

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
Serge Rancourt	B-122	4664	serge.rancourt@ena.ca

Office hours

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Morning					
Afternoon					
Other					

Coordinator(s)	Office	☎ extension	✉ e-mail
Joaquin Mora	C-160	4220	Joaquin.mora@ena.ca
Jeanne Dumas Roy	C-160	4470	Jeanne.dumasroy@ena.ca

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.

The course general objective is to apply aerodynamic principles to helicopter flight and maintenance.

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 [Student Guide](#) website under the heading « Information/AME and AML licences ».

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)

At the end of this course, student will be able 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	<u>MODE OF INSTRUCTION AND LEARNING ACTIVITIES</u>	<u>DOCUMENTATIONS, RESOURCES, TECHNOLOGICAL TOOLS AND URL ADDRESS</u>
7	1	<p>Take off</p> <p>Orientation changes of the resultant aerodynamic force to obtain displacement and fight parasites.</p> <p>Gyroscopic precession.</p> <p>Main rotor reaction torque source and solutions.</p> <p>Flight controls.</p>	Presentation and group research	Powerpoint and student book
8	1	<p>Transition</p> <p>Effect and solution of the lateral dissymmetry of lift (led and lag).</p> <p>Blade flapping effect (Coriolis effect).</p> <p>Solutions for horizontal bending moments.</p>	Presentation and group research	Powerpoint and student book
9	1	<p>Transition</p> <p>Main rotor types and arrangements.</p> <p>Balance of forces present</p> <p>Drag hinge location</p>	Presentation and group research	Powerpoint and student book
10		Exam 2 (20%)	In school	
11	2	<p>Autorotation</p> <p>Definition of autorotation</p> <p>Autorotative and anti-autorotative forces</p> <p>Change in angle of attack along a blade in autorotation</p> <p>Autorotation and anti-autorotation range</p> <p>Influence of the speed during horizontal flight on the autorotative zone</p> <p>Control of the rotor speed in autorotation</p> <p>Autorotation and blade inertia</p>	Presentation and group research	Powerpoint and student book
12	2	<p>Performances vs altitude</p> <p>Stall and compressibility</p> <p>Powers check.</p>	Presentation and group research	Powerpoint and student book
13	1	<p>Landing and history</p> <p>Main and tail rotor blade evolution</p> <p>Steps and pitfalls that pioneers in the development stages confronted regarding the principles of aeronautics for rotorcraft.</p>	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	

Laboratory

WEEK	OBJECTIVE	CONTENT	<u>MODE OF INSTRUCTION AND LEARNING ACTIVITIES</u>	<u>DOCUMENTATIONS, RESOURCES, TECHNOLOGICAL TOOLS AND URL ADDRESS</u>
1	1	Teachers presentation, course and helicopters. Hangar visit Helicopter history 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	Distribution of the eight workstations by teams of two or three students. Explanations and signing of contracts. – Research beginning	Presentation and group research	Powerpoint and student book
8	2	Presentations (10%) Workstation presentation by teams. – Questions and exchanges during the presentations.	Oral presentation	Powerpoint and student book
9	2	Presentations (10%) Workstation presentation by teams. – Questions and exchanges during the presentations.	Presentation and group research	Powerpoint and student book

WEEK	OBJECTIVE	CONTENT	<u>MODE OF INSTRUCTION AND LEARNING ACTIVITIES</u>	DOCUMENTATIONS, RESOURCES, TECHNOLOGICAL TOOLS AND URL ADDRESS
10	2	Drivetrain and autorotation <ul style="list-style-type: none"> - Drive shafts - Tail rotor drive shaft - Sprag clutch and autorotation 	In school	
11	3	<ul style="list-style-type: none"> - Helicopter preflight / exam correction Safety around running helicopter	Presentation and group research	Powerpoint and student book
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 and dynamic balancing of a semi rigid rotor Blade alignments and balancing 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. <ul style="list-style-type: none"> - Procedure application, alignment and static balancing - Introduction to rotor vibration analysis - Vibration simulator (SIMENA) End of exam 3 subjects.	Presentation and group research	Powerpoint and student book
15		Exam 3 (20%)	In school	

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	Week 6.	<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	Week 15	<u>Theory :</u> 20% <u>Laboratory :</u> 20% Total : 40%
				Theory	60%
				Lab	40%
				TOTAL	100 %
<p>1 Accurate characterization of physical and aerodynamic phenomena, accuracy of links established taking into account the problem, precise location of components</p>					

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.

