



## COURSE OUTLINE

**COURSE:**                   **Organic Materials Used in Aeronautics**

**PROGRAM:**               280.C0 Aircraft Maintenance

**DISCIPLINE:**           280 Aeronautics

**WEIGHTING:**           Theory: 3                           Practical Work: 2                   Personal Study: 2

<b>Instructor(s)</b>	<b>Office</b>	<b>☎ extension</b>	<b>✉ e-mail or website</b>
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### OFFICE HOURS

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Morning					
Afternoon					

<b>Coordinator(s)</b>	<b>Office</b>	<b>☎ extension</b>	<b>✉ e-mail or website</b>
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## CONTEXT OF THIS COURSE IN THE PROGRAM

This course is given during the second session of the program.

By the end of the course, students will have developed their abilities to:

- Select a solvent to clean a part.
- Choose and carry out preparations for different types of plastics.
- Select lubricants and fuel.
- Check the quality of lubricants and fuels.
- Carry out lubricant and fuel contamination tests and analyses.
- Record information in the appropriate documents.

This course is a co-requisite with Course 280-245-EM.

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.

## MINISTERIAL OBJECTIVE(S) AND COMPETENCIES

**025R** Master work techniques in aeronautical maintenance. (To use organic and synthetic materials.)

## TEACHING AND LEARNING STRATEGIES

### **Theory:**

While essentially delivered with a formal lecture format, a variety of pedagogical methods are used including presentations using a multi-media projector or the blackboard, use of organic parts and products as well as films.

### **Practical Work:**

Using a variety of teaching methods, the practical work involves handling organic materials with laboratory equipment as well as laboratory technologies delivered as a lecture. Students will handle materials in teams.

## COURSE PLAN – THEORY

### Activity Period: Weeks 1 to 5

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#### Learning Objectives: 1.1 to 1.4 and 3.1 to 3.2

- 1.1 Describe cleaning products and common solvents.
- 1.2 Describe the physical and chemical characteristics of solvents and cleaning products.
- 1.3 Establish links between the solvents used and the effects on different materials of the parts.
- 1.4 Use applicable standards and specifications for cleaning.
- 3.1 Explain the influence of the refining processes on the final petroleum products. **TC Appendix C Part 2 4.0.2 and 19.0.1**
- 3.2 Name the different hydrocarbons present in lubricants and fuels according to the rules of systematic nomenclature.

#### Content

- Classify solvents and cleaning products.
- Determine the reactivity, solvency and oxidation.
- Describe materials used in aeronautics.
- Determine the compatibility and incompatibility between products and parts.
- Describe WHMIS for properly handling and storing solvents.
- Understand processes for refining and their environmental effects
- Understand saturated, unsaturated, sulfured and aromatic compounds

### Activity Period: Weeks 6 to 10

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#### Learning Objectives: 3.3 and 3.4

- 3.1 Compare different fuels: automotive and aviation gas, jet fuel. **TC Appendix C Part 2, 11.4.4, 19.0.1**
- 3.2 Select the proper fuel as a function of the conditions of operation, standards, specifications and recommendations. **TC Appendix C Part 2, 11.4.1**

#### Content

- Physical and chemical characteristics of fuels: octane and performance numbers, volatility, energy of combustion, coloring, etc.
- Consequences of using automotive fuels in aviation and aviation fuels in automobiles.

### Activity Period: Weeks 11 to 15

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#### Learning Objectives: 2.1 to 2.5 and 3.5 to 3.6

- 2.1 Describe and explain the nature of plastics and composites. **TC Appendix C - Part 2 - 9.0.1**
- 2.2 Compare the physical and chemical characteristics and properties of plastics and composites.
- 2.3 Describe the range of uses of plastics and composites.
- 2.4 Use resins and catalysts properly according to standards and specifications.
- 2.5 Handle and store resins and catalysts properly. **TC Appendix C Part 2 1.0.4**
- 3.1 Compare various lubricants. **TC Appendix C Part 2, 4.0.2, 11.2.2, 16.0.1**
- 3.2 Make a judicious selection of various lubricants according to operating conditions, standards, specifications and recommendations. **TC Appendix C, Part 2, 4.0.2, 11.2.4, 12.6.1**

## **Content**

- Classifying plastics based on their nomenclature.
- Composition and structure of polymers: thermoplastics, thermosettings and elastomers.
- Different types of fiber composites: fiberglass, carbon fiber, etc.
- Understanding aeronautical applications of diverse plastics and composites.
- Defining processes of polymerization and of different catalysts
- Regulations related to handling and storing materials (WHMIS).
- Describing functions of lubricating oil and greases.
- Describing different physical and chemical characteristics.
- Identifying different additives.
- Comparison of mineral and synthetic oils.
- Comparison of different greases.
- Classifying the performance of lubricating oils.

## COURSE PLAN – LAB

The laboratory part of the course consists of experiments in rotation allowing students to achieve the different learning objectives. The timeline of the experiments will be distributed during the first course of the session.

