APPENDIX A3

Aeronautical Engineering Cycle

Curriculum Handbook

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A3.1 Study Guide and Credits	
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A3.1 Study Guide & Credits

Table 1. Workload distribution in the 1st year of the Engineering Cycle / Semester 1

Cycle: Engineering	**Year : 1**	**Semester : 1**			
Code	**Subject**	**Coeff.**	**Contact Hr/W**	**Self study Hr/W**	**Credit ECTS**
Mathematics for Engineering					
MA01	Applied Mathematics	3	5	3	4
Aeronautics					
AE01	Aerodynamics	3	3	2.5	3
AE02	Airframe & Systems	2	3	2	3
AE03	Avionic Systems 1	2	1.5	1.5	2
Mechanical Engineering					
ME01	Mechanics Strength Of Materials (SOM)	2	1.5	1.5	2
ME02	Continuum Mechanics	2	1.5	1.5	2
ME03	Mechanical Design	2	2	1.5	2
Electronics					
EL01	Analog Electronics	3	4.5	3	4
EL02	Measurement & Instruments	1	1.5	1	2
Computer Programming					
CP01	Programming (Python/Java)	2	2	1	2
Social Sciences					
SC01	English	2	1.5	2	2
	Total	***24***	***27***	***20.5***	***28***
Total workload/week=48.5Hrs Total workload/semester=679Hrs Total Credit=28 ECTS					

Table 2. Workload distribution in the 1st year of the Engineering Cycle / Semester 2

Cycle: Engineering	**Year : 1**		**Semester : 2**		
Code	**Subject**	**Coeff.**	**Contact Hr/W**	**Self study Hr/W**	**Credit ECTS**
Applied Mathematics for Engineering					
MA01	Applied Mathematics	3	5	3	4
Aeronautics					
AE01	Aerodynamics	3	3	2	3
AE02	Airframe & Systems	2	3	2	3
AE03	Avionic Systems 1	2	1.5	1	2
AE04	Maintenance & Operation of Aircrafts	2	1.5	1	2
AE05	Workshop Aircraft Engines	1	2	1	2
Mechanical Engineering					
ME01	Mechanics Strength Of Materials (SOM)	2	3	2	3
ME02	Workshop Computer Aided Design CAD	2	2	1	2
Electronics					
EL03	Computer Architecture	2	3	1	2
EL04	Workshop Embedded Systems	1	3	1	2
Computer Programming					
CP01	Programming (Python/Java)	2	2	1.5	2
Social Sciences					
SC01	English	2	1.5	2	2
SC02	Economy & Management	1	1.5	1	2
	Total	***25***	***32***	***19.5***	***31***
Total workload/week=51.5Hrs Total workload/semester=721Hrs Total Credit=31 ECTS					

Table 3. Workload distribution in the 2nd year of the Engineering Cycle / Semester 1

Cycle: Engineering	**Year : 2**	**Semester : 1**			
Code	**Subject**	**Coeff.**	**Contact Hr/W**	**Self study Hr/W**	**Credit ECTS**
Aeronautical Structures & Systems					
AS01	Aircraft Structures	3	3	2	3
AS02	Propulsion	2	1.5	1.5	2
AS03	Turbo Reactors	2	3	2	3
AS04	Avionic Systems 2	2	2	1.5	2
Mechanical Engineering Design					
ME03	Finite Elements Method (FEM)	2	1.5	1.5	2
ME04	Workshop Computer Aided Design CAD (Catia)	2	2	1	2
ME05	Workshop NDT (Non Destructive Testing)	1	2	1	2
Electronics & Control					
EL05	Automatic Control	2	1.5	1.5	2
EL06	Signal Processing	2	3.5	2	3
EL07	Embedded systems	2	3	2	3
Computer Programming					
CP02	UML Programming	2	2	1	2
Social Sciences					
SC03	English	2	1.5	2	2
SC04	Air transport Economy	2	1.5	1	2
	Total	***26***	***28***	***20***	***30***
Total workload/week=48Hrs Total workload/semester=672Hrs Total Credit=30 ECTS					

Table 4. Workload distribution in the 2nd year of the Engineering Cycle / Semester 2

Cycle: Engineering	**Year : 2**	**Semester : 2**			
Code	**Subject**	**Coeff.**	**Contact Hr/W**	**Self study Hr/W**	**Credit ECTS**
Aeronautical Structures & Systems					
AS01	Aircraft Structure	3	4.5	3	4
AS02	Flight Mechanics	2	3	1	2
AS03	Turbo Reactors	2	3	1	2
AS04	Avionic Systems 2	2	1.5	1.5	2
Engineering Tools & Workshops					
ET01	Workshop Computer Aided Design CAD (Catia)	2	2	1	2
ET02	Numerical Simulation1 -ANSYS	1	2	1	2
ET03	Numerical Simulation2 -ABAQUS	1	2	1	2
ET04	Workshop Finite Elements Method (FEM)	1	2	1	2
Electronics & Control					
EL08	Automatic Control	2	1.5	1	2
EL09	Signal Processing	2	3.5	2	3
EL10	Workshop Embedded systems	2	1.5	1	2
Industrial Management					
IM01	Statistical Process Control SPC	2	2	1	2
Social Sciences					
SC03	English	2	1.5	2	2
Projects					
PR01	Annual Research Project	2	2	2	2
	Total	***28***	***29.5***	***20.5***	***31***
Total workload/week=50Hrs Total workload/semester=700Hrs Total Credit=31 ECTS					

Table 5. Workload distribution in the 3rd year of the Engineering Cycle / Semester 1

Cycle: Engineering	Year : 3	Semester : 1			
Code	**Subject**	**Coeff.**	**Contact Hr/W**	**Self study Hr/W**	**Credit ECTS**
Aircraft					
AC01	Radar Telecom	3	3	1.5	3
AC02	Aero elasticity (Fluid mechanics)	2	2	1	2
AC03	Composites Materials	2	1.5	1	2
AC04	Aircraft Hydraulic Systems	2	1.5	1.5	2
AC05	Aircraft Technical Data	2	1.5	1.5	2
AC06	Aircraft Certifications	2	1.5	1.5	2
Engineering Tools & Workshops					
ET05	Project -Computer Aided Design CAD (Catia)	2	2	2	2
ET06	Numerical Simulation ANSYS	1	2	1	2
ET07	Workshop Feedback Control (Matlab)	2	3	1	2
Industrial Management					
IM02	Quality Systems & Lean Management	2	3	1	2
IM03	Industrial Production Management	1	1.5	1	2
IM04	Project Startup	1	1.5	1	2
Social Sciences					
SC05	English: TOEIC Preparation	2	1.5	2	2
SC06	French Communication Technique	2	1.5	1.5	2
Projects					
PR02	Synthesis Project	2	2	1	2
	Total	***28***	***29***	***19.5***	***31***
Total workload/week=48.5Hrs Total workload/semester=679Hrs Total Credit=31 ECTS					

Table 6. Workload distribution in the 3rd year of the Engineering Cycle / Semester 2

End of Studies/Graduation Reasearch Project

Cycle: Engineering		**Year : 3**		**Semester : 2**	
Code	**Subject**	**Coeff.**	**Contact Hr/W**	**Self study Hr/W**	**Credit ECTS**
IGP 03	Graduation Research Project (4-6 months)	5	-	***40***	***32***
	Total	*5*	-	***40***	***32***
Total workload/week=50Hrs Total workload/semester=700Hrs Total Credit=30 ECTS					

A3.2 Semester 1 Modules' Handbook

Applied Mathematics Module Handbook

Module designation	Applied Mathematics
Module level, if applicable	1st year aeronautical engineering cycle
Code, if applicable	MA01
Subtitle, if applicable	
Courses, if applicable	Applied Mathematics
Semester(s) in which the module is taught	Semester 1
Person responsible for the module	Yassine MABROUKI
Lecturer	Yassine MABROUKI Marwa Bouali
Language	French
Relation to curriculum	This module aims to give students the knowledge in Applied Mathematics such as Numerical Analysis, Scientific Calculation and Optimization. This allows them to apply Mathematics by using numerical methods and then to develop practical methods in Numerical Analysis.
Type of teaching, contact hours	Total Contact hours: 5h per week including: Lecture: 03h00 per group (15 students) and per week. Laboratory session: 02h00 per group (15 students) and per week.
Workload	8 hours per week
Credit points	4
Requirements according to the examination regulations	A student must have attended at least 75% of the lectures to sit in the exams. Authorized calculator, and unauthorized documents and internet access.
Recommended prerequisites	Some basics knowledge of basic mathematics, basic calculus, and linear algebra.

Module objectives/intended learning outcomes	Knowledge: - Students understand how to approximate patterns using linear and non-linear interpolations (Lagrange Polynomial and Newton Polynomial). - They are familiar with solving nonlinear equations by using Fixed Point Method, Bisection Method and Newton's Method. - Students understand how to calculate error of the numerical solutions. - Students understand how to approximate the solution of linear functions. - Students understand how to approximate the solution of nonlinear functions. - The students understand how using Direct Methods for solving linear equations systems such as Gaussian elimination, Gaussian transformation, LU factorization and Cholesky factorisation. - The students also understand how using Iterative Methods for solving linear equations systems such as Jacobi method and Gauss-Seidel method. - They understand Numerical Differentiation (first derivative and second derivative). - They are familiar with Numerical Integration by studying Rectangle method, Trapezoid method and Simpson's method. - Students learn numerical solutions of ordinary differential equations by using Euler's method and Runge-Kitta method. - Students understand how to approximate the differential equations. - Students understand the concept of differential equation and Taylor series. - They study the finite element method, that is, they establish Lax-Milgram Theorem, Galerking's method and finite element method. Skills: - Students use Numerical Analysis to calcul and programming some numerical methods. - Students use Scientific Calculation for manipulation of matrices in Numerical Calculation. - Students use their skills in Linear algebra and programming. Competences: - Students are able to programming, and to develop some and useful methods in Applied Mathematics. - Students are able to use Numerical Analysis in their field of study work. - They are able to solve complex problems. - Ability to communicate more confidently.

Content	CHAP 1: POLYNOMIAL INTERPOLATION 2.1. Interpolation of Lagrange 2.1.1. Applications and Examples 2.2. Newton's Interpolation 2.2.4. Applications and Examples 2.3. Estimation of the Error CHAP 2: SOLVING NONLINEAR EQUATIONS 2.1. Motivation 2.2. Fixed point Method 2.1.1. Principle of the Method 2.1.2. Convergence 2.3. Dichotomy Method 2.3..1. Principle of the Method 2.3.2. Stopping Criteria 2.3.3. Convergence 2.4. Newton's Method 2.4.1. Principle of the Method 2.4.2. Convergence 3.3.3. Applications and Examples CHAP 3: RESOLUTION OF LINEAR SYSTEMS 3.1. Reminder on Linear Algebra 3.1.1. Positive Definite Matrix 3.1.2. Normal Matrix 3.1.3. Orthogonal Matrix 3.1.4. Spectrum 3.1.5. Matrix Standards 3.1.6. The Conditioning of a Matrix 3.2. Direct Methods for Solving Linear Equations Systems 3.2.1. Cramer's Method 3.2.2. Gauss Method (Gaussian Pivot) 3.2.3. Gauss Jordan's Method 3.2.4 LU Decomposition Method 3.2.5. Cholesky Decomposition Method 3.3. Iterative or Indirect Methods for Solving Linear Equations Systems 3.3.1. Fixed point method 3.3.2. Jacobi Method 3.3.4. Gauss-Seidel Method 3.3.5. Relaxation Method

CHAP 4: NUMERICAL DIFFERENTIATION

- 4.1. First Derivative
- 4.2. Second Derivative
- 4.3. Estimation of the error
  - 4.3.1. Applications and Examples

CHAP 5: NUMERICAL INTEGRATION

- 5.1. Rectangle Method:
  - 5.1.1. Rectangle on the Left
  - 5.1.2. Rectangle on the Right
  - 5.1.3. Rectangle Midpoint
  - 5.1.4. Estimation of the error
- 5.2. Trapezoidal Method
  - 5.2.1. Simple Trapezoidal Method
  - 5.1.2. Composite Trapezoid Method
  - 5.1.3. Estimation of the error
- 5.3. Simpson's Method
  - 5.3.1. Simple Simpson's Method
  - 5.3.2. Compound Simpson's Method
  - 5.3.3. Estimation of the Error
- 5.4. Quadrature Formula
  - 5.4.1. Gaussian Quadrature Formula
  - 5.4.2. Degree of Precision
  - 5.4.3. Estimation of the Error

CHAP 6: NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS

- 6.1. Reminder on Differential Equations
  - 6.1.1. Linear Differential Equation of Order 1
  - 6.1.2. Differential Equation with Constant Coefficients of Order 2
- 6.2. Euler Method
- 6.3. Runge-Kutta Method
  - 6.3.1. Second-Order Runge-Kutta Method
  - 6.3.2. Runge-Kutta Method at Order 3 and 4
  - 6.3.3. Consistency Convergence and Stability
  - 6.3.4. Estimation of the Error

	CHAP 7: INTRODUCTION TO THE FINITE ELEMENT METHOD 7.1. Functional Analysis Tools 7.1.1. Standards and Scalar Products 7.1.2. Functional Spaces 7.1.3. Test Functions 7.1.4. Space H1 7.2. Variational Formulation 7.2.1. Example 1-D 7.2.2. Existence and Uniqueness of the Solution 7.2.3. The Lax-Milgram Theorem 7.3. Calculation of Approximate Solutions by the Finite Element Method 7.3.1. Galerkin's Method 7.3.2. The finite element method P1 7.3.3. Example 1 (Equation of Heat) 7.3.4. Example 2 (Equation of the Convection Diffusion) 7.3.5. Approximation Error and Convergence of the Method 7.3.6. Examples
Study and examination requirements and forms of examination	At least two tests of about 20 minutes A mid-semester written exam of at least 1h30 A final Written exam of at least 2h
Media employed	Booklets for theoretical exercise whiteboard
Reading list	M. Atteia, M. Pradel, Éléments d'Analyse Numérique, CEPAD, 1990. J. Bastien, Introduction à l'Analyse Numérique: Applications sous Matlab, Dunod, 2003. K. Chen, P. Giblin, A. Irving, Mathematical Explorations with Matlab, Cambrige University Press, 1999. E. Süli, D. Mayers, An Introduction to Numerical Analysis, Cambridge Univ. Press, 2003. K. Yosida, Functional Analysis, Springer-Verlag, 1980, 6e ed. J. Rappaz, M. Picasso, Introduction à l'Analyse Numérique, Presses Polytechniques et Universitaires Romandes, 1998.

