



## **COURSE OUTLINE**

**COURSE:** Introduction to Aeronautics

**PROGRAMS:** 280.03 Aircraft Maintenance  
280.B0 Aircraft Construction Technology  
280.04 Avionics

**DISCIPLINE:** 280 Aeronautics

**WEIGHTING:** Theory: 3                      Laboratory: 2                      Personal Study: 2

<b>Your teacher</b>	<b>Office</b>	<b>☎ Extension</b>	<b>✉ Email or Website</b>
Serge Rancourt	C-182	4216	<a href="mailto:serge.rancourt@college-em.qc.ca">serge.rancourt@college-em.qc.ca</a>

### **OFFICE HOURS**

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Morning		9 to 10			
Afternoon				12 to 14	

<b>Coordinators</b>	<b>Office</b>	<b>☎ Extension</b>	<b>✉ Email or Website</b>
Ménard Pierre	C-160	4207	<a href="mailto:pierre.menard@college-em.qc.ca">pierre.menard@college-em.qc.ca</a>
Rousseau Jean-Yves	C-160	4610	<a href="mailto:jean-yves.rousseau@college-em.qc.ca">jean-yves.rousseau@college-em.qc.ca</a>

## **CONTEXT OF THIS COURSE IN THE PROGRAM**

This course is designed for all beginning students at ENA regardless of the program they have chosen.

The fundamental knowledge acquired in this course will serve students in a number of other courses, in particular courses that involve working on aircraft and the systems that make up the aircraft.

Consequently, students are strongly advised to pass this course during their first year.

The overall objective of the course is to introduce students to the construction of aircraft and the physical principles that affect flight. The course also allows students to associate the characteristics of aircraft structural components with established operational demands (element of the ministerial competence).

## **MINISTERIAL OBJECTIVE(S) OR COMPETENCIES**

- To analyse the function of work.
- To establish relationships between the characteristics of aircraft operation and construction principles.
- To apply the principles of aerodynamics to flight and aircraft maintenance.
- To inspect flight control systems and dead reckoning navigation

## **TEACHING AND LEARNING STRATEGIES**

### **Theory:**

This part of the course is made up of four modules that cover basic concepts of aeronautics and aerodynamics of helicopters and planes.

Lecture courses will be supported with examples, exercises, illustrations and equipment. Students are expected to take notes to reinforce their learning.

### **Laboratory:**

The practical part of the course is divided into three modules, two of which cover aircraft. During the two modules, students will learn through situation scenarios and exercises in the hangars.

Students will experiment with wind tunnels for the module on aerodynamics in order to progressively learn the basic concepts.

**COURSE PLAN – THEORY**

**Activity Periods: 9 hours (approximately)**

**MODULE 1 – BASIC CONCEPTS**

Learning Objective	Content	Personal Study Activities
1. Distinguish classes of aircraft	<ul style="list-style-type: none"> <li>▪ Classification of aircraft according to Canadian Aviation Regulations (CAR)</li> <li>▪ Historical overview of the evolution of aircraft.</li> </ul>	Course notes.  Readings and exercises as assigned by the instructor(s).
2. Recognize the units of different measuring systems.	<ul style="list-style-type: none"> <li>▪ MKSA (Metre, Kilogram, Second, Ampere) International Units System and FSS (Foot, Slug, Second) System.</li> </ul>	
3. Recognize the static and dynamic properties of fluids and of the atmosphere.	<ul style="list-style-type: none"> <li>▪ Basic aerodynamic concepts : composition and properties of fluids (liquid and gas); Archimedes Principle, Bernouilli's Law.</li> </ul>	

**Activity Period : 16 hours (approximately)**

**MODULE 2 – AERODYNAMICS**

Learning Objective	Content	Personal Study Activities
1. Define the main parameters that affect aircraft performance.  2. Recognize different types of flow: laminar and turbulent.  3. Associate the distribution of pressure with lift, with drag, with aerodynamic resultant and with moment on an airfoil.	<ul style="list-style-type: none"> <li>▪ Speed : relative, indicated, true.</li> <li>▪ Drag : from shape, from friction, from profile, induced, parasitic, shock wave, overall aircraft.</li> <li>▪ Lift :                             <ul style="list-style-type: none"> <li>– characteristics of profiles (relative thickness and camber);</li> <li>– NACA 4-digit profile classification;</li> <li>– characteristics of rectangular, tapered, elliptical and arrow wing shapes.</li> </ul> </li> <li>▪ Equilibrium of forces in flight :                             <ul style="list-style-type: none"> <li>– Lift / weight;</li> <li>– Thrust / drag.</li> </ul> </li> <li>▪ Stalling and pitching moments.</li> </ul>	Course notes.  Readings and exercises assigned by the instructor(s).

