ÉCOLE NATIONALE D'AÉROTECHNIQUE

UNE ÉCOLE AFFILIÉE AU CÉGEP ÉDOUARD-MONTPETIT

280-3B4-EM

FALL 2020

Pre-Flight Department

COURSE OUTLINE

COUSE: **Aerodynamics**

PROGRAM: 280.C0 Aircraft Maintenance

DISCIPLINE: 280 Aeronautics

WEIGHTING: Theory: 2 Practical Work: 2 Personal Study: 2

Instructor(s)	**Office**	**☎ extension**	**✉ e-mail or website**
Éric Jetté	C-182	4615	eric.jette@ena.ca

OFFICE HOURS

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Morning		8h00 – 9h00 11h00 -			
Afternoon		- 13h00			14h00 – 15h00
Other					

*** Microsoft Teams will be the only way to communicate with me outside these hours.**

Dep. Coordinator(s)	**Office**	**☎ Extension**	**✉ Email or Website**
Goudreault, Éric	C-160	4691	eric.goudreault@ena.ca
Arpin Stéphanie	C-160	4630	stephanie.arpin@ena.ca

CONTEXT OF THIS COURSE IN THE PROGRAM

This course is offered during the third session of the program and is designed for all students in the Aircraft Maintenance Technology program. By the end of this course, students will have developed:

- The ability to recognize factors that influence drag and lift on aircraft.
- The ability to recognize factors that influence the propulsive force of propellers.
- The ability to make calculations in order to compare and observe aircraft performance.
- The ability to recognize factors that influence aircraft performance.

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) and Avionics (280.D0) according to Transport Canada requirements. The application of Transport Canada policies regarding absences is available on the ENA website and in the student agenda under the heading « Privilèges accordés par Transports Canada ».

COMPETENCIES OF THE EXIT PROFILE (student skill profiles)

Master the scientific bases and those of the work functions.

MINISTERIAL OBJECTIVE(S) AND COMPETENCIES

0260 To apply the principles of aerodynamics.

TERMINAL OBJECTIVE OF THE COURSE (FINAL COURSE OBJECTIVE)

Recognize, gauge and quantify the factors that influence the design performance and aerodynamic parameters of an aircraft, subject to conditions of use and maintenance activities.

TEACHING AND LEARNING STRATEGIES

The technical methodologies will be a mix in rotation of in class teaching and live videoconferences and chatting using Microsoft Teams supported by written and multimedia material. Theory classes will last 2 hours per week. Labs will be 2 hours per week and will be at school.

Theory:

- The theory part of the course is divided into four modules that deal with advanced concepts of the principles of aerodynamics, aircraft performance and flight.
- Formal lectures will be supported with examples, exercises, illustrations, transparencies, multimedia projection, video, photographs and aircraft parts as teaching aids.
- Before summative evaluations, students will be informed of the important points and elements of the study table which could be targeted on the exam to allow them the best opportunity to succeed in the course.
- Students will complete their learning with their class notes, reviewing exercises and homework.

Laboratory:

- The laboratory part of the course is divided into five modules that deal with advanced concepts of aerodynamics. Students will apply and validate the theoretical elements through wind tunnel tests.
- Students will complete their learning with class notes, reviewing exercises and homework.
- Transparencies, multimedia projection, videos, photographs and aircraft parts will be used as teaching aids.

Warning: exercises or preparatory activities in class (theory) and in the laboratory (practical work) assigned by the instructor(s) must be completed before arriving in class or the laboratory. The instructor(s) reserve the right

to refuse access to class or the lab if the exercises have not been completed beforehand and the absence will be recorded in the student's file. It is the student's responsibility to finish exercises in time.

In case of an absence, it is the student's responsibility to find out from classmates what was done in class and the work that was assigned in order to be up to date (refer to the learning objectives in the *Synthesis of Summative Evaluation Methods table*)

COURSE PLAN– THEORY

Follow the process in Teams Theory channel under the files tab.

