

Course outline

COURSE : **Helicopter**

PROGRAM : 280.C0 Aircraft Maintenance

DISCIPLINE : 280 Aeronautics

WEIGHTING : Theory :2 Practice :2 Personal Study :2

Teacher(s)	Office	☎ extension	✉ e-mail ou website
José Marcoux	C-183	4407	jose.marcoux@ena.ca

Office hours

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Morning					
Afternoon					
Other					

Coordinator(s)	Office	☎ extension	✉ e-mail
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1 CONTEXT OF THIS COURSE WITHIN THE PROGRAM

- This course is offered during the program's fourth semester
- The basic knowledge students acquire in this course is essential for any future work regarding helicopters.
- It is also RECOMMENDED that students complete this course before signing up for an internship during the 5th or 6th semesters.
- 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.

Transport 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.C0) according to Transport Canada requirements. The application of Transport Canada policies regarding absences is available on the [Ma réussite à l'ÉNA](#) website under the heading « Privilèges accordés par Transports Canada ».

2 COMPETENCIES OF THE EXIT PROFILE (STUDENT SKILL PROFILES)

- To master scientific bases and aeronautic maintenance work technics.

3 MINISTERIAL OBJECTIVE(S) AND COMPETENCIES

- 0268 To apply principals of aerodynamics to flight and helicopter maintenance.

4 TERMINAL OBJECTIVE OF THE COURSE (FINAL COURSE OBJECTIVE)

- To establish links between the principals of aerodynamics and the various components of a helicopter.

5 TEACHING AND LEARNING STRATEGIES

- Theory: this course includes seven modules covering basic concepts in aeronautics, aerodynamics and helicopters. Formal lectures will be supported with examples, exercises, illustrations, animations and equipment. Student will complete their learning with their course notes.
- Practical Work: The practical part is divided into nine chapters that deal with nomenclature and various mechanical aspects specific to helicopters. For this part of the courses, simulation exercises, plenary session, demonstrations, identification exercises and handling will be used.

WEEK	OBJECTIVE	CONTENT	MODE OF INSTRUCTION AND LEARNING ACTIVITIES	DOCUMENTATIONS, RESOURCES, TECHNOLOGICAL TOOLS AND URL ADDRESS
		Flight controls.		
8	1	Transition Effect and solution of the lateral dissymmetry of lift (led and lag). Blade flapping effect (Coriolis effect). Solutions for horizontal bending moments.	Presentation and group research	Powerpoint and student book
9	1	Transition Main rotor types and arrangements. Balance of forces present Drag hinge location	Presentation and group research	Powerpoint and student book
10		Exam 2 (20%)	In school	
11	2	Autorotation Definition of autorotation Autorotative and anti-autorotative forces Change in angle of attack along a blade in autorotation Autorotation and anti-autorotation range Influence of the speed during horizontal flight on the autorotative zone Control of the rotor speed in autorotation Autorotation and blade inertia	Presentation and group research	Powerpoint and student book
12	2	Performances vs altitude Stall and compressibility Powers check.	Presentation and group research	Powerpoint and student book
13	1	Landing and history Main and tail rotor blade evolution Steps and pitfalls that pioneers in the development stages confronted regarding the principles of aeronautics for rotorcraft.	Presentation and group research	Powerpoint and student book
14	1	Main rotor and tail rotor blade evolution	Presentation and group research	Powerpoint and student book
15		Exam 3 (20%)	In school	Powerpoint and student book

Laboratory

WEEK	OBJECTIVE	CONTENT	<u>MODE OF INSTRUCTION</u> AND LEARNING ACTIVITIES	DOCUMENTATIONS, RESOURCES, TECHNOLOGICAL TOOLS AND URL ADDRESS
1	1	Teachers presentation, course and helicopters. Hangar visit Nomenclature	Presentation and group research	Powerpoint and student book
2	2	Flight controls Swashplate Collective and cyclic pitch change	Presentation and group research	Powerpoint and student book
3	2	Safety rules	Presentation and group research	Powerpoint and student book
4	2	Possible types of landing gears for helicopters Different structures and construction modes	Presentation and group research	Powerpoint and student book
5	2	Types of engines used Components made for engines so that they can operate on helicopters Engine power check exercise End of content for exam next week	Presentation and group research	Powerpoint and student book
6		Exam (10%)	In school	
7	2	Explanation of week 8 and 9 presentations Research begining	Presentation and group research	Powerpoint and student book
8	2	Presentations (10%)	Oral presentation	Powerpoint and student book
9	2	Presentations (10%)	Presentation and group research	Powerpoint and student book
10	2	Drivetrain Drive shafts Tail rotor drive shaft Sprag clutch and autorotation	In school	
11	3	Preflight Safety around running helicopter	Presentation and group research	Powerpoint and student book