Aerodynamics Module Handbook

Module designation	*Aerodynamics*
Module level, if applicable	*1st year Aeronautical engineer cycle*
Code, if applicable	*AE01*
Subtitle, if applicable	*-*
Courses, if applicable	*-*
Semester(s) in which the module is taught	*Semester1 and Semester2*
Person responsible for the module	*Mr TAREK NEJAH*
Lecturer	*Mr TAREK NEJAH*
Language	*English / Frensh*
Relation to curriculum	*Compulsory*
Type of teaching, contact hours	*Lecture and Matlab coding and simulations,* *3 contact hours per week*
Workload	*5h30 per week*
Credit points	*3*
Requirements according to the examination regulations	*Mid-term Exam* *Final Term Exam*
Recommended prerequisites	*Fluid Mechanics and Matlab coding*
Module objectives/intended	*This course extends fluid mechanics concepts from Unified Engineering to the aerodynamic performance of wings and bodies in sub/supersonic regimes.* *This course will help the student to get familiar with the basics and fundamentals of Aerodynamics for Subsonic, Transonic and Supersonic flight.* *After this course, the student should be capable of:* - *Understanding how an aircraft flies.* - *Dealing primarily with internal and external flow (low- speed and high speed) relevant to aerospace applications)* - *Analysing flows past airfoils, wings as well as nozzles and diffusers which form the basic building blocks of an airplane.* - *Mastering the necessary basics and fundamentals of Aerodynamics that are required for Aircraft Engineering and Design*

Content	*OVERVIEW OF FLUID MECHANICS.* *THE ATMOSPHERE AND AIR STATIC CHARACTERISTICS.* *INCOMPRESSIBLE FLOW:* *Bernoulli's equation* *Low-speed wind tunnel flows* *Governing equations and boundary conditions* *ELEMENTARY FLOWS* *Ideal lifting flow past a circular cylinder* *INCOMPRESSIBLE FLOW OVER AIRFOILS* *Introduction* *Kutta Condition* *Thin airfoil theory* *Aerodynamic center* *Vortex panel method for lifting flows* *Qualitative picture of viscous flow* *FINITE WING THEORY* *Introduction* *Downwash and induced drag* *Prandtl's lifting line theory* *Numerical lifting-line method* *Introduction to Compressible flows* *THERMODYNAMICS REVIEW* *Governing equations and Saint Venant Equations* *Compressibility.* *NORMAL SHOCK, OBLIQUE SHOCK AND EXPANSION WAVES* *Basic relations* *Flow over wedges and cones* *Shock interactions* *blunt body flow* *Prandtl-Meyer expansion waves* *Flow through nozzles and diffusers7* *LINEARIZED THEORY FOR SUBSONIC AND SUPERSONIC FLOWS* *FLOW AND PRESSURE DISTRIBUTION AROUND* *BODIES* *WING SECTIONS* *Forces, Moments and Coefficients, etc...* *Development of Profile Shapes* *Increasing Lift Coefficient: Flaps and Slats* *Pitching Moment*

	Center of pressure and Aerodynamic Center *BOUNDARY LAYER FLOW* *Viscosity and Reynolds number* *Scale problems in windtunnel testing* *Boundary Layers* *STATIC STABILITY* *DYNAMIC STABILITY*
Study and examination	*Mid-terms examination (40%) and Final examination (60%)*
requirements and forms of examination	*Final Term Exam* Mid-Term
Media employed	*Data show / laptops / Magnetic Board*
Reading list	*None*

AIRFRAME & SYSTEMS Module Handbook

Module designation	*Airframe & Systems*
Module level, if applicable	*1st year Aeronautical engineer cycle*
Code, if applicable	*AE02*
Subtitle, if applicable	
Courses, if applicable	*Airframe and Systems*
Semester(s) in which the module is taught	*Semester 1 and Semester 2*
Person responsible for the module	*M. Djmel Mohamed*
Lecturer	*M. Djmel Mohamed*
Language	*French*
Relation to curriculum	
Type of teaching, contact hours	*3h per week* *Course and exercices*
Workload	*5h per week*
Credit points	*3*
Requirements according to the examination regulations	*Unauthorized calculator, unauthorized documents and internet access.*
Recommended prerequisites	
Module objectives/intended learning outcomes	*Knowledge:* - *Construction design* - *Airplane wings* - *Fuselage* - *Flight control*

Content	*CHAP 1: CONSTRUCTION DESIGN* *1.1. Concept of Safe Life Design* *1.2. Concept of Fail Safe Design* *1.3. Redundancies* *1.3.1. Definition* *1.3.2. Multiplex Systems* *1.3.3. Multiple Systems* *CHAP 2: AIRPLANE WINGS DESCRIPTION* *2.1. Wing Spar* *2.2. Ribs* *2.3. Citing Working* *2.4. Applied Forces on the Wing* *2.5. Applied Forces on the Fuselage* *2.5.1. Efforts by the Weight of the Plane* *2.5.2. Efforts by the Pressurization* *2.5.3. Efforts of the Aircraft Control Surfaces Steering* *2.5.4. Localized Efforts* *CHAP 3: FUSELAGE* *3.1. Frame* *3.2. Couple* *3.3. Smooth* *3.4. Floor* *3.5. Passenger Doors* *3.5.1. Windshield* *3.6. Structural Limitations* *3.6.1. Portholes* *CHAP 4: FLIGHT CONTROL* *4.1. Fuselage and Wing Assembly* *4.2. Wing and Reactor Assembly* *4.3. Fuselage Reactor Attachment* *4.3.1. Spoilers* *4.3.2. Flaps and Slats* *CHAP 5: SYSTEMS* *5.1. Hydraulic System* *5.1.1. Landing Gear* *5.2. Start System* *5.3. Zones and Stations Identification*
Study and examination requirements and forms of examination	*Midterm Exam* *Final Term Exam*
Media employed	
Reading list	

Avionic Systems 1 Module Handbook

Module designation	*Avionic Systems 1*
Module level, if applicable	*1st year Aeronautical engineering cycle*
Code, if applicable	*AE03*
Subtitle, if applicable	*-*
Courses, if applicable	*Anemometric instruments, inertial navigation systems, radio navigation systems, radio communication systems, satellite based navigation*
Semester(s) in which the module is taught	*Courses provided in two semesters*
Person responsible for the module	*DRIDI SLIM*
Lecturer	*DRIDI SLIM*
Language	*French and English used for the schemes and data sheet*
Relation to curriculum	*AVIONICS MIGHT BE A SPECILIZATION FOR THE STUDENTS FOR THE ACADEMIC RESEARCH*
Type of teaching, contact hours	- *Classe size: 20 students* - *Course projection and exercises* - *Contact hours per course: 1h30mn*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*Two examinations and test per semester*
Recommended prerequisites	*-*
Module objectives/intended learning outcomes	*Knowledge:* *Familiarity with avionics systems in the aircraft, knowledge of relating ICAO standards* *Skills:* *Cognitive abilities for which knowledge of avionics systems and architecture in the aircraft is used* *Competences:* *Integration of knowledge, skills and social and methodological capacities in maintenance organization and aircrafts operator*

Content	***ChapTER 1 Main Avionics Functions in the Aircraft*** 1. *Introduction to Avionic systems* 2. *Objectives and Function.* 3. *Flying an Airplane* 4. *Powertrain management* 5. *Telecommunications management* 6. *Easement management.* ***ChapTER 2 Avionic instruments & Systems*** 1. *Anemometric System* 2. *How the instruments work with PD, PS, PT* 3. *Pitot tube and static plug.* 4. *Altimeter, Variometer, Anemometer, Machmeter..* ***ChapTER 3 Inertial Navigation System*** 1. *Introduction.* 2. *Magnetic compass* 3. *The Cap.* 4. *ADI (Artificial horizon)* 5. *Pitch* 6. *Turn and slip indicator* ***ChapTER 4 Classic Radionavigation System*** 1. *Principle of Radionavigation* 2. *Antennas of Radionavigation* 3. *DME (Distance Measuring Equipment)* 4. *ILS (Instrument Landing System)* 5. *Localizer* 6. *Glide Path* 7. *Markers* 8. *Receiver (Antenna)* 9. *VOR (VHF Omnidirectionnel Range)* 10. *QDM, QDR* 11. *ADF Compass Radio (Automatic Direction Finder)* ***ChapTER 5 Radio Communication*** 1. *Antennas on airplane* 2. *Cockpit equipment* 3. *Frequencies used* 4. *the universal language* 5. *Emergency frequencies:* 6. *Aeronautical phraseology and alphabet* 7. *Radio distress beacon* 8. *Transponder* 9. *ACARS. system* ***ChapTER 6 Altimeter Radio***
Study and examination requirements and forms of examination	*Two examinations and test per semester*
Media employed	-
Reading list	-

Mechanics Strength of Materials (SOM) Module Handbook

Module designation	*Mechanics Strength of Materials SOM*
Module level, if applicable	*1st year Aeronautical engineering cycle*
Code, if applicable	*ME01*
Subtitle, if applicable	
Courses, if applicable	*Mechanics Strength of Materials SOM*
Semester(s) in which the module is taught	*Sesmeter1*
Person responsible for the module	*Dr Nader BEN JABER*
Lecturer	*Dr Nader BEN JABER*
Language	*French*
Relation to curriculum	*This is an annual course taught for 3th grade classes. it is compulsory for the aeronautical engineering curriculum.it is en relation with mechanical characterization of aeronautical materials.*
Type of teaching, contact hours	*1.5h contact hours*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*documents not authorized*
Recommended prerequisites	*have knowledge about:* *Modeling of mechanical actions.* *Fundamental principle of the static.*

Module objectives/intended learning outcomes	*Knowledge:* *- Understand the general objectives of the RDM and the working hypotheses.* *-Determine the cohesion torsor along a beam.* *-Determine the nature of the stresses in a beam.* *-Tracing of the diagrams of sollicitations.* *-Determine the distribution of stresses in a beam section.* *-Check the condition of strength and stiffness for a beam.* *Skills:* *-Dimension a beam.* *-Apply the superposition principle to decompose complex solicitations into simple solicitations.* *-Solve simple cases of hyperstatic problems.* *-Stress distribution in the section of a beam subjected to a compound stress.* *-Check the resistance condition of a beam subjected to compound stress.* *-Dimension a beam subjected to a compound solicitation.* *-be able to do certain calculations (difficult to do analytically) using finite element codes (RDM6).* *Competences:* *-Realization of mini-simulation projects.* *-Problem solving of damaged structures.*
Content	*CHAP 1 INTRODUCTION TO THE RESISTANCE OF MATERIALS* *1.1 objective of the resistance of materials* *1.2 general hypotheses* *1.3 geometry of the masses* *CHAP 2 COHESION TORSOR* *2.1the torsors* *2.2 determination of the cohesion torsor* *2.3 study of the balance of the beam* *2.4 identification of the nature of the solicitations* *CHAP 3 TRACTION AND COMPRESSION* *3.1 tensile test* *3.2study of deformations* *3.3resistance condition* *3.4 rigidity condition*
Study and examination requirements and forms of examination	*-After each course or part of a course the knowledge is tested.* *-The most common form of examination is the written exam,* *-Other forms, such as the oral examination, project work, laboratory session or essay writing, are also used.* *Student will receive information about examination and grading at the beginning of each course.*
Media employed	*P-C video-projector*

Reading list	*1. .J. BAHUAUD Notes de cours de mécanique des milieux continus INSA Lyon 1983* *2. L. BRILLOUIN Les tenseurs en mécanique et en élasticité Ed. Masson 1949* *3. F. BUREAU Calcul vectoriel et calcul tensoriel Ed. Université de Liège* *4. A.J. McCONNEL Applications of tensor analysis Ed. Dover Publications (Lavoisier) 1931* *5. A. KAUFMANN Cours de calcul tensoriel appliqué Ed. Albin Michel 1966* *6.V. DRIVASL. ROSENTHALY. SEMEZIS La pratique des tenseurs Ed. Eyrolles 1987* *7. C. JEANPERRIN Initiation progressive au calcul tensoriel Ed. Marketing 1987* *8. J.N. GENCE Introduction au calcul tensoriel R. GOUYON Calcul tensoriel Ed. Vuibert 1963* *9. J. LELONG-FERRAND J.M. ARNAUDIES Cours de mathématiques Ed. Dunod 1978* *10. A. LICHNEROWICZ Eléments de calcul tensorie lEd. Jacques Gabay 1987* *11. A. LICHNEROWICZ Algèbre et analyses linéaires Ed. Masson 1970* *12. E. RAMIS Exercices d'algèbre Ed. Masson 1974* *13. J. WINOGRADZKI Les méthodes tensorielles de la physique Ed. Masson 1979* *14. Recueil de normes françaises AFNOR 1983* *15. Yves DEBARD Notice du logiciel "RDM"* *16. J.P. FAURIE et al.Guide du dessinateur. Les concentrations de contraintes. CETIM* *17. J.P. HENRY et F.PARSYCours d'élasticité. DUNOD Université 1982* *18. M. KERGUIGNAS et G. CAIGNAERTRésistance des Matériaux. DUNOD Université 1977* *19. G. SPINNLER Cours polycopié de "Dimensionnement des organes de machine" Ecole polytechnique fédérale de Lausanne 1985* *20. S. LAROZE et J.J. BARRAU: Mécanique des structures. Tome 1. Solides élastiques plaques et coques 2e Edition EYROLLES-MASSON 1988* *21. A. POTIRON . Cours de Mécanique des Milieux Continus .Centre de l' ENSAM d'Angers*

Continuum Mechanics Module Handbook

Module designation	*Continuum Mechanics*
Module level, if applicable	*1st year Aeronautical engineering cycle*
Code, if applicable	*ME02*
Subtitle, if applicable	
Courses, if applicable	*Continuum Mechanics*
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr Nader BEN JABER*
Lecturer	*Dr Nader BEN JABER*
Language	*French*
Relation to curriculum	*This is a course taught for 3th year classes. it is compulsory for the aeronautical engineering curriculum.it is en relation with mechanical characterization of aeronautical materials.*
Type of teaching, contact hours	*teaching method* *contact hours* *class size* *Lesson* *1.5h per week* *22*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*Documents are not authorized*
Recommended prerequisites	*have knowledge about:* *Understand the general objectives of the Continuum Mechanics and the working hypotheses.* *Modeling of mechanical actions.*