Week	Subject	Title	Where
1	Presentation		Teams
2	Workbook 1	Mass & Weight	Teams
3	Workbook 2	Length distance & time	Teams
4	Workbook 3	Surface calculations & earth atmosphere	Teams
5	Workbook 4	The choice of altitude	Teams
	Workbooks 1 to 4	Exam 1	ENA
6	Workbook 5	Fuel flow rate	Teams
7	Workbook 6	The speed of an aircraft	Teams
8	Workbook 7	The envelopes: speed and load factor	Teams
9	Workbook 8	Load factor, radius & turn rate	Teams
10	Workbook 9	Wing load & drag	Teams
	Workbooks 5 to 8	Exam 2	ENA
11	Workbook 10	Aerodynamics And the air aircraft maintenance Engineer	Teams
12	Workbook 11	Propellers	Teams
13	Workbooks 1 to 11	Revision & Questions	Teams
	Workbooks 1 to 11	Examen 3	ENA

Activity Periods: **8 hours (approximately)**

MODULE 1 – Study of Aerodynamic Drag

Learning Objective	Content	Personal Study Activities
1.1 Use demonstrations to recognize the major inherent laws, constants and variables of aerodynamics.	Aircraft descriptive forms, mass, standard atmosphere, length weight, surface, volume, density, general gas equation, speed, speed of sound, Mach numbers, specific gravity, pressure, force, dynamic viscosity, Reynolds number, work, power, energy	Review course notes 280-265 Course Notes Readings and exercises as assigned by the instructor
2.1 Determine the reactions produced on aerodynamic variables due to external changes.	Density, viscosity, speed, pressure, surface, volume, mass, humidity, altitude, laminar and turbulent flow	
3.1 Use demonstrations and calculations to recognize different facets of air resistance and different types of drag.	Boundary layer, reference surface, Reynolds number, fluid flow, viscosity, aspect ratio, relative thickness, relative camber, surface finish	

	Total drag Induced drag Parasitic drag: T form T friction T profile T interference T compensation T cooling T parasite Shockwave drag	
4.1 Analyse the factors that influence the drag coefficient and drag.	Characteristic curves of airfoils, surface condition, adjustments, positions, settings, relative thickness, relative camber, plan form, speed, Oswald coefficient, altitude, weight, W_{TO}/S ratio, W_{TO}/HP ratio.	

Activity Period: **8 hours (approximately)**

MODULE 2 – STUDY OF DRAG

Learning Objective	Content	Personal Study Activities
1.2 Compare aircraft characteristics	Aircraft descriptive forms, single engines, twin-engines, business, wide-bodied aircraft, military, supersonic, subsonic	Review course notes 280-265
2.2 Use calculations to recognize the factors that influence aircraft performance.	Surface, elongation, weight W_{TO}/S report, W_{TO}/HP ratio, W_E/ W_{TO} ratio, W_{FUEL}/ W_{TO} ratio, range, autonomy, endurance, takeoff distance, vertical speed, horizontal speed, altitude, turn	Course Notes Readings and exercises as assigned by the instructor(s)
3.2 Analyze the factors that influence the lift coefficient (C_Z) and lift.	Boundary level, cross-section, Reynolds number, flow type, viscosity, plan form, aspect ratio, relative thickness, relative camber, surface finish, maintenance	
4.2 Analyze the information in a graph representing the curves characteristic of a wing and an airplane.	Relationship between the AR and the characteristic curves of a wing, relationship between the Reynolds number and the characteristic curve of a wing.	
5.2 Recognize the angles of attack of a flight at subsonic, trans-sonic, and supersonic speeds.	Compressibility, speed of shockwave creation, speed of sound, Mach angle, Mach number, pressure wave, expansion wave, maximum speed	
6.2 Calculate the lift of an airplane	Weight, wing loading, W_{TO}/S ratio, W_{TO}/HP ratio, W_{TO}/T ratio, W_E/ W_{TO} ratio, W_{FUEL}/ W_{TO} ratio, W_U/ W_{TO} ratio,	
7.2 Calculate the moment of an airplane.	Center of pressure, aerodynamic center, moment coefficient and moment, influence of the relative thickness and relative camber on the center of pressure, aerodynamic center and moment coefficient.	