WEEK	OBJECTIVE	CONTENT	<u>MODE OF INSTRUCTION</u> AND LEARNING ACTIVITIES	DOCUMENTATIONS, RESOURCES, TECHNOLOGICAL TOOLS AND URL ADDRESS
12	3	Static and dynamic balancing of a semi rigid rotor Blade alignments, balancing and tracking Teacher's demo	Presentation and group research	Powerpoint and student book
13	3	Static balancing of a semi rigid rotor Blade alignments, balancing and tracking in hangar	Presentation and group research	Powerpoint and student book
14	3	Dynamic balancing of a semi rigid rotor using simulators Equipment installation and manipulation. Procedure application, alignment and static balancing Introduction to rotor vibration analysis Vibration simulator.	Presentation and group research	Powerpoint and student book
15		Exam 3 (20%)	In school	Powerpoint and student book

7 SYNTHESIS OF SUMMATIVE EVALUATION METHODS

Description of Evaluation Activity	Context	Learning objective(s)	Evaluation Criteria ¹	Due Date (approximate date assignment due or exam given)	Weighting (%)
Written exam no. 1 covering start-up, take-off, transition and hover manoeuvres.	Alone, without class notes. Duration: 2 hours	<u>Theory</u> : 1 and 2 <u>Laboratory</u> : 1, 2 and 3	①	6th week of the course of theory.	<u>Theory</u> : 20% <u>Laboratory</u> : 10% Total : 30%
Written exam no. 2 relating to translation and cruise	Alone, without class notes. Duration: 2 hours	1		Week 10	<u>Theory</u> : 20%
Aerodynamic principles of a component in the flight of a helicopter.	20 minute oral presentation In teams of 2 (individual assessment) A topic assigned to each student.	Make connections between the principles of aerodynamics and the various components of a helicopter.	②	Week 8 and 9	<u>Laboratory</u> : 10%
Written exam no. 3 dealing with the aerodynamic principles of the main rotors, the static and dynamic balancing of the main rotors, the pre-flight of the helicopter and the landing.	Alone, without class notes. Duration: 2 hours	<u>Theory</u> : 1 and 2 <u>Laboratory</u> : 1, 2 and 3	①	15 th week of laboratory course	<u>Theory</u> : 20% <u>Laboratory</u> : 20% Total : 40%
				TOTAL	100 %
① Accurate characterization of physical and aerodynamic phenomena, accuracy of links established taking into account the problem, precise location of components					
② Accuracy of answers given following questions from other students, accurate distinction of influential factors, clear explanation of physical phenomena or aerodynamic principles, accuracy of component location.					

¹ Issus du programme d'études (critères de performance) et adaptés au niveau des étudiants (exigences évolutives) d'une session à l'autre. Les critères d'évaluation doivent être explicites et permettre l'observation des résultats (processus, produits, propos). Les critères d'évaluation seront présentés par écrit aux étudiants au moins une semaine avant l'activité d'évaluation sommative (article 5.1j PIEA)

8 REQUIRED MATERIAL

- None

9 MEDIAGRAPHY

LEFORT, Pierre et Hamann J. *L'hélicoptère: théorie et pratique*, Lyon, Chiron, 1983, 303 pages.
Réf. : 629.13335 L 494 h

RALETZ, Roger. *Théorie élémentaire de l'hélicoptère*, Suresne, Aérospatiale Hélicoptère, 1983, 73 pages.
Réf. : 629.13335 R 163 T

SCHAFER, Joseph. *Basic Helicopter Maintenance*, Basin Wyo., Aviation Maintenance, © 1980, 343 pages. Réf. : 629.1346 S 296 b

OR

SCHAFER, Joseph. *Helicopter Maintenance*, Jeppesen Sandersen.

Video :

The story of the helicopter, 629.13335209 S887.

Rotor et son royaume, 629.133352 R848.

Vertical flight, 629.13A958 V. 11 Ex. 2

Les missions d'hélicoptère, 629.13335 P724m.

Manipulation prévol d'hélicoptère, disponible à la bibliothèque.

10 REQUIREMENTS TO PASS THE COURSE

1. Passing Mark

The passing mark for this course is 60% by adding the marks for the theory and practical work for the course.

2. Attendance for Summative Evaluations

Students must be present for summative evaluations and must comply with the instructions given by the instructor to carry out the evaluation activity and written in the course outline. Unexcused tardiness for a summative evaluation could result in being excluded from the activity. Any absence from a summative evaluation that is not due to serious reasons (illness, death in the family, etc.) could result in a mark of zero (0) for the activity.

Students are responsible for meeting with the instructor before an evaluation activity is held or immediately upon returning to ENA to explain the reason for an absence. Proper documentation, such as a medical certificate, a death certificate, legal papers, etc., must be shown if the reason for absence is serious and recognized as such by the instructor(s), arrangements will be made between the instructor(s) and the student to make up the activity.