Module objectives/intended learning outcomes	*Knowledge:* *-Determine the nature of the stresses in a beam.* *-Tracing of the diagrams of sollicitations.* *-Determine the distribution of stresses in a beam section.* *-Check the condition of strength and stiffness for a beam.* *Understand the hypothesis of small HPP disturbances.* *-to check the strength of a structure based on a yield strength criterion.* *Skills:* *-Study the transformations of deformable bodies.* *Understand the notion of strain and stress.* *Understand the behaviour of materials (while giving particular attention to elastic behaviour).* *-Stress distribution in the section of a beam subjected to a compound stress.* *Competences:* *-Realization of mini-simulation projects.* *-Problem solving of damaged structures.*

Content	*CHAP 1 INTRODUCTION AND MATHEMATICAL PREREQUISITES* *1.1 General introduction to the MMC: position of the problem and scenario.* *1.2 Index and tensor calculation.* *1.3 Differential operators: gradient, divergence, Laplacian, rotational.* *CHAP 2 TRANSFORMATION OF CONTINUUM MECHANICS* *2.1 Concept of transformation* *2.2 Transformation gradient tensor and volume change (Jacobian concept)* *2.3 Movement of continuous media: Eulerian and Lagrangian configuration.* *2.4 Movement in the vicinity of a material point: notion of particulate derivative.* *CHAP 3 STUDY OF DEFORMATIONS* *3.1 Transformation around a material point.* *3.2 Study of deformations: deformation tensors.* *3.3 Concept of displacement.* *3.4 Hypothesis of small HPP and its consequences.* *CHAP4 STUDY OF STRESS* *4.1 Stress vector and stress tensor: Cauchy's postulate.* *4.2 Interpretation of constraints.* *4.3 Usual states of solicitation.* *4.4Flat stresses and flat deformations.* *CHAP5 LINEAR ELASTICITY* *5.1Tensile curve: description of the behaviour of the materials.* *5.2 Generalized elastic linear behaviour.* *5.3Isotropic homogeneous elastic linear elastic behaviour: Hooke's law.* *5.4 Yield strength criteria: Von Mises and Tresca.*
Study and examination requirements and forms of examination	*-After each course or part of a course the knowledge is tested. - The most common form of examination is the written exam,* *-Other forms, such as the oral examination, project work, laboratory session or essay writing, are also used.* *Student will receive information about examination and grading at the beginning of each course.*
Media employed	*P-C video-projector*

Reading list	*Amestoy M. (2004). M´ecanique des milieux continus d´eformables : recueil de probl`emes. Cours de l'Ecole des Mines de Paris.* *Amestoy M. and Leblond J.-B. (1992). Crack paths in plane situations–II. Detailed form of the expansion of the stress intensity factors. International Journal of Solids and Structures, vol. 29, pp 465–501.* *Dugas R. (1959-1996). Histoire de la m´ecanique. Editions Jacques Gabay, Paris.* *Erdogan F. and Sih G.C. (1963). On the crack extension in plates under plane loading and transverse shear. Journal of Basic Engineering, vol. 85, pp 519–527.*

Mechanical design module Handbook

Module designation	*Mechanical Desig***n**
Module level, if applicable	*1st year Aeronautical Engineering cycle*
Code, if applicable	*ME03*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	Mohamed CHOUCHENE
Lecturer	Mohamed CHOUCHENE
Language	French
Relation to curriculum	Mechanical Design *of structure is of great interest in aeronautical engineering since it's a practical way to better understand aircraft's performances besides to assess new design concept for wings and aeronautical structures*
Type of teaching, contact hours	
Workload	*3h30 per week*
Credit points	*2*
Requirements according to the examination regulations	A student must have attended at least 75% of the lectures to sit for the exams.
Recommended prerequisites	Mathematics courses
Module objectives/intended learning outcomes	*Knowledge:* *Identify the Equivalence Classes from the plan of a mechanism.* *Identify the main components (gears, bearings, complete links) and the main function of a mechanism from a plan of a mechanism (with or without nomenclature).* *Skills:* *Extract a sequence of assembly or disassembly of a mechanism.* *Know how to recognize links from a real mechanism or a drawing.* *Propose a 2D kinematic diagram* *Competences:* *Calculate the degree of hyperstatism of a single chain: recognize the degrees of freedom of the links recognize the internal and useful degrees of mobility of a mechanism* *Propose a kinematic diagram based on a provided plan, or modify a kinematic diagram to meet a specific need* *Calculate the degree of hyperstatism of a complex chain*

Content	*CHAP 1 MECHANICAL LINKS* *1.1 Symbols, kinematic and static torsors* *1.2 Kinematic diagram* *1.3 Complete links* *. CHAP 2 EQUIVALENT LINK* *2.1 Serial arrangement* *2.2 Parallel arrangement* *. CHAPTER 3 STUDY OF HYPERSTATIC SYSTEMS* *3.1 Mobility* *3.2 Entry and exit law* *3.3 Cyclomatic number* *3.4 Study of hyperstatistics* *a/- Static approach* *b/- Kinematic approach*
Study and examination requirements and forms of examination	Mid-terms examination (40%) and Final examination (60%).
Media employed	projectors (Epson), Whiteboard and handouts
Reading list	*[Denkena et al, 2007] B. DENKENA, M. SHPITALNI, P. KOWALSKI, G. MOLCHO and Y. ZIPORI, "Knowledge management in process planning", Annals of the CIRP, 56/1, 175-180, 2007.* *[Derigent, 2005] W. DERIGENT, « Méthodologie de passage d'un modèle CAO vers un modèle FAO pour des pièces aéronautiques »: Prototype logiciel dans le cadre du projet USIQUICK, Thèse de doctorat, Université Henri Poincaré, Nancy-I, 2005.* *[Martin, 2006] P. MARTIN, "Integrated product and manufacturing process: Virtual Manufacturing of Reconfigurable Manufacturing Systems", Proceedings of the 15th International Conference on Manufacturing Systems – ICMaS, Published by Editura Academiei Romane, ISBN, University POLITEHNICA of Bucharest, Machine and Manufacturing Systems Department Bucharest, Romania, 26 - 27 October, 2006.*

Analog electronics Module Handbook

Module designation	*Analog electronics*
Module level, if applicable	*1st year of the aeronautical engineering cycle*
Code, if applicable	*EL01*
Subtitle, if applicable	
Courses, if applicable	*Analog electronics*
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr Henda JABBERI*
Lecturer	*Dr Henda JABBERI*
Language	*French*
Relation to curriculum	*This module aims to give all the students the same knowledge in analog electronics. Students will gain an understanding of basic analog electrical systems and an understanding of how such systems can form part of larger technical systems. This allows them to apply logic theory to develop practical analog electronic applications.*
Type of teaching, contact hours	*Lecture: 3 hours per group (30 students) and per week* *Laboratory session: 3h per group (10 students) every two weeks*
Workload	*7.5 hours per week*
Credit points	*4*
Requirements according to the examination regulations	*Unauthorized documents and internet access*
Recommended prerequisites	- *Electrical circuits course* - *Electronics course* - *basic circuit analysis*
Module objectives/intended learning outcomes	*Knowledge:* - *The unit introduces students to the properties and characteristics of analogue electronics. Students will gain an understanding of basic analogue electrical systems and an understanding of how such systems can form part of larger technical systems.* *Skills:* - *Fundamental skills will be gained in the analysis, modelling and implementation of low frequency electronic circuits and systems.* *Competences:* - *The students are able to design and develop simple and useful systems* - *They are able to solve complex problems* - *The unit prepares students to undertake future studies in Electronic/Communication Engineering.*

Content	*CHAP 1: OPERATIONAL AMPLIFIERS* *1.1. Introduction* *1.2. Description* *1.3. Constitution* *1.4. Operating mode* *1.5. Idealized Model of an Operational Amplifier* *1.6. Operating Regimes of an Operational Amplifier* *1.7. Operational Amplifier Faults* *CHAP 2: LINEAR OP-AMP CIRCUIT APPLICATIONS* *2.1. Introduction* *2.2. Operating in linear mode* *Open loop, Positive feedback and Negative feedback* *2.3. Inverting, non-inverting, summing, difference* *2.4. Integrator, Differentiator* *2.5. Limitations* *2.6. Applications* *CHAP 3 : NON-LINEAR OP-AMP CIRCUIT APPLICATIONS* *3.1. Introduction* *3.2. Comparator* *3.3.* Schmitt-trigger *3.4. Schmitt-trigger oscillator [astable multivibrator]* *3.5. Applications* *CHAP 4: ACTIVE FILTERS* *4.1. Introduction* *4.2. Bode diagrams - Interest of the logarithmic scale* *4.3. Interest of Bode Diagrams for Cascading Systems* *4.4. Action of The Different Filters* *4.5. Active Filter Structure* *4.6. Applications* *CHAP 5: Sinusoidal Oscillators* *5.1. Introduction* *5.2. Oscillator A Reaction* *5.3. Oscillator A Resonator* *5.4. Applications* *Workshop Analog Electronics* *W.1. Linear op-amp circuit applications* *W.2. Non-linear op-amp circuit applications* *W.3. Realization of a fixed frequency triangular and square signal generator/ half wave rectifier circuit* *W.4 active filters*

Study and examination requirements and forms of examination	*At least two tests of about 20 minutes* *A mid-semester written exam of at least 2h* *A final written exam of at least 3h* *A written report is delivered at the end of every practical session* *A final practical exam of at least 1h*
Media employed	*Data show* *Booklets for theoretical exercises* *Electronics materials* *Booklets for practical sessions* *Computers* *Internet*
Reading list	*Analog Devices. Op Amp Applications. Ed. Walter G. Jung. UC3M available link at http://www.sciencedirect.com/science/book/9780750678445.* *"Microelectronic circuits: analysis and design" by M. H. Rashid* *"Analysis and Design of Analog Integrated Circuits" by Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer* *Texas Instruments. Op Amps for Everyone. Ron Mancini, ed. Free online at www.ti.com*

Measurement & Instruments Module Handbook

Module designation	*Measurement & Instruments*
Module level, if applicable	*1st year of the aeronautical engineering cycle*
Code, if applicable	*EL02*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Henda Jabberi*
Lecturer	*Seif Eddine NAFFOUTI*
Language	*French*
Relation to curriculum	*This module aims to give all the students the same knowledge in measurements and instrumentations. This allows them to apply logic theory to develop practical digital electronic applications.* *Students will be able to solve real life problems by incorporating previous theoretical knowledge acquired during the course.*
Type of teaching, contact hours	*1.5 hours of contact with students per class and per week.* *20 students per class for lectures.*
Workload	*2.5 hours per week*
Credit points	*2*
Requirements according to the examination regulations	*unauthorized calculator, unauthorized documents*
Recommended prerequisites	*The fundamental concepts covered in statistical methods will be useful for understanding the concepts discussed in this course.*

Module objectives/intended learning outcomes	*Knowledge:* - *Students know fundamental concepts in measurements and instrumentations* - *Students get familiar with industrial metrology* - *They learn how to differentiate measurement vocabularies and list the concept of calibration* - *The students understand the notions of error and uncertainty* - *Students understand the different types of errors and uncertainties, as well as their calculation methods.* - *They know how to express a result of measurement* - *They understand the different types of measuring devices* - *Students understand the limits of a measurement taken experimentally and to apply different techniques to measure electrical quantities.* *Skills:* - *Students know to formally apply measurements terminology and notation and know to analyse relevant results.* - *Students know how to apply the measurement formula to solve related problems.* *Competences:* - *Students are able to apply the knowledge of measurements and instrumentations to solve real life problems.*
Content	*CHAP 1: GENERAL INFORMATION ON MEASUREMENT* *1.1 Introduction* *1.2 Some definitions* *1.3 The greatnesses* *1.4 The dimensions* *1.5 The units* *1.6 Stallions* *CHAP 2: STANDARDIZED MEASUREMENT UNCERTAINTIES* *2.1 Definitions* *2.2 Standard uncertainties* *2.3 Standard compound uncertainties* *2.4 Extended standard uncertainties* *2.5 Practical calculation of uncertainty* *2.5 Measurement results representation* *CHAP 3: PERFORMANCE OF MEASUREMENT SYSTEMS* *3.1 The ideal measuring system* *3.2 Static characteristics of a sensor* *3.3 Dynamic characteristics of a sensor*
Study and examination requirements and forms of examination	*At least two tests of about 20 minutes* *A mid-semester written exam of at least 1h* *A written exam of at least 1h*

Media employed	*Data show, formal presentation* *Booklet for theoretical exercises*
Reading list	*" Measurement and Instrumentation: Theory and Application " by Alan S. Morris, Reza Langari* *" Principles of Measurement and Instrumentation " by Alan S. Morris* *The website:* *http://www.karimbourouni.com/upload/files/Livre%20Exercices%20Instrumentation%202011.pdf*

Programming Module Handbook

Module designation	Programming (Python/Java)
Module level, if applicable	*1st year aeronautical engineering cycle*
Code, if applicable	*CP01*
Subtitle, if applicable	*JAVA*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Taycir Bouasker*
Lecturer	*Taycir Bouasker*
Language	*French*
Relation to curriculum	*Students will be able to design, code and solve simple and complex problems using JAVA programming language.*
Type of teaching, contact hours	*2 hours / week* *Theoretical and practical works* *Classes of 15 students*
Workload	*Workload 42h per semester:* *28 contact hours=* • *10 Hours Lecture* • *24 Hours laboratory sessions: practical activities* • *4 Hours Evaluation* *14 self study Hours: weekly reports and final exams preparation*
Credit points	*2*
Requirements according to the examination regulations	*Unauthorized documents and unauthorized internet access*
Recommended prerequisites	*The student has basic knowledge in algorithms writing and has already get a course in C++ language programming. Thus, he has already an idea about the concepts of object oriented programming: classes, objects, attributes, methods, abstraction, inheritance, polymorphism …*

