 0263 : 3.5., 5.1., 5.2., 5.3., 5.4., 5.5., 5.6.		<ul style="list-style-type: none"> Correctness of answers For troubleshooting questions: <ul style="list-style-type: none"> Correct interpretation of measured values Correctness of diagnostic 	Week 15	25
				TOTAL:	100	

All reports are due at the end of the concerned workshop.

If a student is absent for an activity or a part of an activity, he or she will receive the mark of zero for the report that corresponds to this activity or part of the activity during which he or she was absent. If the absence is for a serious and documented reason, the student will not be penalized.

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Deadlines:

All work, work documents and reports will be handed in at the end of each session or group of sessions or will be subject to pre-determined penalties.

REQUIRED MATERIAL

- Work clothes and accessories required by the college to work in the hangar (safety shoes, safety glasses)
- Workshop documents and presentations (available on LEA)
- Manufacturers documents (manuals and catalogues)

Students who do not have these three elements will be denied access to the hangar or laboratory will not be able to participate in the class and will receive a mark of zero without the opportunity to make it up. The College provides all other equipment required for the course.

MEDIAGRAPHY

Mandatory Documents

Course notes, workbook and lab book as well as other complementary computer documents that are available on an internet or intranet support.

Reference manuals

EISMIN, THOMAS K. – Aircraft Electricity & Electronics, Sixth Edition, Glencoe, 2014.

This list is not exhaustive

REQUIREMENTS TO PASS THE COURSE

(1) Passing Mark

The passing mark for this course is 60% (PIEA, article 5.1m).

(2) Course Attendance for Summative Evaluations

Attendance at summative evaluation activities is mandatory. (PIEA, article 5.2.5.1).

(3) Submitting Assignments

Homework required by the teacher must be handed in at the established date, place and time. The penalties associated with delays are established according to departmental rules (PIEA, article 5.2.5.2). In case of delay the penalties are:

- See section « Règles des départements » at the following website
link: <http://guideena.cegepmontpetit.ca/regles-des-departements/>

(4) Presentation of Written Work

Students must follow the standards adopted by the College for written work (*Normes de présentation matérielle des travaux écrits*). These can be found in the documentation centre on the College web site (<http://www.cegepmontpetit.ca/normes.>) under the heading « **Méthodologie** ».

The **departmental penalties** for non-compliance with Written Work Standard Presentation (PIEA, article 5.3.2) are:

- See section « Règles des départements » at the following
link: <http://guideena.cegepmontpetit.ca/regles-des-departements/>

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(5) Quality of the English language

The Teacher expects the use of proper English terminology. The formative evaluation also relates to the quality of oral and written English. If need be, the teacher will recommend that students register for an English course.

When a given homework is considered to be unacceptable because of the quality of written English, the correction of this work will be delayed until the work is returned in the standards set by the teacher. In this case, penalties apply to any delay in submitting homework assignments. The teacher may allocate 10% of the mark for any assignment to the quality of oral or written English.

EXPECTATIONS OF CLASS PARTICIPATION

Laboratory safety and use of the premises:

Students must be under the supervision of a teacher or a technician whenever they are in the laboratory or using the equipment, unless otherwise indicated.

Any student whose conduct in the laboratory poses a risk to others will receive a warning from the teacher and then be excluded from the laboratory until the case can be reviewed by the teacher and the coordinator of the Avionics Department.

OTHER DEPARTMENTAL REGULATIONS

Students are encouraged to consult the website for the specific regulations for this course:

<http://guideena.cegepmontpetit.ca/regles-des-departements/>.

INSTITUTIONAL POLICIES AND REGULATIONS

All students enrolled in the École nationale d'aérotechnique of Édouard-Montpetit CEGEP must be aware of and comply with the contents of institutional policies and regulations. In particular, the *Politique institutionnelle de la langue française (PILF)*, the *Politique pour un milieu d'études et de travail exempt de harcèlement et de violence (PPMÉTEHV)*, the *conditions of admission and academic progress*, the *procedure dealing with student complaints within educational relations*.

The complete version of these policies and regulations is available on the CEGEP website at the following address: <http://www.cegepmontpetit.ca/ena/a-propos-de-l-ecole/reglements-et-politiques>. In case of discrepancy between the version appearing elsewhere and the complete version, the complete version will be applied and will be considered the official version for legal purposes.

APPENDIX

None.