Activity periods: 6 hours (approximately)

MODULE 3 – PERFORMANCE STUDY

Learning Objective	Content	Personal Study Activities
1.3 Compare aircraft characteristics.	Aircraft descriptive forms, single engines, twin-engines, business, wide-bodied aircraft, military, supersonic, subsonic.	Review Course Notes 280-265. Course Notes.
2.3 Use calculations to recognize the factors that influence the performance of an aircraft.	Surfaces, surface ratios, aspect ratio, weight, W_{TO}/S, rapport ratio W_{TO}/HP, W_E/ W_{TO} ratio, W_{FUEL}/ WTO ratio, range, autonomy, endurance, take-off distance, vertical speed, horizontal speed, altitude, turning, G force.	Readings and exercises assigned by the instructor(s).
3.3 Make calculations to validate aircraft performance.	Aircraft descriptive forms, standard atmosphere, mass flow, volume flow, specific fuel consumption, flight time, filling time, flight distance, speed.	

Activity period: 6 hours (approximately)

MODULE 4 – STUDY OF THE PROPELLER

Learning Objective	Content	Personal Study Activities
1.4 Explain the theory of propulsion for a propeller.	Speed increase ratio, advance ratio, thrust coefficient, power coefficient, speed power coefficient, efficiency.	Review Course Notes 280-265. Course Notes.
2.4 Explain the propeller geometrically.	- Plane of rotation, hub, blades of the propeller shaft, blade shaft, geometric pitch, experimental pitch.	Readings and exercises assigned by the instructor(s).
3.4 Explain the kinematics of the propeller.	- Ideal propeller, simplified theory of the blade element, effective pitch, slip	
4.4 Use vectors to explain the different modes of a propeller.	- Thrust, wind milling, transparency, feather, brake and reverse pitch.	
5.4 Distinguish the factors that influence traction, torque, power and performance of a propeller.	- Angle of attack, helix angle, pitch angle geometry, speed, RPM of the propeller, torque of the propeller, propeller diameter, blade plan form, blade profile, number of blades, solidity coefficient, critical engine, thrust asymmetry	
6.4 Make calculations related to propellers.	- Propulsive forces, torque, power, geometric pitch angle, experimental pitch angle, helix angle, tangential speed, speed.	

COURSE PLAN – PRACTICAL PART

Follow the process in Teams Lab channel under the files tab.

Week	Subject	Title	Where
1	Presentation		ENA
2	Lab 1	Fundamentals	
3	Lab 2	Calibration of the Göttingen wind tunnel	
4	Lab 3	Pressure distribution around a disk	
5	Lab 4	Distributions of pressures around a wing profile	
6	Lab 5	Pressure distribution around the airfoil	
7	Lab 1 to 5	Exam 1	
8	Lab 7	Drag of a missile vs. nose shape	
9	Lab 8	Rate of drag reduction by adding a fairing	
10	Lab 9	The effect of the aspect ratio and winglets on a wing and the Reynolds number	
11	Lab 10	Difficulty of scaling & equivalence of Reynolds number	
12	Lab 7 to 10	Exam 2	
13	Lab 12	Characteristic of a wing	
	Workbooks 1 to 12	Examen 3	

Activity period: **2 hours (approximately)**

MODULE 1 – PERFORM WIND TUNNEL CALIBRATIONS

Learning Objective	Content	Personal Study Activities
1.1 Determine the dynamic pressure in the test chamber.	- Göttingen 30X30Wind Tunnel - Aerolab 12D Wind Tunnel - Hampden 8X8 Wind Tunnel, - Design an assembly using a Pitot-static tube, total pressure, static pressure, dynamic pressure, anemometer (airspeed indicator), observed speed, actual speed, theoretical speed, dynamic pressure constant of the wind tunnel. - Formula : $P_D = ½\rho V^2$: $p = \rho g \Delta h$: $pV = mRT$ - density, voltage, speed, anemometer (airspeed indicator), barometer, pressure, manometer, thermometer, temperature.	Review Course Notes 280-265 Course Notes Readings and exercises assigned by the instructor(s)
2.1 Determine the actual speed in the test chamber.	- Formula : $P_D = ½\rho V^2$: $p = \rho g \Delta h$: $pV = mRT$ - density, voltage, speed, anemometer anemometer barometer, pressure, manometer, thermometer, temperature.	