Module objectives/intended learning outcomes	*This course presents an overview of simple and some advances programming utilities provided by JAVA language. Both theoretical and practical studies are offered at this course.* *At the end of this training, participants will be able to deepen their knowledge in complete autonomy.* *Among the expected outcomes of this course, those listed below:* *Knowledge: the students learn to:* - *Manipulate basic primitive types and operations of JAVA: int, double, string, etc.* - *Declare and instantiate different types: tables and new classes.* - *Use logic analysis to resolve problems using conditional and choice structures* - *Analyse problems where iterative structures are needed and distinguish between different loops (for, while, do...while)* - *Understand the object oriented programming concepts: Abstraction, encapsulation, inheritance and polymorphism* - *Know how to decompose a complex program into elementary modules and implement each one in JAVA* *Skills:* - *The students learn how to correctly write programs in JAVA* - *They understand how to read different types from scanner and how to print a message using text, variable values, punctuation…* - *They learn how to translate algorithms into JAVA syntax.* - *Students become familiar with object oriented programming concepts: class, constructor, attributes, methods* - *They learn how to access and use existing methods for each class* *Competences:* - *The students are able to design and develop simple and useful information systems* - *They become able to implement new classes and use it to resolve a complex problem.*

Content	***CHAP1 INTRODUCTION TO JAVA LANGUAGE*** *1.1. Historical review* *1.2. JAVA characteristics: JAVA VS C++* *1.3. JAVA Garbage Collector* *1.4. Compilation and interpretation of Java programs* *1.5. JDK, JRE and Development Environment (IDE) Installation and configuration* ***Workshop1*** ***CHAP2 BASIC COMPONENTS OF JAVA*** *2.1. JAVA program structure* *2.2. Variables VS Constants: Declaration and initialisation* *2.3. Primitive types* *2.4. Basic operations: addition, concatenation, division …* *2.5. JAVA Input and output* ***Workshop2*** ***CHAP3 CONDITIONAL STRUCTURES*** *3.1. If... else…* *3.2. Switch* ***Workshop3*** ***CHAP4 ITERATIVE STRUCTURES*** *4.1 For* *4.2 While* *4.3 Do…While* ***Workshop4*** ***CHAP5 STRING CLASS MANIPULATION*** *5.1. String type declaration* *5.2. Basic operations on string variables* ***5.3.** Types conversions* ***Workshop5*** ***Evaluation (DS)*** ***CHAP6 OBJECT ORIENTED PROGRAMING*** *6.1. OOP Concepts* *6.2. Advantages* ***CHAP7 CLASSES AND OBJECTS*** *7.1. Class VS Object* *7.2. Accessibility types* *7.3. Attributes* ***Workshop6***

	CHAP8 OBJECTS INSTANTIATION *8.1. Constructors* *8.2. "This" Pointer* *8.3. Attributes use and methods call* ***Workshop7*** ***CHAP9 POLYMORPHISM*** *9.1. Methods overloading* *9.2. Getters / Setters* ***Workshop8*** ***CHAP10 Object collections*** *10.1. Maps* *10.2. Lists* *10.3. Sets* ***Workshop9*** ***Final Exam***
Study and examination requirements and forms of examination	*Weekly reports,* *At least two tests of about 20 minutes* *A mid-semester written exam of at least 1h* *A final written exam of at least 1h30*
Media employed	*Computer, NetBeans IDE, JDK, internet access*
Reading list	*Programmer en Java, 7th Edition, Claude Delannoy, Eyrolles, 2011* *Java World Site : http://www.javaworld.com* *Java tutorial : http://java.sun.com/developer/onlineTraining*

English Module Handbook

Module designation	*English*
Module level, if applicable	*1st year Aeronautical engineering cycle*
Code, if applicable	*SC01*
Subtitle, if applicable	*First impression/motivation/ on sechedule /new ideas / ethical business/ making decisions*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester1 and Semester2*
Person responsible for the module	*Samia Ben Salah.*
Lecturer	*Samia Ben Salah.*
Language	*English*
Relation to curriculum	*Teach students how to communicate in their professional lives/ it provides real world business: it addresses the language and communication needs of employees at all levels of an organisation who need to use English at work in a global environment the whole book focuses primarily on shaping effectively students'* **soft skills**
Type of teaching, contact hours	*Contact hours: 1.30h/ week* ***class size****: it should be no more than 20 students* ***teaching method****: speaking/ listening/ writing/ reading/ oral presentations/ role plays/ brainstormings/ interactions and communication/ case studies* ***total:*** *in class sessions: 1.30 hours* *teacher's private home work: 6 hours a week*
Workload	*Workload: 3h30 per week* *Before/ after classes 2h self study at home weekly preparing lessons, exercises, speaking session, etc.*
Credit points	*2*
Requirements according to the examination regulations	*Oral exams: check students ability and skills in terms of communicating easily in work life* *Written exams: evaluate students' writing skills and grammar mainly technical engineering writing.*
Recommended prerequisites	*E.g. existing competences in speaking and writing technically in the field.*

Module objectives/intended learning outcomes	*Help students communicate in English in real-life work situation to acquire the key communication skills they will need in their future working life.* *All units are about helping students communicate in eng real life work situations. The priority is enabling them to do so more effectively and with confidence.* *The course recognizes that, With so many businesses now being staffed by people of different nationalities there is an increasing trend towards using English as the language of internal communication in many organisations.as well as learning appropriate language for communicating externally. With clients, suppliers; colleagues….* *The main emphasis is o the students speaking and trying out the target language in meaningful and authentic ways to activate students' interest and encouraging them to talk spontaneously.*
Content	*Shaping **soft skills** through speaking activities/ video reviews/ listening/ communicative / interactive approach/ case studies*
Study and examination requirements and forms of examination	*Assess students' acquisition in terms of:* *Speaking/ listening* *Communicating/ interacting* *Reading/ understanding* *Writing* *Evaluation done via non-conventional tests.*
Media employed	*Videos: data show/ JBL/smart phones*
Reading list	*Business results teacher's book/ student book*

A3.3 Semester 2 Modules' Handbook

Applied Mathematics Module Handbook

Module designation	*Applied Mathematics*
Module level, if applicable	*1st year aeronautical engineering cycle*
Code, if applicable	*MA01*
Subtitle, if applicable	
Courses, if applicable	*Applied Mathematics*
Semester(s) in which the module is taught	*Semester 1 and Semester 2*
Person responsible for the module	*Yassine MABROUKI*
Lecturer	*Yassine MABROUKI* *Marwa Bouali*
Language	*French*
Relation to curriculum	*This module aims to give students the knowledge in Applied Mathematics such as Numerical Analysis, Scientific Calculation and Optimization. This allows them to apply Mathematics by using numerical methods and then to develop practical methods in Numerical Analysis.*
Type of teaching, contact hours	*Lecture: 03h00 per group (15 students) and per week.* *Laboratory session: 02h00 per group (15 students) and per week.*
Workload	*8 hours per week.*
Credit points	*4*
Requirements according to the examination regulations	*A student must have attended at least 75% of the lectures to sit in the exams.* *Authorized calculator, and unauthorized documents and internet access.*
Recommended prerequisites	*Some basics knowledge of basic mathematics, basic calculus, and linear algebra.*

Module objectives/intended learning outcomes	*Knowledge:* - *Students understand how to approximate patterns using linear and non-linear interpolations (Lagrange Polynomial and Newton Polynomial).* - *They are familiar with solving nonlinear equations by using Fixed Point Method, Bisection Method and Newton's Method.* - *Students understand how to calculate error of the numerical solutions.* - *Students understand how to approximate the solution of linear functions.* - *Students understand how to approximate the solution of nonlinear functions.* - *The students understand how using Direct Methods for solving linear equations systems such as Gaussian elimination, Gaussian transformation, LU factorization and Cholesky factorisation.* - *The students also understand how using Iterative Methods for solving linear equations systems such as Jacobi method and Gauss-Seidel method.* - *They understand Numerical Differentiation (first derivative and second derivative).* - *They are familiar with Numerical Integration by studying Rectangle method, Trapezoid method and Simpson's method.* - *Students learn numerical solutions of ordinary differential equations by using Euler's method and Runge-Kitta method.* - *Students understand how to approximate the differential equations.* - *Students understand the concept of differential equation and Taylor series.* - *They study the finite element method, that is, they establish Lax-Milgram Theorem, Galerking's method and finite element method.* *Skills:* - *Students use Numerical Analysis to calcul and programming some numerical methods.* - *Students use Scientific Calculation for manipulation of matrices in Numerical Calculation.* - *Students use their skills in Linear algebra and programming.* *Competences:* - *Students are able to programming, and to develop some and useful methods in Applied Mathematics.* - *Students are able to use Numerical Analysis in their field of study work.* - *They are able to solve complex problems.* - *Ability to communicate more confidently.*

Content	*CHAP 1: POLYNOMIAL INTERPOLATION* *2.1. Interpolation of Lagrange* *2.1.1. Applications and Examples* *2.2. Newton's Interpolation* *2.2.4. Applications and Examples* *2.3. Estimation of the Error* *CHAP 2: SOLVING NONLINEAR EQUATIONS* *2.1. Motivation* *2.2. Fixed point Method* *2.1.1. Principle of the Method* *2.1.2. Convergence* *2.3. Dichotomy Method* *2.3..1. Principle of the Method* *2.3.2. Stopping Criteria* *2.3.3. Convergence* *2.4. Newton's Method* *2.4.1. Principle of the Method* *2.4.2. Convergence* *3.3.3. Applications and Examples* *CHAP 3: RESOLUTION OF LINEAR SYSTEMS* *3.1. Reminder on Linear Algebra* *3.1.1. Positive Definite Matrix* *3.1.2. Normal Matrix* *3.1.3. Orthogonal Matrix* *3.1.4. Spectrum* *3.1.5. Matrix Standards* *3.1.6. The Conditioning of a Matrix* *3.2. Direct Methods for Solving Linear Equations Systems* *3.2.1. Cramer's Method* *3.2.2. Gauss Method (Gaussian Pivot)* *3.2.3. Gauss Jordan's Method* *3.2.4 LU Decomposition Method* *3.2.5. Cholesky Decomposition Method* *3.3. Iterative or Indirect Methods for Solving Linear Equations Systems* *3.3.1. Fixed point method* *3.3.2. Jacobi Method* *3.3.4. Gauss-Seidel Method* *3.3.5. Relaxation Method*

	CHAP 4: NUMERICAL DIFFERENTIATION *4.1. First Derivative* *4.2. Second Derivative* *4.3. Estimation of the error* *4.3.1. Applications and Examples* *CHAP 5: NUMERICAL INTEGRATION* *5.1. Rectangle Method:* *5.1.1. Rectangle on the Left* *5.1.2. Rectangle on the Right* *5.1.3. Rectangle Midpoint* *5.1.4. Estimation of the error* *5.2. Trapezoidal Method* *5.2.1. Simple Trapezoidal Method* *5.1.2. Composite Trapezoid Method* *5.1.3. Estimation of the error* *5.3. Simpson's Method* *5.3.1. Simple Simpson's Method* *5.3.2. Compound Simpson's Method* *5.3.3. Estimation of the Error* *5.4. Quadrature Formula* *5.4.1. Gaussian Quadrature Formula* *5.4.2. Degree of Precision* *5.4.3. Estimation of the Error* *CHAP 6: NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS* *6.1. Reminder on Differential Equations* *6.1.1. Linear Differential Equation of Order 1* *6.1.2. Differential Equation with Constant Coefficients of Order 2* *6.2. Euler Method* *6.3. Runge-Kutta Method* *6.3.1. Second-Order Runge-Kutta Method* *6.3.2. Runge-Kutta Method at Order 3 and 4* *6.3.3. Consistency Convergence and Stability* *6.3.4. Estimation of the Error*

	CHAP 7: INTRODUCTION TO THE FINITE ELEMENT METHOD *7.1. Functional Analysis Tools* *7.1.1. Standards and Scalar Products* *7.1.2. Functional Spaces* *7.1.3. Test Functions* *7.1.4. Space H1* *7.2. Variational Formulation* *7.2.1. Example 1-D* *7.2.2. Existence and Uniqueness of the Solution* *7.2.3. The Lax-Milgram Theorem* *7.3. Calculation of Approximate Solutions by the Finite Element Method* *7.3.1. Galerkin's Method* *7.3.2. The finite element method P1* *7.3.3. Example 1 (Equation of Heat)* *7.3.4. Example 2 (Equation of the Convection Diffusion)* *7.3.5. Approximation Error and Convergence of the Method* *7.3.6. Examples*
Study and examination requirements and forms of examination	*At least two tests of about 20 minutes* *A mid-semester written exam of at least 1h30* *A final Written exam of at least 2h*
Media employed	*Booklets for theoretical exercise* *whiteboard*
Reading list	*M. Atteia, M. Pradel, Éléments d'Analyse Numérique, CEPAD, 1990.* *J. Bastien, Introduction à l'Analyse Numérique: Applications sous Matlab, Dunod, 2003.* *K. Chen, P. Giblin, A. Irving, Mathematical Explorations with Matlab, Cambrige University Press, 1999.* *E. Süli, D. Mayers, An Introduction to Numerical Analysis, Cambridge Univ. Press, 2003.* *K. Yosida, Functional Analysis, Springer-Verlag, 1980, 6e ed.* *J. Rappaz, M. Picasso, Introduction à l'Analyse Numérique, Presses Polytechniques et Universitaires Romandes, 1998.*