Activity Period: 16 hours (approximately)

**MODULE 3 – PLANES**

Learning Objective	Content	Personal Study Activities
1. Distinguish different types of airframe structures.	<ul style="list-style-type: none"> <li>▪ Airfoils: roles; types; classification; profiles used; loads supported construction elements.</li> <li>▪ Tail assembly: roles, types, relative surfaces, profiles used.</li> <li>▪ Fuselage: roles, shapes, loads supported, construction elements, stability and control around the axes.</li> </ul>	Course notes.  Readings and exercises as assigned by the instructor(s).
2. Distinguish the main airplane systems.	<ul style="list-style-type: none"> <li>▪ Flight controls: primary and secondary control surfaces.</li> <li>▪ Landing gear: roles, types and configurations.</li> <li>▪ Ground services: hydraulic, pneumatic and electric.</li> <li>▪ Propellers : types and configurations.</li> <li>▪ Environment: air conditioning, pressurisation and oxygen.</li> <li>▪ Fuel : supply system.</li> </ul>	

Activity Period: 4 hours (approximately)

**MODULE 4 – HELICOPTERS**

Learning Objective	Content	Personal Study Activities
1. Distinguish various components of the airframe and the mechanical chain.	<ul style="list-style-type: none"> <li>▪ Historical overview.</li> <li>▪ Roles and missions.</li> <li>▪ Components of the airframe and of the mechanical chain.</li> </ul>	Course notes.  Readings and exercises as assigned by the instructor(s).
2. Distinguish the main configurations associated with the operation of the aircraft.	<ul style="list-style-type: none"> <li>▪ Lift control in intensity and direction.</li> <li>▪ Torque reaction of the main rotor.</li> <li>▪ Rotors: configurations and operation.</li> <li>▪ Autorotation.</li> </ul>	

**COURSE PLAN – LABORATORY**

**Activity Period:** 13 hours (approximately)

**MODULE 1 – AIRCRAFT (external)**

Learning Objective	Content	Personal Study Activities
1. Recognize dangers related to being around aircraft.	▪ Safety around aircraft.	Course notes.
2. Demonstrate responsible behaviour in a hangar.	▪ Safety in a hangar.	
3. Distinguish aircraft at ENA.	▪ Aircraft identification. ▪ Aircraft characteristics.	
4. Identify and describe the function of the main components of an aircraft.	▪ Nomenclature: role and function.	

**Activity Period :** 11 hours (approximately)

**MODULE 2 – AERODYNAMICS**

Learning Objectives	Content	Personal Study Activities
1. Become familiar with density and relative pressure.	▪ Pascal and Archimedes, density, relative and absolute pressure.	Course notes.
2. Distinguish the different shapes that take energy contained in the air : pressure energy; kinetic energy; total, static and dynamic energy.	▪ Application of Bernouilli’s Principle.	
3. Interpret the behaviour of pressures in an airflow.	▪ Distribution of pressures around a profile. ▪ Determination of the stalling angle of a profile.	
4. Associate aerodynamic characteristics with different shapes of objects.	▪ Airflow on a plate, hemisphere, sphere, wing, etc.	

**Activity Period:** 6 hours (approximately)

**MODULE 3 – AIRCRAFT (internal)**

Learning Objective	Content	Personal Study Activities
1. Identify and describe the function of the main instruments on board an aircraft.	▪ The role and function of flight, navigation and operation instruments.	Course notes.
2. Recognize types of structures.	▪ Tubular, monocoque and semi-monocoque structures.	
3. Recognize and describe the function of the main elements of the structure of an airframe.	▪ Elements of construction of airfoils, of the airframe and of the tail assembly.	

**SYNTHESIS OF SUMMATIVE EVALUATION METHODS**

**Theory**

For the theoretical part of the course, the instructor(s) will indicate during the first course which of the two tables below will be used.