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

MODULE 2 – STUDY OF DRAG AND PROFILE SHAPE

Learning Objective	Content	Personal Study Activities
1.2 Measure pressure distribution	Göttingen 30X30.Wind Tunnel, Disc, shapes ,cylinder, wheel, profiles, manometer, scale,	Review Course Notes 280-265 Course Notes Readings and exercises assigned by the instructor(s)
2.2 Determine the normal aerodynamic resultant	Hampden 8X8 Wind Tunnel, cylinder, manometer, shapes, profiles, scale	
3.2 Determine the coefficient of pressure (CP)	Model aircraft and front shape of the fuselage: disc, cone, revolution paraboloid, manometer, balance	
4.2 Determine the normal coefficient		
5.2 Determine the form drag coefficient	- Formula: $FN = \Delta P * S$	
6.2 Determine the profile drag coefficient	- Formula: $FN = \frac{1}{2}\rho V^2 S C_N$ - Formula: $T = \frac{1}{2}\rho V^2 S C_X$	
7.2 Evaluate the thickness of the boundary layer		
8.2 Describe the shock waves produced in front of various shapes.	Supersonic Wind Tunnel, Shapes	
9.2 Describe the influence of speed on the shock waves.	Supersonic Wind Tunnel, Shapes Model and photos	
10.2 Determine the maximum speed of a supersonic airplane.	Formula: $Mach_{MAX} = 1/Sin(\theta)$	
11.2 Determine the shape adapted to the speed and the situation for subsonic and / or supersonic speeds.		

Activity period: 8 hours (approximately)
MODULE 3 – STUDY OF LIFT AND DRAG ON WINGS

Learning Objective	Content	Personal Study Activities
1.3 Take pressure distribution measurements 2.3 Determine the normal aerodynamic resultant 3.3 Determine the coefficient of pressure (CP) 4.3 Determine the coefficient of lift (C_Z) 5.3 Determine the position of the center of pressure (c.p.) 6.3 Distinguish the reactions to the distribution of the pressures on a wing profile following changes on the angle of attack. 7.3 Distinguish the reactions made to the distribution of the pressures on a wing profile following changes on the position of flaps (and slats)	Aerolab 12 D Wind Tunnel, NACA 0012 wing, flight controls, manometers Hampden 8X8 Wind Tunnel, NACA 0020 wing, flight controls, manometers	Review Course Notes 280-265 Course Notes Readings and exercises as assigned by the instructor(s)
8.3 Distinguish reactions to the characteristic curves of a wing due to changes in aspect ratio.	- Göttingen 30X30 Wind Tunnel, - NACA 0012, 2412 wing, - Wing with aspect ratio (1,2,3,4,6, oo). - Lift and drag - Dynamic pressure, speed - Lift and drag coefficient - Formula: $T = ½\rho V^2 S C_X$ - Formula: $P = ½\rho V^2 S C_Z$ - Stall angle - Fineness - Reynolds number	Review Course Notes 280-265 Course Notes Readings and exercises as assigned by the instructor(s)
9.3 Distinguish reactions to the characteristic curves of a wing due to changes in the plan shape, of the relative thickness and relative camber.	- Göttingen 30X30 Wind Tunnel, NACA 0012, 2412 wings - Aircraft models and wing profiles NACA 0012, 2412. - Wings plan shapes: rectangular, trapezoidal, rectangular sweep, trapezoidal sweep, delta, elliptical - Same content as # 8.3	Review Course Notes 280-265 Course Notes Readings and exercises as assigned by the instructor(s)
10.3 Distinguish the reactions made to the characteristic curves of a wing following the use of flaps (and slats)	- Göttingen 30X30 wind tunnel, - Aircraft models and wings with profiles NACA 0012, 2412. - Rectangular wing plan shape. - Same content as # 8.3	Review Course Notes 280-265 Course Notes Readings and exercises as assigned by the instructor(s)
11.3 Calculate lift and drag. 12.3 Measure lift and drag	- Lift and drag - Dynamic pressure - Lift and drag coefficients - Formula: $P = ½\rho V^2 S C_Z$ - Formula: $T = ½\rho V^2 S C_X$ - C_Z / C_X ratio - Reynolds Number	Review Course Notes 280-265 Course Notes Readings and exercises as assigned by the instructor(s)