Aerodynamics Module Handbook

Module designation	*Aerodynamics*
Module level, if applicable	*1st year Aeronautical engineer cycle*
Code, if applicable	*AE01*
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	*Semester1 and Semester2*
Person responsible for the module	*Mr TAREK NEJAH*
Lecturer	*Mr TAREK NEJAH*
Language	*English / Frensh*
Relation to curriculum	*Compulsory*
Type of teaching, contact hours	*Lecture and Matlab coding and simulations,* *3 contact hours per week*
Workload	*5h30 per week*
Credit points	*3*
Requirements according to the examination regulations	*Midterm Exam* *Final Term Exam*
Recommended prerequisites	*Fluid Mechanics and Matlab coding*
Module objectives/intended learning outcomes	*This course extends fluid mechanics concepts from Unified Engineering to the aerodynamic performance of wings and bodies in sub/supersonic regimes.*
	This course will help the student to get familiar with the basics

	and fundamentals of Aerodynamics for Subsonic, Transonic and Supersonic flight. *After this course, the student should be capable of:* - *Understanding how an aircraft flies.* - *Dealing primarily with internal and external flow (low-speed and high speed) relevant to aerospace applications.* - *Analysing flows past airfoils, wings as well as nozzles and diffusers which form the basic building blocks of an airplane.* - *Mastering the necessary basics and fundamentals of Aerodynamics that are required for Aircraft Engineering and Design.*
Content	*OVERVIEW OF FLUID MECHANICS.* *THE ATMOSPHERE AND AIR STATIC CHARACTERISTICS.* *INCOMPRESSIBLE FLOW:* *Bernoulli's equation* *Low-speed wind tunnel flows* *Governing equations and boundary conditions* *ELEMENTARY FLOWS* *Ideal lifting flow past a circular cylinder* *INCOMPRESSIBLE FLOW OVER AIRFOILS* *Introduction* *Kutta Condition* *Thin airfoil theory* *Aerodynamic center* *Vortex panel method for lifting flows* *Qualitative picture of viscous flow* *FINITE WING THEORY* *Introduction* *Downwash and induced drag* *Prandtl's lifting line theory* *Numerical lifting-line method* *Introduction to Compressible flows* *THERMODYNAMICS REVIEW* *Governing equations and Saint Venant Equations* *Compressibility.*

	NORMAL SHOCK, OBLIQUE SHOCK AND EXPANSION WAVES *Basic relations* *Flow over wedges and cones* *Shock interactions* *blunt body flow* *Prandtl-Meyer expansion waves* *Flow through nozzles and diffusers7* *LINEARIZED THEORY FOR SUBSONIC AND SUPERSONIC FLOWS* *FLOW AND PRESSURE DISTRIBUTION AROUND BODIES* *WING SECTIONS* *Forces, Moments and Coefficients, etc...* *Development of Profile Shapes* *Increasing Lift Coefficient: Flaps and Slats* *Pitching Moment* *Center of pressure and Aerodynamic Center* *BOUNDARY LAYER FLOW* *Viscosity and Reynolds number* *Scale problems in windtunnel testing* *Boundary Layers* *STATIC STABILITY* *DYNAMIC STABILITY*
Study and examination requirements and forms of examination	*Midterm Exam* *Final Term Exam*
Media employed	*Data show / laptops / Magnetic Board*
Reading list	*None*

AIRFRAME & SYSTEMS Module Handbook

Module designation	Airframe & Systems
Module level, if applicable	1st year Aeronautical engineer cycle
Code, if applicable	AE02
Subtitle, if applicable	
Courses, if applicable	Airframe and Systems
Semester(s) in which the module is taught	Semester 1 and Semester 2
Person responsible for the module	M. Djmel Mohamed
Lecturer	M. Djmel Mohamed
Language	French
Relation to curriculum	
Type of teaching, contact hours	3h per week
Workload	5h per week
Credit points	3
Requirements according to the examination regulations	Unauthorized calculator, unauthorized documents and internet access.
Recommended prerequisites	
Module objectives/intended learning outcomes	Knowledge: - Construction design - Airplane wings - Fuselage - Flight control

Content	CHAP 1: CONSTRUCTION DESIGN 1.4. Concept of Safe Life Design 1.5. Concept of Fail Safe Design 1.6. Redundancies 1.3.1. Definition 1.3.2. Multiplex Systems 1.3.3. Multiple Systems CHAP 2: AIRPLANE WINGS DESCRIPTION 2.1. Wing Spar 2.2. Ribs 2.3. Citing Working 2.4. Applied Forces on the Wing 2.5. Applied Forces on the Fuselage 2.5.1. Efforts by the Weight of the Plane 2.5.2. Efforts by the Pressurization 2.5.3. Efforts of the Aircraft Control Surfaces Steering 2.5.4. Localized Efforts CHAP 3: FUSELAGE 3.1. Frame 3.2. Couple 3.3. Smooth 3.4. Floor 3.5. Passenger Doors 3.5.1. Windshield 3.6. Structural Limitations 3.6.1. Portholes CHAP 4: FLIGHT CONTROL 4.1. Fuselage and Wing Assembly 4.2. Wing and Reactor Assembly 4.3. Fuselage Reactor Attachment 4.3.1. Spoilers 4.3.2. Flaps and Slats CHAP 5: SYSTEMS 5.1. Hydraulic System 5.1.1. Landing Gear 5.2. Start System 5.3. Zones and Stations Identification
Study and examination requirements and forms of examination	Midterm Exam Final Term Exam
Media employed	
Reading list	

Avionic Systems 1 Module Handbook

Module designation	*Avionic Systems 1*
Module level, if applicable	*1st year Aeronautical engineering cycle*
Code, if applicable	*AE03*
Subtitle, if applicable	*-*
Courses, if applicable	*Anemometric instruments, inertial navigation systems, radio navigation systems, radio communication systems, satellite based navigation*
Semester(s) in which the module is taught	*Courses provided in two semesters*
Person responsible for the module	*DRIDI SLIM*
Lecturer	*DRIDI SLIM*
Language	*French and English used for the schemes and data sheet*
Relation to curriculum	*AVIONICS MIGHT BE A SPECILIZATION FOR THE STUDENTS FOR THE ACADEMIC RESEARCH*
Type of teaching, contact hours	- *Classe size: 20 students* - *Course projection and exercises* - *Contact hours per course: 1h30mn*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*Two examinations and test per semester*
Recommended prerequisites	*-*
Module objectives/intended learning outcomes	*Knowledge:* *Familiarity with avionics systems in the aircraft, knowledge of relating ICAO standards* *Skills:* *Cognitive abilities for which knowledge of avionics systems and architecture in the aircraft is used* *Competences:* *Integration of knowledge, skills and social and methodological capacities in maintenance organization and aircrafts operator*

Content	***ChapTER 1 Main Avionics Functions in the Aircraft*** *7. Introduction to Avionic systems* *8. Objectives and Function.* *9. Flying an Airplane* *10. Powertrain management* *11. Telecommunications management* *12. Easement management.* ***ChapTER 2 Avionic instruments & Systems*** *5. Anemometric System* *6. How the instruments work with PD, PS, PT* *7. Pitot tube and static plug.* *8. Altimeter, Variometer, Anemometer, Machmeter..* ***ChapTER 3 Inertial Navigation System*** *7. Introduction.* *8. Magnetic compass* *9. The Cap.* *10. ADI (Artificial horizon)* *11. Pitch* *12. Turn and slip indicator* ***ChapTER 4 Classic Radionavigation System*** *12. Principle of Radionavigation* *13. Antennas of Radionavigation* *14. DME (Distance Measuring Equipment)* *15. ILS (Instrument Landing System)* *16. Localizer* *17. Glide Path* *18. Markers* *19. Receiver (Antenna)* *20. VOR (VHF Omnidirectionnel Range)* *21. QDM, QDR* *22. ADF Compass Radio (Automatic Direction Finder)* ***ChapTER 5 Radio Communication*** *10. Antennas on airplane* *11. Cockpit equipment* *12. Frequencies used* *13. the universal language* *14. Emergency frequencies:* *15. Aeronautical phraseology and alphabet* *16. Radio distress beacon* *17. Transponder* *18. ACARS. system* ***ChapTER 6 Altimeter Radio***
Study and examination requirements and forms of examination	*Two examinations and test per semester*
Media employed	-
Reading list	-

Maintenance & Operation of Aircrafts Module Handbook

Module designation	*Maintenance & Operation of Aircrafts*
Module level, if applicable	*1st year Aeronautical Engineering cycle*
Code, if applicable	*AE04*
Subtitle, if applicable	----
Courses, if applicable	----
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Mohamed Montassar Doggui*
Lecturer	*Mohamed Montassar Doggui*
Language	*French - English*
Relation to curriculum	*Aircraft maintenance is of a great interest for Aeronautical engineers students since it allows them to explore aircraft systems in a practical way involving maintenance standard practices and techniques besides to Civil aviation regulations for both EASA and FAA.*
Type of teaching, contact hours	*Course teaching for 1.5h per week regarding a class of 22 students*
Workload	*2.5 hours per week*
Credit points	*2*
Requirements according to the examination regulations	-----
Recommended prerequisites	*General Knowledge on aerodynamic and aircraft structure*
Module objectives/intended learning outcomes	

Content	*INTRODUCTION TO THE MAINTENANCE IN THE AERONAUTICAL FIELD :* *Civil Aviation regulations : FAA - EASA - PART 145- PART 66* *the Maintenance, Repair and Overhaul concept (MRO)* *UNDERSTANDING THE AIRCRAFT MANUALS AND TECHNICAL DOCUMENTATION* *including the Aircraft maintenance manual AMM, the Aircraft Flight Manual AFM, the illustrated parts catalogue IPC, the Structure repair Manual SRM , the Engine operator's Manual EOM, Troubleshooting Manual TSM, Work Cards and Engineering Orders in addition to the Maintenance publication : Service Bulletin SB , Service Letter SL and Airworthiness Directives AD.* *Understanding of the Daily Maintenance Operations for General Aviation Aircrafts and airliners including Pre-flight and routine maintenance* *AIRCRAFT SCHEDULED MAINTENANCE AND PERIODIC INSPECTIONS : checks for General Aviation Aircrafts, Single and twin engine aircrafts including :* *50h inspection / 100h inspection /1000 h inspection Annual inspection besides to Operating Time Limit OTL and Time between Overhaul TBO.* *UNSCHEDULED MAINTENANCE like Curative maintenance* *Blown Tire, wing strike, Propeller strike, hard landing, Defective Component replacement* *AIRCRAFT RECIPROCATING ENGINE MAINTENANCE :Ignition system* *Magnetos check, Spark plugs, electrical harness,* *Carburettor-injection system, Fuel System check* *Lycoming 50h Inspection /100 h inspection and Compression Test* *AIRCRAFT MAINTENANCE SAFETY like Operations safety and* *Aircraft and workers safety : Inside and outside the Hangar* *Emergency procedures and Protection and safety equipments* *NON DESTRUCTIVE TESTING :The use of NDT in the aircraft maintenance Dye check, Eddy current, X-rays, Ultrasonic inspection, Magnetic-particle inspection and Endoscopy* *WORKSHOP ON AIRCRAFT MAINTENANCE OF SINGLE ENGINE AIRCRAFT*
Study and examination requirements and forms of examination	*01 test for 2h* *01 exam for 2h*
Media employed	---
Reading list	---

Workshop Aircraft Engines Module Handbook

Module designation	*Workshop Aircraft Engines*
Module level, if applicable	*1st year aeronautical engineering cycle*
Code, if applicable	*AE05*
Subtitle, if applicable	
Courses, if applicable	*Workshop Aircraft Engines*
Semester(s) in which the module is taught	*Semester 2.*
Person responsible for the module	*Zied Zarrouk*
Lecturer	*Zied Zarrouk*
Language	*French*
Relation to curriculum	
Type of teaching, contact hours	*2 contact hours*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*Unauthorized calculator, unauthorized documents and internet access.*
Recommended prerequisites	*THERMAL ENGINE TECHNOLOGY AND AIRCRAFT*

Module objectives/intended learning outcomes	*Knowledge:* - *Understand the operating principles of 2 stroke and 4 stroke, spark ignition, diesel and supercharged piston engines for aviation applications.* - *Understand the components characteristics of aircraft piston engines.* - *Know the certification requirements for these technologies.* - *AIRCRAFT PISTON ENGINE PERFORMANCE* - *Review of thermodynamics: definition of thermodynamic quantities, fundamentals of thermodynamics, thermodynamic reference cycles, power calculation and yields (energy balance).* - *Performance piston engines: specific power, thermal and propulsive efficiency, calculating returns, parameter optimization, choosing optimum architecture (2-stroke, 4-stroke, spark ignition or diesel), choice of materials, first ideas on the impact of altitude on the design of the supercharger, performance depending on the mission profile of the flight, calculation exercises.* *Skills* *- Effective technical skills.* *-Problem solving* *Competences* *-Working with tools and technologies* *-Analytical and synthetics spirit*
Content	*PRACTICAL EXERCICE 1: CHECK AND ADJUSTMENT OF VALVE SETS* *PRACTICAL EXERCICE 2: DIAGNOSIS OF THE IGNITION SYSTEM* *PRACTICAL EXERCICE 3: DIAGNOSIS OF THE CHARGING SYSTEM* *PRACTICAL EXERCICE 4: DIAGNOSIS OF THE STARTING SYSTEM* *PRACTICAL EXERCICE 5: CHECKING THE MOVING PARTS OF THE ENGINE (PISTON, CONNECTING ROD, CRANKSHAFT, CAMSHAFT; VALVES)* *PRACTICAL EXERCICE 6: CHECKING THE FIXED PARTS OF THE ENGINE (ENGINE HEAD, CYLINDER, CYLINDER BLOCK)* *PRACTICAL EXERCICE 7: CALIBRATION OF THE DISTRIBUTION*

Study and examination requirements and forms of examination	
Media employed	*whiteboard*
Reading list	

Mechanics Strength of Materials (SOM) Module Handbook

Module designation	*Mechanics Strength of Materials SOM*
Module level, if applicable	*1st year Aeronautical engineering cycle*
Code, if applicable	*ME01*
Subtitle, if applicable	
Courses, if applicable	*Mechanics Strength of Materials SOM*
Semester(s) in which the module is taught	*Semester2*
Person responsible for the module	*Dr Nader BEN JABER*
Lecturer	*Dr Nader BEN JABER*
Language	*French*
Relation to curriculum	*This is an annual course. it is compulsory for the aeronautical engineering curriculum.it is en relation with mechanical characterization of aeronautical materials.*
Type of teaching, contact hours	*3 hours*
Workload	*5h per week*
Credit points	*2*
Requirements according to the examination regulations	*documents not authorized*
Recommended prerequisites	*have knowledge about:* *Modeling of mechanical actions.* *Fundamental principle of the static.*

Module objectives/intended learning outcomes	*Knowledge:* *- Understand the general objectives of the RDM and the working hypotheses.* *-Determine the cohesion torsor along a beam.* *-Determine the nature of the stresses in a beam.* *-Tracing of the diagrams of sollicitations.* *-Determine the distribution of stresses in a beam section.* *-Check the condition of strength and stiffness for a beam.* *Skills:* *-Dimension a beam.* *-Apply the superposition principle to decompose complex solicitations into simple solicitations.* *-Solve simple cases of hyperstatic problems.* *-Stress distribution in the section of a beam subjected to a compound stress.* *-Check the resistance condition of a beam subjected to compound stress.* *-Dimension a beam subjected to a compound solicitation.* *-be able to do certain calculations (difficult to do analytically) using finite element codes (RDM6).* *Competences:* *-Realization of mini-simulation projects.* *-Problem solving of damaged structures.*