TABLE 1

Description of Evaluation Activity	Context	Learning Objective(s)	Due Date (approximate date assignment due or exam given)	Weighting (%)
Written exam, mainly multiple choice answers.	Individual, in-class exam without course notes; a calculator is necessary. (A course will be given after the exam.)	See Module 1 and part of Module 2.	Week 5	20%
Idem.	Individual, in-class exam without course notes. (A course will be given after the exam.)	See Module 2 and Objective 1 of Module 3.	Week 10	20%
Idem.	Individual, in-class exam without course notes. (No course will be given after the exam.)	See Objective 2 of Module 3 and of Module 4.	Week 15	20%

Sub-total : 60%

TABLE 2

Description of Evaluation Activity	Context	Learning Objective(s)	Due Date (approximate date assignment due or exam given)	Weighting (%)
Weekly mini-test.	No documentation.	Objectives of Modules 1 to 4.	Weeks 2-15	5%
Written exam, mainly multiple choice answers.	Individual, in-class exam without course notes; a calculator will be necessary. (A course will be given after the exam.)	See Module 1 and part of Module 2.	Week 5	15%
Idem.	In classe, individual, without course notes (A course will be given after the exam).	See Module 2 and Objective 1 of Module 3.	Week 10	15%
Idem.	In classe, individuel, without course notes. (A course will be given after the exam.)	See Objective 2 of Module 3 and Module 4.	Week 15	25%

Sub-total : 60%

**Laboratory**

For the practical part of the course, the instructor(s) will indicate during the first course which of the two tables below will be used.

TABLE 1

Description of Evaluation Activity	Context	Learning Objective(s)	Due Date (approximate date assignment due or exam given)	Weighting (%)
Written exam, mainly short answer.	Individual, in-class exam in two parts. Course notes not allowed for part on subject area, notes are allowed for exercises. A course will be given after the exam.	See Module 1 except for helicopters.	Week 7	15%
Idem.	Idem	See Module 2.	Week 12	15%
Idem.	Individual, in-class exam. Course notes not allowed for part on subject area, notes are allowed for exercises. A course will be given after the exam.  Duration: 2 class periods.	See Module 1 (helicopters) and Module 3.	Week 15	10%

Sub-total : 40%

**TOTAL : 100%**

TABLE 2

Description of Evaluation Activity	Context	Learning Objective(s)	Due Date (approximate date assignment due or exam given)	Weighting (%)
Identification of aircraft at ÉNA.	Individual, in the hangar. Each student will have a different aircraft.  Duration : 2 class periods.	Describe the characteristics and background of the aircraft.	Week 3	5%
Written exam.	Individual, in-class exam.  Duration : 2 class periods.	Describe and identify the components (wings, tail assembly, instruments) of a plane and a helicopter.	Week 8	20%
Written exam.	Individual, in-class exam.  Duration : 2 class periods.	Interpretation of results in the wind tunnels.	Week 15	15%

Sub-total : 40%

**TOTAL : 100%**

## **REQUIREMENTS TO PASS THE COURSE**

### **(1) Passing Mark**

The passing mark for this course is 60% which is the sum of the theoretical and practical (laboratory) parts of the course.

### **(2) Attendance for Summative Evaluations**

Students must be present for summative evaluations and they must comply with the directives indicated by the instructor and written in the course outline.

La présence aux activités d'évaluation sommative est obligatoire. L'étudiant(e) doit se conformer aux prescriptions de réalisation de l'activité d'évaluation prévues par l'enseignant(e) et inscrites au plan de cours.

The instructor may refuse to allow students from participating in the summative examination for unexcused tardiness.

Students may receive a mark of zero (0) for any absence that is not due to serious circumstances (illness, death in the family, major event that prevented student from attending, etc.).

Students are responsible for contacting their instructor(s) and making the necessary arrangements before the evaluation activity or immediately upon returning to ENA. Students must explain the reason for the absence and provide supporting documents. If the instructor recognizes that the reasons are serious, arrangements for the evaluation activity will be made between the teacher and the student.

### **(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 one week.

### **(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.

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://ww2.college-em.qc.ca/biblio/normes.pdf>) under the heading « **Aides à la recherche** ».

## **METHODS OF COURSE PARTICIPATION**

### SAFETY MEASURES IN THE HANGARS

1. Smoking is prohibited.
2. Sitting on the workbenches or machines is prohibited
3. Shoes must be worn at all times. (Sandals are prohibited)
4. Machines may be used only with the authorization of the teacher(s).
5. Long hair must be tied back or worn under a cap when working with machinery.
6. Ties must be removed or tucked inside the shirt when working with machinery.
7. Shirts with wide cuffs or fringe may not be worn when working near machinery.



8. Protective eyewear is mandatory when working with machinery.
9. Machinery and workbenches must be cleaned after usage.
10. Workshop must be cleaned after each course.
11. Only authorized personnel may use the bending machine.
12. No aluminum or non-ferrous material may be put on the grinders.
13. Briefcases and wallets are prohibited.
14. No one may walk around the hangar without authorization.
15. No visitors without authorization

### **REQUIRED MATERIAL**

- Course Notes for the Theory part of the course (the instructor(s) will provide the number at the first course).
- Course Notes for the Laboratory (practical) part of the course (the instructor(s) will provide the number at the first course).
- The only model of calculator allowed during exams is the **SHARP EL531**.
- Graduated ruler in 1/10-inch gradations.