3. Submitting Assignments

All assignments must be submitted by the date, hour and location designated by the instructor(s). Late assignments will be penalized 10% per day that they are late and will receive a mark of zero (0) after 6 days.

4. Presentation of Written Work

The instructor(s) will provide students with information and guidelines regarding the presentation of written work. When the presentation of an assignment is unacceptable, the work will be penalized as a late assignment until an acceptable

version is submitted. In this case, the penalties for late work will be applied (Late assignments will be penalized 10% per day that they are late and will receive a mark of zero (0) after 6 days).

Students must follow the standards adopted by the Cégep for written work (« *Normes de présentation matérielle des travaux écrits* »). These can be found at : <http://rmsh.cegepmontpetit.ca/normes-de-presentacion-materielle-des-travaux-ecrits-du-cegep/>.

11 METHODS OF COURSE PARTICIPATION

Student must:

in the classroom, in a workshop or in a hangar:

- it is forbidden to bring food and drinks at the exception of a bottle of water.
- You are allowed to bring your electronic device (Laptop, tablets, etc.)

in a workshop or hangar:

- the ÉNA suit and safety shoes are MANDATORY. Those who do not have them will be refused access to the workshop or hangar and the absence will be recorded in their file.
- safety glasses are MANDATORY to work on the wind tunnels and must be within easy reach in the hangars.
- he (she) can only use the aircraft and equipment with the authorization of the teacher and by respecting the instructions for use.
- it is forbidden to climb on a stool, a table or a workbench.
- there must never be more than 3 students per team unless otherwise indicated by the teacher, and never more than one team per bench or per aircraft.
- he (she) must clean the workbench and store the equipment after use, in short he (she) must make sure to leave the room clean and tidy.

in the hangar:

IT'S FORBIDDEN :

- to bring suitcases, briefcases or briefcases as well as a backpack;
 - to circulate in the sheds without the permission of the teacher;
 - to change hangar without the permission of the teacher;
 - to place a school bag or any other object on the wings or any other external part of the aircraft;
 - expose an open flame (eg lighter, matches);
 - to touch the propellers;
 - to open aircraft panels and cowlings;
 - to touch the levers, buttons, switches and controls of the aircraft. Respect the information written on the maintenance labels;
 - to gather together;
 - to disturb those (students of another course) who work on an aircraft.
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- only the teacher can unlock and lock the aircraft doors. Never force the doors open or closed. Handle them with care.
if an airplane is on jacks, do not shake it unnecessarily. Also, be vigilant.
 - when descending from an aircraft, do not jump.
 - It is the student's responsibility to complete the exercises on time.
 - once the time prescribed by the teacher has elapsed, it is MANDATORY to return to class.
 - compliance with safety and work instructions is not optional, it is MANDATORY.

12 OTHER DEPARTMENTAL REGULATIONS

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

<http://guideena-en.cegepmontpetit.ca/departement-rules/>

<https://mareussite.cegepmontpetit.ca/ena/mon-parcours/mon-programme/regles-departementales>

13 INSTITUTIONAL POLICIES AND REGULATIONS

All students enrolled at Cégep Édouard-Montpetit must become familiar with and comply with the institutional policies and regulations. In particular, these policies address learning evaluations, maintaining admission status, French language policies, maintaining a violence-free and harassment-free environment, and procedures regarding student complaints. The French titles for the policies are: *Politique institutionnelle d'évaluation des apprentissages* (PIEA), la *Politique institutionnelle de la langue française* (PILF), la *Politique pour un milieu d'études et de travail exempt de harcèlement et de violence* (PPMÉTEHV), les *Conditions d'admission et cheminement scolaire*, la *Procédure concernant le traitement des plaintes étudiantes dans le cadre des relations pédagogiques*.

The full text of these policies and regulations is accessible on the Cégep web site at the following address:

<http://www.cegepmontpetit.ca/ena/a-propos-de-l-ecole/reglements-et-politiques>. If there is a disparity between shortened versions of the text and the full text, the full text will be applied and will be considered the official version for legal purposes.

14 STUDENT ACCESSIBILITY CENTER - FOR STUDENTS WITH DISABILITIES

Students having received a professional diagnosis of impairment (motor skills, neurological, organic, sensory, learning difficulties, mental health, autism spectrum disorder or other) or suffering from a temporary medical condition may request special accommodations.

Students seeking these accommodations must forward their diagnosis to the CSA by either MIO to "Service, CSA-ENA" or email to "servicesadaptesena@cegepmontpetit.ca".

Students already registered with the CSA must communicate with their teachers at the beginning of the semester to discuss those accommodations they have been awarded by the CSA.

15 ANNEX