8 REQUIRED MATERIAL

Laptop. You can consult the information document which contains the minimum configuration and answers to frequently asked questions <https://www.cegepmontpetit.ca/ena/futurs-etudiants/programmes-d-etudes/maintenance-d-aeronefs#description>

Safety equipments.

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% (PIEA, article 5.1m) by adding the marks for the theory and practical work for the course.

2. Attendance for Summative Evaluations

Presence at exams is obligatory. Any absence from an evaluation activity which is not justified by a serious reason will mean a mark of zero and failure of this evaluation. According to article 5.2.5.1 of the *Institutional Policy on the Evaluation of Student Achievement* (IPESA). "it is the student's responsibility to take the necessary means to meet his teacher and explain the motives for his absence with a supporting document explaining his absence. If the motives are

serious and recognized as such by the teacher, the teacher and the student will agree to the terms of the delay for doing the evaluation or assignment.”

In addition, the IPESA indicates that *“if a student is late for an evaluation activity with no justifiable reason, the teacher can refuse to allow the student to participate in the said activity. “*

Serious reasons that can be considered are: illness (with a medical certificate), death of a family member (with a death certificate), a force majeure or overpowering event, activities authorized by the College, and legal reason (proof of the court summons).

3. Submitting Assignments

All assignments must be submitted by the date, time and place designated by the teacher (s). Unless there is an agreement with the teacher, late assignments are penalized by the deduction of 10% per day, and a mark of zero will be given when the assignment is six days late. Any assignments due in the fifteenth week cannot be submitted late.

4. Presentation of Written Work

The teacher (s) will provide students with information and guidelines regarding the presentation of written work. When the presentation of an assignment is judged 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.

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-presentation-materielle-des-travaux-ecrits-du-cegep/>.

5. French language quality

N/A

6. Plagiarism and other breaches of intellectual honesty

- a) Plagiarism consists of copying, translating, paraphrasing, in whole or in part, the work of another person and wrongfully attributing it to oneself, with or without their consent, and constitutes a breach of academic integrity.
- b) The use of works generated entirely or partially by artificial intelligence, if not authorized by the professor, is also considered a breach of academic integrity.
- c) Acts of fraud, such as impersonating another student during a summative assessment, deceiving, cheating, or falsifying documents or results, also constitute breaches of academic integrity.
- d) Any collaboration in such acts or any attempt to commit them is also considered a breach of intellectual ethics.

Any violation of intellectual honesty, as well as any attempt at or collaboration in such an action will result in a mark of “0” for the exam, the assignment or the evaluation activity in question. In this case, the teacher will make a written report to departmental coordination which will be transmitted to the Dean of Studies in accordance with article 5.6.1 IPESA.

11 METHODS OF COURSE PARTICIPATION

Accident prevention is the responsibility of each and every individual. We invite you to familiarize yourself with all health and safety measures at <https://mareussite.cegepmontpetit.ca/ena/mes-outils/sante-et-securite/>.

Bringing food or beverages into the laboratories is strictly prohibited.

Attire worn by students in laboratories and workshops must feature the ÉNA logo. The use of hooded sweatshirts with drawstrings is not permitted due to safety risks when using equipment or machinery. ÉNA-branded clothing is available for purchase at the ÉNA Coop (room C163-A).

Authorized pants include work pants or jeans without any decorations (nails, metal parts, etc.).

Personal Protective Equipment (PPE) is essential for the safety of students and is mandatory in laboratories, workshops, and hangars. This includes wearing safety footwear (boots or shoes) and safety glasses. Protective clothing such as lab coats or uniforms is only necessary when required.

12 OTHER DEPARTMENTAL REGULATIONS

Students are invited to consult the website for the specific rules for this course:

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

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