### **MEDIAGRAPHY**

#### **Theory:**

Chappuy J.P., Grégori J.P. Instruments de bord, Tome 1 : Mesure de vitesse, incidence, température, dispositifs de sécurité, compas de navigation, contrôle moteurs; Tome 3 : Instruments gyroscopiques, altimètre, variomètre, compas magnétique. Institut aéronautique Jean Mermoz, Paris, 1978. 629.135 C 4671 1978.

Féminier, Didier. Cellules et systèmes d'aéronef. Outremont, Modulo, c1982, 315 p. D 629.13431 F 329c.

Fleury, Jacques. Technologie cellule. Institut aéronautique Jean Mermoz, c1981, 410 p. D 629.13431 F618t.

Gauvin, Daniel. Aérodynamique mécanique du vol, Institut aéronautique Jean Mermoz, Paris, 1979, 281 p. A.629.1323C375a

Kermode, A.C. Mécanique du vol. traduction, Didier Féminier, Outremont, Modulo, c1982, 515 p. D 629.132 K 39m.

McKinley, Bent. Aircraft basic science. USA, Gregg Division, Mc Graw-Hill Book Company, c1970, 374 p. D 629.13 M 158b.

Raletz, Roger, Théorie élémentaire de l'hélicoptère, Suresne, Aérospatiale Hélicoptère, 1983. 629.13335 R163T

Thierry du Puy de Goynes, Yves Plays, Patrick Lepourry, Jacques Besse. Initiation à l'aéronautique. Cépaduès-Éditions, Toulouse, ©Cepad2000, 176 p.

Rice handbook of Airfoil Sections for Light Aircraft.

Histoire de l'évolution des aéronefs (diaporama) 629-1300971-H673-EX-2

#### **Laboratory:**

Jane's Encyclopedia of Aviation, R629.13005 T244J.

Jane's Pocket Book of Light Aircraft, 629.133340422 T244J.

Maintenance d'aéronefs, EA-AC 43.13-1A et 2A, D629.1346E83ac.

Schafer, Joseph. Basic Helicopter Maintenance, Basin, Wyo., Aviation Maintenance, c1980, 343 pages. 629.1346 S 296 b

How Airplane Fly (vidéo) 629.1323 H 847-EX.2 VHS (18 min.)

Les substances dangereuses, 363.19S234 (25 min.)

Sécurité au sol et sur les aéroports (vidéo) A-629.1368 - S446-EX-2 VHS (25 min.)

## **INSTITUTIONAL POLICIES AND REGULATIONS**

All students enrolled at Collège 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, les conditions particulières concernant le maintien de l'admission d'un étudiant, la Politique de valorisation de la langue française, la Politique pour un milieu d'études et de travail exempt de harcèlement et de violence, les procédures et règles concernant le traitement des plaintes étudiantes.*

The full text of these policies and regulations is accessible on the College web site at the following address : [www.college-em.qc.ca](http://www.college-em.qc.ca). 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.

## **OTHER DEPARTMENTAL REGULATIONS**

### **(1) Course Attendance**

Students are required to attend all courses and participate actively. Students who have missed 10% of the practical part (laboratory) of the course will immediately receive a warning informing them of their attendance record; when students have missed more than 20% of the practical part of the course, they will be excluded from the course.

The final mark for students who have been excluded from the course will represent the number of points accumulated at the time of exclusion **or** a mark of 55% if the accumulated mark is greater than 60%.

If the instructor(s) was not able to offer a makeup activity for an excused absence, the mark for the activity will not be penalized.

Students who believe a mark is not justified may appeal to the administrator responsible for the department.

### **(2) Course Attendance – Transport Canada Standards**

The Department applies Transport Canada standards 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 ».

### **(3) Tardiness**

Students who arrive more than 10 minutes after the beginning of the first period of a course are considered absent for this period. No late arrivals are allowed for subsequent periods of the same course.

### **(4) Absence of the Instructor(s) Absence de l'enseignant(e)**

Students must wait 10 minutes before considering that an instructor is absent for the first period of a course and they must be present for the second hour unless an absence has been posted.

### **(5) Safety and Use of Department Services and Workshops or Classrooms**

See the regulations for the Pre-Flight Department on the College website under the heading *Règles et politiques de l'ÉNA*

### **(6) Mark Revisions**

See Article 6.6.2 of the institutional policies for learning evaluation (*Politique institutionnelle d'évaluation des apprentissages.*)