Content	*CHAP1 SIMPLE TORSION* *1.1. study of deformations* *1.2. resistance condition* *1.3. rigidity condition* *PRACTICAL WORK:**TORSION*** • *Torsional deformation of a solid bar* *For this experiment, students should measure the torsional deformation of a bar with increasing torque and thus determine the relationship between torque and deformation. They will test for two types of materials, calculate and compare the shear modulus of each material.* • *Influence of the length of the bar on the deformation* *In this experiment, students study the relationship between torsional deformation and bar length for constant torque. They will use the brass bar since it will give a greater deformation for a given couple.* • *Comparison between a solid bar and a tube.* *In this experiment, students compare the torsional deformation of a solid bar and a tube of the same diameter.* *CHAP2 SIMPLE BENDING* *2.1. study of deformations* *2.2. resistance condition* *2.3. rigidity condition* *PRACTICAL WORK:**STANDARD BENDING TEST*** *For this experiment, students must apply increasing force to the beam and measure the resulting deformations. They will then convert these deformations into constraints and compare the position where the stress is zero with the theoretical position and the neutral axis of the beam.* *CHAP3 SIMPLE SHEAR* *3.1. Study of deformations* *3.2. Resistance condition* *3.3. Rigidity condition* *CHAP4 BUCKLING OF COMPRESSED BEAMS* *4.1. critical load of euler* *4.2. elancement* *4.3. critical constraint resistance condition* *4.4. coefficient of security k* *4.5. resistance condition*
	*PRACTICAL WORK: **BUCKLING*** *This beam buckling experiment allows students to experimentally test the basic concepts of beam buckling such as the relationship between length, beam end conditions, and load.*

Study and examination requirements and forms of examination	*-After each course or part of a course the knowledge is tested.* *-The most common form of examination is the written exam,* *-Other forms, such as the oral examination, project work, laboratory session or essay writing, are also used.* *Student will receive information about examination and grading at the beginning of each course.*
Media employed	*P-C video-projector*

Reading list	*1. .J. BAHUAUD Notes de cours de mécanique des milieux continus INSA Lyon 1983* *2. L. BRILLOUIN Les tenseurs en mécanique et en élasticité Ed. Masson 1949* *3. F. BUREAU Calcul vectoriel et calcul tensoriel Ed. Université de Liège* *4. A.J. McCONNEL Applications of tensor analysis Ed. Dover Publications (Lavoisier) 1931* *5. A. KAUFMANN Cours de calcul tensoriel appliqué Ed. Albin Michel 1966* *6.V. DRIVASL. ROSENTHALY. SEMEZIS La pratique des tenseurs Ed. Eyrolles 1987* *7. C. JEANPERRIN Initiation progressive au calcul tensoriel Ed. Marketing 1987* *8. J.N. GENCE Introduction au calcul tensoriel R. GOUYON Calcul tensoriel Ed. Vuibert 1963* *9. J. LELONG-FERRAND J.M. ARNAUDIES Cours de mathématiques Ed. Dunod 1978* *10. A. LICHNEROWICZ Eléments de calcul tensorie lEd. Jacques Gabay 1987* *11. A. LICHNEROWICZ Algèbre et analyses linéaires Ed. Masson 1970* *12. E. RAMIS Exercices d'algèbre Ed. Masson 1974* *13. J. WINOGRADZKI Les méthodes tensorielles de la physique Ed. Masson 1979* *14. Recueil de normes françaises AFNOR 1983* *15. Yves DEBARD Notice du logiciel "RDM"* *16. J.P. FAURIE et al.Guide du dessinateur. Les concentrations de contraintes. CETIM* *17. J.P. HENRY et F.PARSYCours d'élasticité. DUNOD Université 1982* *18. M. KERGUIGNAS et G. CAIGNAERTRésistance des Matériaux. DUNOD Université 1977* *19. G. SPINNLER Cours polycopié de "Dimensionnement des organes de machine" Ecole polytechnique fédérale de Lausanne 1985* *20. S. LAROZE et J.J. BARRAU: Mécanique des structures. Tome 1. Solides élastiques plaques et coques 2e Edition EYROLLES-MASSON 1988* *21. A. POTIRON . Cours de Mécanique des Milieux Continus .Centre de l' ENSAM d'Angers*

Workshop Computer Aided Design CAD Module Handbook

Module designation	*Workshop Computer Aided Design CAD*
Module level, if applicable	*1st year Aeronautical Engineering cycle*
Code, if applicable	*ME02*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	Mohamed CHOUCHENE
Lecturer	Mohamed CHOUCHENE
Language	French
Relation to curriculum	*CAD (computer aided Design) has had a major influence on many industries, it has been particularly revolutionary in the field of product design.* *to better understand aircraft's performances besides to assess novel design concept aeronautical structures*
Type of teaching, contact hours	*2 contact hours. A total of 28 hours per semester*
Workload	*3 hours per week*
Credit points	*2*
Requirements according to the examination regulations	Documents not authorized
Recommended prerequisites	Mechanical Design
Module objectives/intended learning outcomes	**Knowledge** Become familiar with the tools and techniques of mechanical part design with CATIA. **Skills** Make a part with the Revolution function. **Competences** Master the tools of the Sketcher workshop. Master the tools for removing material.

Content	TP1 : INITIATION ON CATIA V5 TP2 : SKETCH CREATION TOOLS TP3 : PART DESIGN BY EXTRUSION PART DESIGN BY MULTI-EXTRUSION TP4 : PART DESIGN BY REVOLUTION TP5 : PART DESIGN BY SCANNING DESIGN OF MULTI-SECTION PARTS TP6 : PART DESIGN BY COMBINATION TP7 : ELABORATION OF A DRAWING FOR THE DEFINITION OF A PART
Study and examination requirements and forms of examination	Mid-terms examination (40%) and Final examination (60%).
Media employed	projectors (Epson), Whiteboard and handouts
Reading list	

Computer architecture Module Handbook

Module designation	*Computer architecture*
Module level, if applicable	*1st year of the aeronautical engineering cycle*
Code, if applicable	*EL03*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Dr. Ibtissem Malouche*
Lecturer	*Dr. Ibtissem Malouche*
Language	*French*
Relation to curriculum	*This course aims to give students knowledges on basic computer architecture which allows having necessary perquisites to address advanced processors architectures. The ultimate goal is to be able to participate on architecture optimization and performance enhancements.*
Type of teaching, contact hours	*Lecture: 3h per group (20 students) per week*
Workload	*4 hours per week.*
Credit points	*2*
Requirements according to the examination regulations	*Unauthorized documents and internet access*
Recommended prerequisites	*Knowledge in C and Assembly programming is appreciated*

Module objectives/intended learning outcomes	*The general objective of this course aims that the students know and strengthen key aspects of analysis, design and implementation of classic sequential architectures, the immediate improvements within this classic paradigm, and the existence of alternative architectures. As a basic working method, a set of tools and settings are established that allow students to study and analyse in greater depth and rigor different architectural options, combining the abstract and generic aspects with the study of specific implementations.* *The specific objectives are specified in the following:* *Cognitive objectives* - *Define the concept of architecture and incorporate parameters to evaluate and analyze the performance* - *Explain the impact of the ISA on the architecture and performance, understanding the design principles of the ISA* - *Identify the pipelining as a basic technique for increasing CPU performance as well as design, planning and control of pipeline units* - *Understanding the evolution of the architectures and the differences between CISC and RISC approaches* - *Explain techniques for improving the performance of memory and input/output system* - *Recognize the limitations of classical architectures and the importance of parallelism* - *Know and use the usual terminology and the language of the subject and employ it correctly both orally and in writing* *Skills* - *Develop design skills of Instruction Sets* - *Know how to design a pipelined datapath* - *Understand the potential of a hierarchical memory system* - *Be able to write benchmarks to evaluate specific aspects of computers* - *Be able to use standard benchmarks to perform evaluation studies, and interpret the corresponding result reports* *Competences* - *Appreciate the importance of optimization of various components of the computer architecture to improve performance* - *Develop critical thinking when evaluating the performance of a computer system according to objective criteria* - *Ability to integrate into working groups involved in analysis and design tasks* - *Capacity to make efforts in searching solutions and autonomous learning*

Content	**CHAP 1 Overview** 1.1. Introduction 1.2. What does Architecture mean? 1.3. What is a microprocessor? 1.4. Reminders5. Where are Microprocessor Systems? **CHAP 2 Basic Architecture** 2.1. VON NEUMANN model 2.2. The central unit 2.3. The main memory 2.4. Input / output interfaces 2.5. . The buses 2.6. . Address decoding **CHAP 3 Coding of information** 3.1. Introduction 3.2. Layered computer structure 3.3. Coding of instructions and Treatment instructions 3.4. Loading and storage instructions 3.5. Inter-register transfer instructions 3.6. The execution control instructions 3.7. Encoding of natural numbers (recall) and Encoding of relative integers (recall) **CHAP 4 The Microprocessor** 4.1. Basic Architecture of a Microprocessor 4.2. Execution Cycle of an Instruction 4.3. Instruction Set and Programming Language 4.4. Performance of a Microprocessor 4.5. Concept of RISC and CISC Architecture 4.6. Basic Architecture Improvements 4.7. Special Processors **CHAP 5 Operations on numbers and architecture of the UAL** 5.1. Introduction 5.2. Binary Adder 5.3. Half-adder and Full Adder 1 Bit 5.4. N-bit Additioner and Basic logical operations 5.5. Architecture of the simplified 1bit UAL 5.6. Addition of natural numbers 5.7. Addition of whole numbers 5.8. Subtraction of natural numbers 5.9. Subtraction of relative integers 5.10. Offset and Rotation

Content	**CHAP 6 Memories** 6.1. Organization of a Memory 6.2. Characteristics of a Memory 6.3. Different Types of Memory **CHAP 7 Bus Systems** 7.1. Introduction-vocabulary 7.2. Classification of Bus Systems and Data transfer 7.3. Addressing and Bus time protocols 7.4. Arbitration of buses and General architecture based on Pentium
Study and examination requirements and forms of examination	*At least two tests of about 20 minutes* *A mid-semester written exam of at least 2h* *A final written exam of at least 3h*
Media employed	*Video projector* *Booklets for theoretical exercises* *Computers* *Internet*
Reading list	** « Architecture et technologie des ordinateurs »* *(Dunod) – Paolo Zanella and Yves Ligier* ** « Technologie des ordinateurs et des réseaux »* *(Dunod) – Pierre-Alain Goupille* ** « Les microprocesseurs, comment ça marche ? »* *(Dunod) – T. Hammerstrom and G. Wyant*

Workshop Embedded Systems Module Handbook

Module designation	*Workshop Embedded Systems*
Module level, if applicable	*1st year of the aeronautical engineering cycle*
Code, if applicable	*EL04*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*2nd semester*
Person responsible for the module	*Dr. Ibtissem Malouche*
Lecturer	*Dr. Ibtissem Malouche*
Language	*French*
Relation to curriculum	*This course introduces students to the C programming and helps mastering 8 bits microcontrollers architectures drivers and embedded applications developments*
Type of teaching, contact hours	*Lecture and practical: 3h per group (16 students) per week*
Workload	*4 hours per week*
Credit points	
Requirements according to the examination regulations	*Authorized documents and internet access*
Recommended prerequisites	*Knowledge in the fundamentals of embedded C programming, Embedded systems and electronics basics is appreciated.*
Module objectives/intended learning outcomes	*Knowledge The unit objective is mastering embedded C language with hints and tricks. Students will gain an understanding of 8 bits microcontrollers' drivers' developments and basic applications.* *Skills: Fundamental skills will be gained in the analysis, modelling and implementation of embedded applications.* *Competences: The unit prepares students to undertake future studies in more complex microcontroller's architecture with higher performances (such as 32 bits microcontrollers having up to 200 MHz frequency).*

Content	**INTRODUCTION** Some basic safety rules The best online courses About electronic diagrams Necessary material Discover the arduino platform Diagram of a platinum arduino uno The microcontroller Exploring arduino pins The platinum of experimentation The arduino ide software The basics of electronics A few reminders on electricity Some resources to understand electricity: diodes, resistance… **PROJECT 1: PWM, SOFT VARIATION OF AN LED** code 1: vary the brightness of a led by modifying the pwm value code 2: varying the brightness of a smooth led code 3: alternative to vary the brightness of a led **PROJECT 2: DIGITAL INPUTS** Code 1: lighting led by push button status Code 2: a more elegant code Code 3: the bargraphe **PROJECT 3: ANALOG INPUTS** code 1: value of threshold code 2: variation of the brightness of an led based on ambient light code 3: mapping data **PROJECT 4: THE POTENTIOMETER** code 1: vary the brightness of the pwm led with a potentiometer code 2: displaying the value of a potentiometer using a bargrapher variant 1: use a bargraph 10 leds variant 2: use AN 8-DIGIT LED DISPLAY **PROJECT 5: BUILD A WEATHER STATION** code 1: acquire sensor data and display. Code 2: display data on lcd screen **PROJECT 6: USE A SERVOMOTOR** code 1: acquire sensor data and display code 2: servomotor and task management code 3: ordering a servomotor with a potentiometer **PROJECT 7: USE A TEMPERATURE AND HUMIDITY SENSORS**
Study and examination requirements and forms of examination	*At least two tests of about 20 minutes* *A final written exam of at least 1.5h*
Media employed	*Video projector* *Booklets for theoretical exercises* *Computers Internet*
Reading list	*ARDUINO UNO GETTING STARTED* *ARDUINO UNO introduction and programming pdf* *ARDUINO UNO datasheet pdf*