Activity period: **4 hours (approximately)**

MODULE 4 – STUDY OF MOMENTS

Learning Objective	Content	Personal Study Activities
1.4 Analyse the stresses generated by the control surfaces. 2.4 Compare a stabilator with a standard empennage (tail). 3.4 Compare with aircraft models, wing configurations (high and low) with standard tail and "T".	- Göttingen 30X30 wind tunnel - Model aircrafts and wings profiles NACA 0012, 2412 - Rectangular wing plan shape, Wing with flight controls, model airplane wing with control surface, center of pressure, coefficient of moment, moment, speed. - Wings plan shapes: rectangular, trapezoidal, rectangular sweep, trapezoidal sweep, delta, elliptical - Wing profiles NACA 0012, 2412, - Wings with aspect ratios (1, 2, 3, 4, 4W, 6, 6W and oo), wings with winglets. - Formula: $M_n = ½\rho V^2 S C C_{Mn}$ - Fineness	Review Course Notes 280-265. Course Notes. Readings and exercises as assigned by the instructor(s).

Activity period: **4 hours (approximately)**
MODULE 5 – STUDY OF PROPELLERS

Learning Objective	Content	Personal Study Activities
1.5 Distinguish the factors that influence thrust, power consumption and efficiency of a propeller. 2.5 Make calculations related to propellers. 3.5 Plot characteristic curves of propellers. 4.5 Interpret propeller characteristic curves. 5.5 Observe the different types of propellers.	Göttingen 30X30 wind tunnel Types of propellers, number of blades, geometric pitch, diameter, forward speed, tangential speed, mode, efficiency, power, propulsive force, speed (RPM), angle of advance, geometric pitch, real pitch, angle of attack, solidity coefficient. Airplane angle of inclination and lateral asymmetry of traction. Propulsive force, power, efficiency, speed-power ratio, advance ratio, speed. - Traction vs RPM, va and J - Power vs RPM, va and J - Efficiency vs RPM, va and J Thrust mode, transparency, brake, wind milling. - Lift, trust, drag et torq - Dynamic pressure, speed - Coefficient lift and drag - Coefficient thrust and power - Formula : - Drag = $\frac{1}{2}\rho v^2 S C_X$ - Thrust = $\rho n^2 Ø^4 C_T$ - Necessaire power = Pn - Pn = Trust·v - Power transmitted to the propeller = P - P = $2\Pi n Q$ - P = $\rho n^3 Ø^5 C_P$ - Electrical power = VI - η = Pn/P = (Tv)/P - J = v/(nØ) - $\omega = \alpha+\beta$ - Reynolds number	Review Course Notes 280-265. Course Notes. Readings and exercises as assigned by the instructor(s).

SYNTHESIS OF SUMMATIVE EVALUATION METHODS

Theory

Description of Evaluation Activity	Context	Learning Objective(s)	Evaluation Criteria	Due Date (approximate date assignment due or exam given)	Weighting (%)
Exam on basic variables and parameters affecting drag and lift	In class, individual, without any notes, Short development and multiple-choice answers. Questions, comparisons and calculations based on the descriptive sheets of airplanes, calculations on the properties of fluids facing variables. Questions referring to homework and courses.	1.1, 2.1 & 1.2, 2.2 & 1.3, 2.3, 3.3	See table 1	Week of the 28th of September	15%
Exam on drag and lift	In class, individual, without any notes, Short development and multiple-choice answers. Questions, comparisons and calculations based on the descriptive sheets of airplanes, calculations on the properties of fluids facing variables. Questions referring to homework and courses.	3.1, 4.1 & 3.2, 4.2, 5.2, 6.2 & 1.1 to 3.3 (review)	See table 1	Week of the 16th of November	20%
Exam on performances and propellers	In class, individual, without any notes, Short development and multiple-choice answers. Questions, comparisons and calculations based on the descriptive sheets of airplanes, calculations on the properties of fluids facing variables. Questions referring to homework and courses.	1.3, 2.3, 3.3 & 1.4, 2.4, 3.4, 4.4, 5.4, 6.4 & principal objectives	See table 1	Week 15	25%