### **Activity Period: Weeks 1 to 15**

### **Learning Objectives: 4.1 to 7.2**

- 4.1 Use the different measuring instruments appropriately.
- 4.2 Properly interpret different tests. **TC Appendix C, Part 2, 4.0.2, 12.6.3**
- 4.3 Handle and store fuels and lubricants appropriately. **TC Appendix C, Part 2, 1.0.4**
- 5.1 Handle and store fuels and lubricants appropriately.
- 5.2 Use different measuring instruments appropriately.
- 5.3 Analyze results from different tests made on fuels and lubricants. **TC Appendix C, Part 2, 4.0.2, 4.0.7**
- 6.1 Describe the entries to be made in different documents when analyzing organic and synthetic materials.
- 6.2 Make entries in documents.
- 7.1 Apply health and security regulations related to the workplace. **TC Appendix C, Part 2, 1.0.4**
- 7.2 Apply environmental regulations related to the workplace. **TC Appendix C, Part 2, 1.0.4**

## **Content**

- Using experimentation standards
- Describing laboratory equipment.
- Determining properties and characteristics of different fuels and lubricants.
- Making links between the characteristics of fuels and lubricants and engine operation.
- Identifying different physical and chemical tests.
- Using technical diagrams and data sheets
- Using methods that respect health and safety (WHMIS)
- Identifying different types of contaminants of lubricants.
- Establishing links between the contamination of lubricants and engine operation.
- Describing special documents (measurement registration sheets, etc.)
- Describing and using required protective equipment

SYNTHESIS OF EVALUATION METHODS

**Theory**

Description of the evaluation activity	Context	Learning Objective(s)	Due Date (date assignment is due or exam date)	Weighting (%)
Written Exam	Individual for up to 3 hours	1.1 to 1.4 – 3.1 – 3.2	Week 5	20%
Written Exam	Individual for up to 3 hours	3.3 – 3.4	Week 10	20%
Written Exam	Individual for up to 3 hours	2.1 to 2.5 – 3.5 – 3.6	Week 15	20%

**Sub-total: 60%**

**Practical Work**

Description of the evaluation activity	Context	Learning Objective(s)	Due Date (date assignment is due or exam date)	Weighting (%)
Written Exam	Individual for up to 2 hours	4.1 to 7.2 (Weeks 1 to 4)	Week 5	10%
Written Exam	Individual for up to 2 hours	4.1 à 7.2	Week 15	15%
Laboratory Reports	In Teams	4.1 à 7.2	Weeks 1 to 14	15%

**Sub-total: 40%**

**TOTAL: 100%**

## REQUIREMENTS TO PASS THE COURSE

### (1) Passing Mark

The passing mark for this course is 60%.

### (2) Presence at Summative Evaluations

Presence is required at summative evaluations.

### (3) Submitting Assignments

Assignments must be submitted by the date, place and time determined by the instructor. For reasons of fairness, any work submitted after the due date will receive a zero (0) unless other arrangements have been made with the instructor.

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

## RULES FOR CLASS PARTICIPATION

Lab coats and safety glasses must be worn in the laboratory from the second class in the lab. Access to the laboratory will be prohibited to any student who is not wearing a lab coat and safety glasses.

Smoking is prohibited (danger of explosion) as well as eating or drinking (risk of contamination) in the laboratory.

After handling, the material used must be cleaned, washed and put in its place; papers must be thrown away in the trash basket, and the work space must be cleaned before leaving. If the instructor determines that these conditions have not been met, points may be deducted from a student's laboratory mark.

## REQUIRED MATERIAL

Theory: Manuel « Carburants, lubrifiants et plastiques utilisés en aéronautique » et calculatrice SHARP EL 531.

Laboratory: Course notes, SHARP EL 531 calculator, lab coat (ENA), safety glasses.

## MEDIAGRAPHY

ARNAUD, P. *Cours de chimie organique*, Gauthier-Villars, Paris, 1978, 472 p.

ASM International Handbook Committee, *Engineered Materials Handbook, vol.1 (composite), vol.2 (engineering plastics)*, ASM International, 1988.

ASTM, *Annual Book of ASTM Standards*, Vol 5, 1992.

DURIER, Y., *Caractéristiques des carburants et combustibles et leur influence sur le fonctionnement des moteurs*. Éd. Technip, Paris, 1971, 308 p.

GROFF, J.L.E., *ABC du graissage*, Editions Technip, Paris, 1961.

GRUSE, William A., *Chemical Technology of Petroleum*, McGraw-Hill, 1960.

GUIBET, J-Claude, *Carburants et moteurs, tomes 1 & 2*, éditions Technip, 1987.

- GUTHRIE, V.B., *Petroleum Products Handbook*, McGraw-Hill, Montréal.
- HARPER, Charles A., *Handbook of Plastics and Elastomers*, McGraw-Hill Book Co., 1975.
- JOLICOEUR, R., *Carburants, lubrifiants et plastiques*, Griffon d'argile, 1992.
- KLAMANN, D., *Lubricants and Related Products.*, Verlag Chemie, 1984.
- LICHTY, L.C., *Combustion Engine Processes*, 7e éd., McGraw-Hill, Toronto, 1967.
- O'CONNOR, J., BOYD, J., *Standard Handbook of Lubrication*, McGraw-Hill, 1968.
- SCHILLING, A., *Les huiles pour moteurs et le graissage des moteurs*, Tome 1, 2e éd., Éd. Technip, Paris, 1975.
- STEELE, G.L., *Exploring the World of Plastics*, McKnight Publishing Co, 1977.
- TREAGER, I., *Aircraft Gas Turbine Engine Technology*, 2e éd., McGraw-Hill, Montréal, 1979, 586 p.
- WEISSMANN, J., *Carburants et combustibles pour moteurs à combustion interne*, Éd. Technip, Paris, 1970, 720 p.

## 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

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

<http://www.college-em.qc.ca/>

[www.college-em.qc.ca/ena/propulseur/reglements](http://www.college-em.qc.ca/ena/propulseur/reglements)