Programming Module Handbook

Module designation	*Programming (Python/Java)*
Module level, if applicable	*1st year aeronautical engineering cycle*
Code, if applicable	*CP01*
Subtitle, if applicable	*Python*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Taycir Bouasker*
Lecturer	*Taycir Bouasker*
Language	*French*
Relation to curriculum	*Students will be able to design, code and solve simple and complex problems using Python programming language.*
Type of teaching, contact hours	*2 hours / week* *Theoretical and practical works* *Classes of 15 students*
Workload	*Workload 3.5h per week* *Per semester:* *28 contact hours=* • *10 Hours Lecture* • *24 Hours laboratory sessions: practical activities* • *4 Hours Evaluation* *21 self study Hours: weekly reports and final exams preparation*
Credit points	*2*
Requirements according to the examination regulations	*Unauthorized documents and unauthorized internet access*
Recommended prerequisites	*The student has basic knowledge in algorithms writing and has already get a course in C++ and JAVA programming languages. Thus, he has already an idea about the concepts of object oriented programming: classes, objects, attributes, methods, abstraction, inheritance, polymorphism …*

Module objectives/intended learning outcomes	*This course presents an overview of simple and some advances programming utilities provided by Python language. Both theoretical and practical studies are offered at this course.* *At the end of this training, participants will be able to deepen their knowledge in complete autonomy.* *Among the expected outcomes of this course, those listed below:* *Knowledge: the students learn to:* - *Manipulate Data Types and Variables within Python (numbers, Booleans, strings, etc)* - *Manipulate basic (comparison, assignment) and arithmetic operations in Python* - *Use logic analysis to resolve problems using different control structures* - *Manipulate loops in Python* - *Define new functions and operations in Python* - *Learn composed data types in Python: Lists et Sets* - *Use Python libraries* *Skills:* - *The students learn how to correctly write programs in Python syntax* - *They understand how to read and print a message using text, variable values, punctuation…* - *They learn how to translate algorithms (conditional structures, loops, etc.) into Python syntax.* - *They learn how to access and use existing methods for each class* *Competences:* - *The students are able to design and develop simple and useful information system using the most popular programming language today: Python.* - *They become able to implement new classes and use it to resolve a complex problem in python.*

Content	*CHAP1 INTRODUCTION TO PYTHON LANGUAGE* *1.1. Python characteristics* *1.2. Python development tools* *1.3. Installation and configuration* ***Workshop1*** *CHAP2 BASIC COMPONENTS OF PYTHON* *2.1. Variables* *2.2. Constants* *2.3. Operators* *CHAP3 INPUT AND OUTPUTS IN PYTHON* ***Workshop2*** *3.1. Strings* *3.2. Strings slicing* *3.3. Types conversion* ***Workshop3*** *CHAP4 CONDITIONAL STATEMENTS* *4.1 If... else…* *4.2 If … elif… else* ***Workshop3*** *CHAP5 FUNCTIONS* *5.1 Function definition* *5.2 Built-in functions* ***Workshop4*** ***Evaluation (mid-semester exam)*** *CHAP6 LOOPS IN PYTHON* *6.1. While* *6.2. For* *6.3. Range* ***Workshop5*** *CHAP7 OBJECT ORIENTED PROGRAMMING IN PYTHON* *7.1. Classes* *7.2. Properties* *7.3. Decorators* *7.4. Inheritance* *7.5. Polymorphism* ***Final Exam***
Study and examination requirements and forms of examination	*Weekly reports,* *At least two tests of about 20 minutes* *A mid-semester written exam of at least 1h* *A final written exam of at least 1h30*
Media employed	*Computer, Python 3.6, internet access*
Reading list	*Python en concentre De Alex Martelli ; 'Head-First Python' by Paul Barry*

English Module Handbook

Module designation	*English*
Module level, if applicable	*1st year Aeronautical engineering cycle*
Code, if applicable	*SC01*
Subtitle, if applicable	*First impression/motivation/ on schedule /new ideas / ethical business/ making decisions*
Courses, if applicable	
Semester(s) in which the module is taught	*Semester1 and Semester2*
Person responsible for the module	*Samia Ben Salah.*
Lecturer	*Samia Ben Salah.*
Language	*English*
Relation to curriculum	*Teach students how to communicate in their professional lives/ it provides real world business: it addresses the language and communication needs of employees at all levels of an organisation who need to use English at work in a global environment the whole book focuses primarily on shaping effectively students'* **soft skills**
Type of teaching, contact hours	*Contact hours: 1.30h/ week* ***class size****: it should be no more than 20 students* ***teaching method****: speaking/ listening/ writing/ reading/ oral presentations/ role plays/ brainstormings/ interactions and communication/ case studies* ***total:*** *in class sessions: 1.30 hours*
Workload	*Workload: 3.30 teaching* *Before/ after classes 2h self study at home weekly preparing lessons, exercises, speaking session, etc. private study, including oral tests and examination preparation/ correcting exams and preparing next sessions..*
Credit points	*2*
Requirements according to the examination regulations	*Oral exams: check students ability and skills in terms of communicating easily in work life* *Written exams: evaluate students' writing skills and grammar mainly technical engineering writing.*
Recommended prerequisites	*E.g. existing competences in speaking and writing technically in the field.*

Module objectives/intended learning outcomes	*Help students communicate in English in real-life work situation to acquire the key communication skills they will need in their future working life.* *All units are about helping students communicate in eng real life work situations. The priority is enabling them to do so more effectively and with confidence.* *The course recognizes that, With so many businesses now being staffed by people of different nationalities there is an increasing trend towards using English as the language of internal communication in many organisations.as well as learning appropriate language for communicating externally. With clients, suppliers; colleagues….* *The main emphasis is o the students speaking and trying out the target language in meaningful and authentic ways to activate students' interest and encouraging them to talk spontaneously.*
Content	*Shaping **soft skills** through speaking activities/ video reviews/ listening/ communicative / interactive approach/ case studies*
Study and examination requirements and forms of examination	*Assess students' acquisition in terms of:* *Speaking/ listening* *Communicating/ interacting* *Reading/ understanding* *Writing* *Evaluation done via non-conventional tests.*
Media employed	*Videos: data show/ JBL/smart phones*
Reading list	*Business results teacher's book/ student book*

Economy & Management Module Handbook

Module designation	***Economy & Management***
Module level, if applicable	*1st year aeronautical engineering cycle*
Code, if applicable	*SC02*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Dr. Soukaina FERSI*
Lecturer	*Dr. Soukaina FERSI*
Language	*French*
Relation to curriculum	*For all programmes*
Type of teaching, contact hours	*All hourly load: 21 hours per semester* ▪ *Lectures: 70%* ▪ *Exercises and Assignments: 30%*
Workload	*2.5 hours per week.*
Credit points	*2*
Requirements according to the examination regulations	*A student must have attended at least 75% of the lectures to sit in the exams.*
Recommended prerequisites	*Management course*
Module objectives/intended learning outcomes	▪ *Ensure the opening of engineering students on economic problems* ▪ *Know the basic economic vocabulary* ▪ *Train engineering students on the economic and social environment* ▪ *• know the methods of analysis in Management*

Content	*CHAP 1. INTRODUCTION TO ECONOMICS* *1.1. Definitions of economics* *1.2. Founding elements of the economy* *1.3. Economic analysis methods* *1.4. The economic model* *CHAP 2. THE MAIN CURRENTS OF ECONOMIC THOUGHT* *2.1. The preclassicals* *2.2. The classic current* *2.3. The Keynesian Current* *2.4. Neoclassicals* *2.5. The contemporaries* *CHAP 3. ECONOMIC FUNCTIONS* *3.1. The consumption function* *3.2. The savings function* *3.3. The investment function* *CHAP 4. MECHANISMS OF PRODUCTION AND DISTRIBUTION* *4.1. The production curve* *4.2. Average and marginal productivities* *4.3. Marginal utility* *CHAP 5. METHODS OF ANALYSIS IN MANAGEMENT* *5.1. Cost, volume, profit (break-even point)* *5.2. Introduction to financial analysis* *5.3.The ratios (solvency, profitability, liquidity, etc.)*
Study and examination requirements and forms of examination	*Midterms examination (40%) and Final examination (60%).*
Media employed	*Whiteboard, data show, laptop computer.*
Reading list	*1- Gregory N. Mankiw • Mark P. Taylor, Principes de l'économie. Traduction de la 3e édition anglaise par Élise Tosi. 4e édition, Ouvertures Economiques. Deboeck supérieur.* *2- Nouri CHTOUROU, Courses of principles of economy, Faculty of Economics and Management of Sfax.* *3- Mme Kamoun Rym et Mme Ben Ammar Salima. Introduction générale à la gestion. Université Libre de Tunis.*

A3.4 Semester 3 Modules' Handbook

Aircraft structures Module Handbook

Module designation	*Aircraft Stuctures*
Module level, if applicable	*2nd level in Aeronautic engineering cycle*
Code, if applicable	*AS01*
Subtitle, if applicable	
Courses, if applicable	*Aircraft Stuctures*
Semester(s) in which the module is taught	*Semester1*
Person responsible for the module	*Prof Moez CHAFRA*
Lecturer	*Prof Moez CHAFRA*
Language	*French*
Relation to curriculum	*This is an annual course taught for 4th grade classes. It is compulsory for the aeronautical engineering curriculum. It is in relation with simulation, sizing of aircraft structures and fatigue of materials.*
Type of teaching, contact hours	*Lecture: 3h per group (20 students) and per week*
Workload	*5 hours per week*
Credit points	*3*
Requirements according to the examination regulations	*documents not authorized*
Recommended prerequisites	*have knowledge about:* *beams concept* *fundamental hypotheses of beam theory* *matrix calculation* *solid mechanics*

Module objectives/intended learning outcomes	*Knowledge:* *-understand the structure of an airplane and know its different components.* *-to know the architectures of the aircraft and the solicitations to which they are subjected during the different phases of flight.* *-understand the dynamics of aeronautical structures and understand their vibration behavior.* *Skills:* *-be able to do calculations of verification and sizing of the various elements of the aircraft based on the theory of beams, lattices and plates and hulls.* *-be able to do certain calculations (difficult to do analytically) using finite element codes (Ansys).* *Competences:* *-Realization of mini-simulation projects.* *-Problem solving of damaged structures.*
Content	*CHAP 1 AIRCRAFT STRUCTURE* *CHAP 2 PLANAR HYPERSTATIC STRUCTURES* *2.1 Position of the problem of hyperstaticity* *2.2 The energy theorems: maxwell-betti, catigliano, ptv* *CHAP3 ARTICULATED SYSTEMS : LATTICE STRUCTURES* *3.1 General and classification of articulated systems* *3.2 Properties of articulated systems and isostaticity conditions* *3.3 Calculation of the forces in the isostatic structures:* *node method/cut method* *PRACTICAL WORK :* *Evaluate the efforts in a cross-linked structure by different methods (experience, calculation* *Determine relative deformations and stress states in structures often* *Verification of the principle of superposition on such a structure.* *Confrontation and comparison of the three methods of estimating deformation.*
	In this workshop, we propose to study beam structures subjected to simple stresses and then validate their strength.

Study and examination requirements and forms of examination	*-After each course or part of a course the knowledge is tested. - The most common form of examination is the written exam,* *-Other forms, such as the oral examination, project work, laboratory session or essay writing, are also used.* *Student will receive information about examination and grading at the beginning of each course.*
Media employed	*P-C video-projector*
Reading list	*- Maquoi R., Mécanique des structures –première partie- Notes de cours destinées aux étudiants de 3ème Bachelier Génie Civil, Université de Liège –Faculté des sciences appliquées, 2008.* *- Megson T. H., Structural and stress analysis, British library cataloguing in publication data, 1996.* *- Nash W. A., Theory and problems of strength of materials. 4th Ed. McGraw-Hill, New York, 1998.* *- Philippe B., Mécanique des Structures, ENPC, 2008.*

Propulsion Module Handbook

Module designation	*Propulsion (Aircraft Preliminary Design)*
Module level, if applicable	*2nd year Aeronautical engineering cycle*
Code, if applicable	*AS02*
Subtitle, if applicable	*-*
Courses, if applicable	*-*
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Mr TAREK NEJAH*
Lecturer	*Mr TAREK NEJAH*
Language	*English / French*
Relation to curriculum	*Compulsory*
Type of teaching, contact hours	*Lecture and Matlab coding and simulations* *1.5 contact hours per week. A total of 21 hours per semester*
Workload	*3 hours per week*
Credit points	*2*
Requirements according to the examination regulations	*Midterm Exam* *Final Term Exam*
Recommended prerequisites	*Aerodynamics and Matlab coding*
Module objectives/intended learning outcomes	*This course will help the student to get familiar with the very first steps of Aircraft Design (Preliminary Design).* *After this course, the student should be capable of:* *- Estimating the MTOW of any aircraft belonging to any category* *- Estimating the Wing loading and the Power Loading or the Thrust to Weight ratio of any aircraft belonging to any*

	category. *- Computing the required Wing Area and the required Engine Power or Thrust for any type of Aircraft.*
Content	*CHAP1 INTRODUCTION* *CHAP2 MAXIMUM TAKE-OFF WEIGHT ESTIMATION* *2.1. The General Technique* *2.2. Weight Build-up* *2.3. Payload Weight* *2.4. Crew Weight* *2.5. Fuel Weight* *2.6. Empty Weight* *2.7. Practical Steps of the Technique* *CHAP3 WING AREA AND ENGINE SIZING* *3.1. Summary of the Technique* *3.2. Stall Speed* *3.3. Maximum Speed* *3.4. Take-Off Run* *3.5. Rate of Climb* *3.6. Ceiling* *3.7. Design Examples*
Study and examination requirements and forms of examination	*Midterm Exam* *Final Term Exam*
Media employed	*Data show / laptops / Magnetic Board*
Reading list	*None*