SUB-TOTAL: 60%

Practical Work

Description of Evaluation Activity	Context	Learning Objective(s)	Evaluation Criteria	Due Date (approximate date assignment due or exam given)	Weighting (%)
Exam on: - wind tunnel calibration, - pressure zones, - form and profile drag	In class, individual, without any notes. The exam includes manipulations, calculations and written reports. Short development and multiple-choice answers. Questions, comparisons and calculations based on data tables obtained from laboratories, calculations on the properties of fluids versus variables. Questions referring to laboratories of weeks 1 to 4.	1.1 to 2.1 & 1.2 to 11.2	See table 2	Week 28th of September	10
Exam on: - Lift and Cz of the wing, - Drag and Cx of the wing, - the effect of: - aspect ratio, - the Reynolds number	In class, individual, without any notes. The exam includes manipulations, calculations and written reports. Short development and multiple-choice answers. Questions, comparisons and calculations based on data tables obtained from laboratories, calculations on the properties of fluids versus variables. Questions referring to laboratories of weeks 6 to 9..	1.3 to 12.3 & (1.1 à 2.1 & 1.2 à 11.2) (review)	See table 2	Week of the 16th of November	15
Exam on : - moments - wing plan shapes, - drag and lift of the entire aircraft, - chart drag / speed - propellers	In class, individual, without any notes. The exam includes manipulations, calculations and written reports. Short development and multiple-choice answers. Questions, comparisons and calculations based on data tables obtained from laboratories, calculations on the properties of fluids versus variables. Questions referring to laboratories of weeks 1 to 14.	1.4 & 3.4 & 1.5 to 5.5 & principal objectives	See table 2	Week 15	15

SUB-TOTAL: 40%

TOTAL: 100%

Table 1 Evaluation criteria

A) Correct interpretations of performance factors.
B) Correct enumeration of Performance Factors.
C) Correct distinction of the factors involved in the flight and performance elements. (T and 172 vs 172)
D) Accuracy of justification when quantifying performance factors. (=)
E) Correct comparison between factors and variables.
F) Appropriate selection of units of measurement.
G) Accuracy of calculations.
H) Accuracy of comparisons.
I) Appropriate mapping of principles and phenomena.
J) Accuracy of established links considering the issue.
K) Evaluation and truthful analysis of the quantitative value of the response.
L) Validity of the approach in the resolution of numerical, technical or situational problems.
M) Precise use of terminology.

Table 2 Evaluation criteria

A) Accuracy in the manipulations.
B) Accuracy during the acquisition of data.
C) Accurate interpretation of the data.
D) Correct choice of units of measurement.
E) Accuracy of calculations.
F) Appropriate mapping of principles, phenomena and results.
G) Accuracy in the use and interpretation of graphs.
H) Evaluation and truthful analysis of the quantitative value of the answer.
I) Accuracy of justification when quantifying performance factors. (=) Vs AR
J) Correct Enumeration of Performance Factors.
K) Accuracy of comparisons.
L) Accuracy of the links established mapping considering the problem.
M) Validity of the approach in the resolution of numerical, technical or situational problems.
N) Precise use of terminology.

REQUIRED MATERIAL

- PDF documents for class and Labs available on OneDrive.
- SHARP EL 531 Calculator

MEDIAGRAPHY

1. Chuan-tau E. et Roskam, J. Dr. (1990). *Airplane Aérodynamics*, Roskam. Aviation and Engineering Corporation, Lawrence, Kansas : University of Kansas
2. Hurt, H. H. (1965). *Aerodynamics for naval aviators*. University of Southern California, USA
3. Kermore, A.C. Translation by Didier Feminier. (2000). *Mécanique du vol*., Outremont, Canada : Modulo
4. Cauvin, D. (1979). *Aérodynamique mécanique du vol*. Paris, France : Institut aéronautique Jean Mermoz
5. Giles, R.V. (1984). *Low-Speed Wind Tunnel Testing*, USA, John Wiley & Sons, Mcgraw-Hill, 1984
6. Giles, R.V. (1975). *Mécanique des fluides et hydrauliques*, cours et problèmes, Série Schaum, Toronto, Canada : Mcgraw-Hill
7. Rice, *Handbook of airfoil sections for light aircraft*
8. https://www.youtube.com/channel/UC-795KiMElgoKZ7SAx77Mjw/featured

REQUIREMENTS TO PASS THE COURSE

1. Passing Mark

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

2. Attendance for Summative Evaluations

Attendance to summative evaluations is mandatory (PIEA, article 5.2.5.1).

3. Submitting Assignments

The assignment requested by a teacher must be handed over on the date, place and time indicated. The penalties incurred for delays are established according to the departmental rules (PIEA, article 5.2.5.2).

In case of delay the penalties are:

- See the section "Departments Rules" at the following address:

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

4. Presentation of Written Work

The student must comply with the "Standards for the physical presentation of written works" adopted by the Cégep. Failure to comply with these standards may delay the acceptance of the work or affect the grade awarded. These standards are available in the "Standards for the physical presentation of written works" adopted by the Cégep. Failure to comply with these standards may delay the acceptance of the work or affect the grade awarded. These standards are available in the Quick Links, Libraries section under the heading "Methodology" of the Cégep's Documentation Centers, at www.cegepmontpetit.ca/normes.

The departmental penalties for non-compliance with the physical presentation standards (PIEA, article 5.3.2) are:
See the section "Departments Rules" at the following address: http://guideena.cegepmontpetit.ca/regles-des-departements/Links, Libraries section under the heading "Methodology" of the Cégep's Documentation Centers, at www.cegepmontpetit.ca/normes.

The departmental penalties for non-compliance with the physical presentation standards (PIEA, article 5.3.2) are:
See the section "Departments Rules" at the following address:
http://guideena.cegepmontpetit.ca/regles-des-departements/

METHODS OF COURSE PARTICIPATION

The following rules must be respected in the classroom and laboratories:

In the classroom:

- Food, drinks cell phones, pagers, MP3 players, IPODs, cameras and any similar devices are prohibited.
- Students must keep the classroom clean and tidy.

In the laboratory:

- Food, drinks cell phones, pagers, MP3 players, IPODs, cameras and any similar devices are prohibited.
- Students must keep the classroom clean and tidy.
- Flames (from a lighter, matches) are prohibited.
- ENA overalls (jumpsuit) and safety shoes or boots are **mandatory**. Students who are not properly dressed will not be admitted to the workshop or hanger and the absence will be recorded in their file.
- Safety glasses are **mandatory** for working with wind tunnels and must be at hand in the hangars.
- Students may not use aircraft or equipment without authorization from an instructor and proper operating instructions must be respected.
- It is prohibited to get up on a stool, a table, a workbench or a wind tunnel.
- There must never be more than 3 students per team unless otherwise indicated by the instructor and there must never be more than one team per workbench or aircraft.
- Students must clean the workbench and put equipment away after being used; the premises must be left clean and organized.

OTHER DEPARTMENTAL REGULATIONS

Students are encouraged to consult the website for the specific regulations for this course:
http://guideena-en.cegepmontpetit.ca/department-rules/

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 and www.cegepmontpetit.ca/ipesa . 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.

THE ADAPTED SERVICES CENTER - FOR STUDENTS WITH DISABILITIES

Students with a professional diagnosis (motor, neurological, organic, sensory limitations,
Learning disabilities, mental health, autism spectrum disorder or others) or having a medical condition
Temporary workers can apply for appropriate measures.

To have access to this service, send your diagnosis either by MIO to "Service, CSA" or by email to servicesaadaptes@cegepmontpetit.ca.

If you already have an adapted measures plan with the CSA, you are invited to contact your teacher as soon as possible. Beginning of the session in order to discuss with him the accommodation measures determined by the CSA.