Turbo Reactors Module Handbook

Module designation	*Turbo Reactor*
Module level, if applicable	*2nd level in Aeronautic engineering cycle*
Code, if applicable	*AS03*
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	*Semester1*
Person responsible for the module	*Mr TAREK NEJAH*
Lecturer	*Mr TAREK NEJAH*
Language	*English / French*
Relation to curriculum	*Compulsory*
Type of teaching, contact hours	*Lecture and Matlab coding and simulations* *3h per week*
Workload	*5 hours per week*
Credit points	*3*
Requirements according to the examination regulations	*Midterm Exam* *Final Term Exam*
Recommended prerequisites	*Thermodynamics and Fluid Mechanics.*
Module objectives/intended learning outcomes	*The purpose of this course is to increase the student's knowledge of aircraft propulsion systems and their operating characteristics.* *This course presents aerospace propulsive devices as systems, with functional requirements and engineering and environmental limitations along with requirements and limitations that constrain design choices.* *At the end of this course, the student should be able to:* - *List and explain the characteristics and performance of aerospace propulsion systems.* - *Understand the working principle of gas turbine engines.* - *Understand thermodynamics and performance characteristics of gas turbine engines.* - *List the different types of jet engines.* - *Explain the different performance metrics, and the Corresponding performance limits, for gas turbine aeroengines and link these to the design features.* - *Separately understand the principle of operation of every single part in a jet engine.* - *Calculate the design thrust and overall efficiency of*

	turbojet and turbofan engines, with and without afterburners, from given component performance. - *Calculate pressure and temperature changes across the turbo machinery.*
Content	*CHAP1 OVERVIEW OF THERMODYNAMICS.* *CHAP2 OVERVIEW OF PROPULSION.* *2.1. Aircraft propulsion, configuration and components.* *2.2. Aircraft engine modelling; turbojet engine.* *2.3. Gas Turbine Engine Theory.* *2.4. Principles, Types, and Theory of Gas-turbine Engines.* *2.5. Gas Turbine-engine Performance and Efficiency.* *2.6. Major parts of gas-turbine engines.* *2.7. Turbojet engines (cont.), design parameters, mass flow and thrust.* *2.8. Jet engines performances, parts and subparts.* *CHAP3 TURBOFAN ENGINES* *CHAP4 INLETS OR DIFFUSERS* *CHAP5 EXHAUST NOZZLES* *CHAP6 COMPRESSORS AND FANS* *6.1. Compressor performances, blades and design.* *6.2. Turbines characteristics, solidity, mass flow, blade temperature, etc...* *CHAP7 ENGINE STRUCTURES* *CHAP8 COMBUSTORS AND AFTERBURNERS.* *8.1. Propeller theory, controls, instruments, classification,etc...*
Study and examination requirements and forms of examination	*Midterm Exam* *Final Term Exam*
Media employed	*Data show / laptops / Magnetic Board*
Reading list	*None*

AVIONIC SYSTEMS 2 Module Handbook

Module designation	*AVIONIC SYSTEMS 2*
Module level, if applicable	*2nd level in Aeronautic engineering cycle*
Code, if applicable	*AS04*
Subtitle, if applicable	*-*
Courses, if applicable	*On board alerting system (TCAS and EGPWS), data acquisition and recording systems, flight management system, on board weather radar, anti/de-icing systems, FADEC, Hyd and pressurisation control panels, power supply generation.*
Semester(s) in which the module is taught	*Semester1*
Person responsible for the module	*DRIDI SLIM*
Lecturer	*DRIDI SLIM*
Language	*French and English used for the schemes and data sheet*
Relation to curriculum	*AVIONICS MIGHT BE A SPECILIZATION FOR THE STUDENTS FOR THE ACADEMIC RESEARCH*
Type of teaching, contact hours	- *Classe size: 20 students* - *Course projection and exercises* - *Credit hours per course séance: 2h*
Workload	*3h30 per week*
Credit points	*2*
Requirements according to the examination regulations	*Two examinations and test per semester*
Recommended prerequisites	*-*
Module objectives/intended learning outcomes	*Knowledge:* *Familiarity with avionics systems in the aircraft, knowledge of relating ICAO standards* *Skills:* *Cognitive abilities for which knowledge of avionics systems and architecture in the aircraft is used* *Competences:* *Integration of knowledge, skills and social and methodological capacities in maintenance organization and aircrafts operator*

Content	*ON BOARD ALERTING SYSTEM (TCAS AND EGPWS)* *DATA ACQUISITION AND RECORDING SYSTEMS* *FLIIGHT MANAGEMENT SYSTEM* *ON BOARD WEATHER RADAR* *ANTI/DE-ICING SYSTEMS* *FADEC* *HYD AND PRESSURISATION CONTROL PANELS* *POWER SUPPLY GENERATION*
Study and examination requirements and forms of examination	*Two examinations and test per semester*
Media employed	-
Reading list	-

Finite Elements Method (FEM) Module Handbook

Module designation	Finite Elements Method (FEM)
Module level, if applicable	*2nd year aeronautical engineer cycle*
Code, if applicable	*ME03*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Amine.Karoui.*
Lecturer	*Amine. Karoui*
Language	*French*
Relation to curriculum	
Type of teaching, contact hours	*Lesson and practical: 20 students/class* *21 H courses + 28 H Practical works*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*Not authorized documents*
Recommended prerequisites	*Basic mathematical tools.*
Module objectives/intended learning outcomes	*- Initiation to numerical methods for partial differential equation resolution.* *- Understanding the principle of finite element method and how to implement it* *- To be able to evaluate analytical solution obtained by finite element method..*

Content	*CHAP 1 MOTIVATION AND OBJECTIVES OF FINITE ELEMENT METHOD* *1.1 Motivation : physical example* *1.2 Initial conditions and boundary conditions* *1.3 Formulation of the typical problem* *CHAP 2 VARIATIONAL FORMULATION* *2.1 Variational formulation of the 1d problem* *2.2.Green formula and variational formulation fo the 3d problem* *2.3.Treatment of the non-homogeneous dirichlet boundary condition* *2.4.The galerkin method* *CHAP 3 MESH AND PROBLEM DISCRETIZATION* *3.1 degrees of freefom* *3.2 domain meshing* *3.3 shape functions* *3.4 global PROBLEM ASSEMBLY* *CHAP 4 SOME USUAL FINITE ELEMENTS* *4.1 Lagrange elements for 1d, 2d and 3d problems* *4.2 Hermite elements* *4.3 Isoparametric elements*
Study and examination requirements and forms of examination	*02 Exams and practical works evaluation*
Media employed	-
Reading list	-

Workshop Computer Aided Design CAD Module Handbook

Module designation	*Workshop Computer Aided Design CAD*
Module level, if applicable	*2nd year Aeronautical Engineering cycle*
Code, if applicable	*ME04*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	Mohamed CHOUCHENE
Lecturer	Mohamed CHOUCHENE
Language	French
Relation to curriculum	*CAD (computer aided Design) has had a major influence on many industries, it has been particularly revolutionary in the field of product design.* *to better understand aircraft's performances besides to assess new design concept aeronautical structures*
Type of teaching, contact hours	2 contact hours. A total of 28 hours per semester
Workload	*3 hours per week*
Credit points	*2*
Requirements according to the examination regulations	Not authorized documents
Recommended prerequisites	Mechanical Design
Module objectives/intended learning outcomes	**Knowledge:** Become familiar with the tools and techniques of mechanical part design with CATIA. **Skills:** Make a part with the Revolution function. **Competences:** Master the transformation and dressing tools. Be able to communicate and present obtained knowledge.

Content	TP1 : DESIGN OF THE PARAMETRIC PARTS TP2 : THE DESIGN TECHNIQUE BY PART BODY TP3: THE BOOLEAN FUNCTIONS TP4 : INITIATION ON ASSEMBLY DESIGN CATIA V5 TP5 : APPLICATION OF ASSEMBLY CONSTRAINTS TP6 : CINEMATIC STUDY ON CATIA TP7 : OVERALL DRAWING DEVELOPMENT
Study and examination requirements and forms of examination	Mid-terms examination (40%) and Final examination (60%).
Media employed	Projectors (Epson), Whiteboard and Handouts
Reading list	--

Workshop NDT (Non Destructive Testing) Module Handbook

Module designation	Workshop NDT (Non Destructive Testing)
Module level, if applicable	2nd year aeronautical engineering cycle
Code, if applicable	*ME05*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	Semester 1
Person responsible for the module	Dr. BEN JABER Nader
Lecturer	Dr. BEN JABER Nader
Language	French
Relation to curriculum	compulsory
Type of teaching, contact hours	2 contact hours. A total of 08 hours per semester
Workload	*3 hours per week*
Credit points	*2*
Requirements according to the examination regulations	not authorized documents
Recommended prerequisites	----------
Module objectives/intended learning outcomes	*Knowledge:* *Understand the origin and type of defects that can be controlled.* *Skills:* *Be able to choose a control method for a given defect.* *Competences:* *Master the principle of control of volume defects by radiography and ultrasound.* *Master the principle of control of surface defects by the techniques of: magnetoscopy, eddy current and bleeding.*

Content	*CHAP1 MOTIVATIONS AND OBJECTIVES OF THE CND* *1.1. The defects: types and nature* *1.2. The choice of a control method* *1.3. Non destructive testing techniques* *1.4. Examples of faults* *CHAP2 X-RAYAND GAMMA* *2.1. Electromagnetic radiation* *2.2. Attenuation of X-rays and Gamma* *2.3. Principle of radiographic control* *CHAP3 SNAPSHOT* *3.1 Radiant image and radiographic films* *3.2 Capacities and limitations of the method* *CHAP4 ULTRASOUND* *4.1 Nature and propagation* *4.2 Absorption of US by matter* *4.3 Transmission of US* *CHAP5 DETECTION OF SUPERFICIAL DEFECTS* *5.1 Magnetic* *5.2 Eddy currents*
Study and examination requirements and forms of examination	Mid-terms examination (40%) and Final examination (60%).
Media employed	projectors (Epson), Whiteboard and handouts
Reading list	----------

Automatic Control Module Handbook

Module designation	*Automatic Control*
Module level, if applicable	*2nd year aeronautical engineering cycle*
Code, if applicable	*EL05*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Rahma SMAILI*
Lecturer	*Dr. Rahma SMAILI*
Language	*French*
Relation to curriculum	
Type of teaching, contact hours	*1h30 of contact lessons*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*Not authorized documents*
Recommended prerequisites	*Basic information on system modelling, linear, non linear systems…*

Module objectives/intended learning outcomes	*Knowledge:* *Students learn the concept and types of systems. This module mainly covers:* - *The basic Terminologie of automatic control systems.* - *The different elements of closed loop control systems.* - *How to model a system.* - *Getting familiar with performances of control system.* - *The block diagram of a closed loop control system.* - *How to use Laplace transform to find transfer function.* - *The response of system (first and second order) in time domain.* - *The response of system in frequency domain (Bode plots, Nichols plots and Nyquist plots).* - *Various types of controllers.* - *The frequency and time synthesis of control systems.* *Skills:* - *Students make a difference between orders of systems.* - *They know tools to determine system performances (rapidity, stability and precision).* *Competences:* - *Students are able to model various types of systems with a transfer function.* - *They are able to plot and analyse response of system in time and frequency domain.* - *They know how to ameliorate performances of system by introducing a suitable controller.*

Content	*CHAP 1:CONCEPT OF CONTROL SYSTEMS* *1.1 Introduction* *1.2 Automatic control loop* *1.3 Systems Modeling* *1.4 Features of a dynamic control system* *CHAP 2: MATHEMATICAL DESCRIPTION OF PHYSICAL SYSTEMS* *2.1 Systems classification* *2.2 Description of linear continuous invariant systems (LCIS)* *2.3 Resolution of differential equations* *2.4 Laplace transform* *2.5 Transfer Function* *CHAP 3 : BLOCK DIAGRAM* *3.1 Definition* *3.2 Formalism* *3.3 Application* *CHAP 4 `: FIRST ORDER SYSTEMS* *4.1 Definition* *4.2 Response of a first order system with canonical signals* *4.3 Generalized first order system*
Study and examination requirements and forms of examination	*At least two tests* *A mid-semester written exam* *A written exam*
Media employed	*Whiteboard*
Reading list	-

Signal Processing Module Handbook

Module designation	*Signal processing*
Module level, if applicable	*2nd year aeronautical engineering cycle*
Code, if applicable	*EL06*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Mohamed Ktari*
Lecturer	*Mohamed Ktari*
Language	
Relation to curriculum	*Application area:* *- Transmission of analog (AM, PM and FM) and digital (ASK, PSK, FSK and QAM) signals,* *- Automatic,* *- DSP: Digital Signal Process,* *- Embedded systems,* *- Mecatronics systems.*
Type of teaching, contact hours	Hours of contact: - 1 h30 lesson and tutorials for each week, - 2 hours of practical work for each week. 18 is the number of students per class both in class and practical work.
Workload	*5.5 hours per week*
Credit points	*3*
Requirements according to the examination regulations	Continuous Control Rating and Final Exam Rating
Recommended prerequisites	Applied mathematics, signals and system, automatic: continuos and discret linear servo-systems.

Module objectives/intended learning outcomes	*Knowledge:* *- Distinguish the different types of analog and digital signals,* *- Distinguish the properties of a signal: Fourier series and Fourier transform,* *- Know the concept of filtering: Convolution and correlation.* *- Sampling techniques: Shanon's theory,* *- TFD: Discrete Fourier Transform,* *- Know the concept of digital filtering: RIF and RII.* *Skills:* *- Master the signal filtering techniques: template of an analog filter low pass, high pass and pass band,* *Competences:* *- The students are able to design and develop simple and useful systems* *- They are able to solve complex problems* *- The unit prepares students to undertake future studies in Signal processing/Communication Engineering.*

Content	**CHAP 1 Generalities** 1.1. Signal Generalies 1.2. Fields of signal processing applications, 1.3. Signal classification, 1.4. Base signals and basic operation. **CHAP 2 Continuous time deterministic signals** 2.1. Temporal and frequency representation (notion on amplitude and phase spectral), 2.2. Real and complex Fourier series development (notion of the uni and bi lateral spectrum), 2.3. Fourier transform of the continuous signals and its properties, the temporal truncation and the periodization of a signal on its spectrum, 2.4. Notion of power and energy. 2.5. Convolution product 2.6. Inter-correlation and autocorrelation functions. **CHAP 3 Continuous time deterministic signal filtering** 3.1. Filtering of finite energy and finite power signals, 3.2. Ideal filters, 3.3. Linearity, 3.4. Stationarity 3.5. Causality 3.6. Filter stability. **CHAP 4 AM analog amplitude modulation** 4.1. Spectral analysis of an AM signal 4.2. Notion of transmission power 4.3. Spectral analysis of AM signals with carrier 4.4. AM-DSB and AM-SSB. **CHAP 5 Digital Systems** 5.1. Equipping and digital conversion ADC digital and digital analog DAC, 5.2. Discrete Fourier Transform TFD and Fast Fourier Transform FFT: Kenly Algorithm, 5.3. Digital systems: Z-transform, RIF digital filtering and RII.
Study and examination requirements and forms of examination	Continuous control with a final exam for evaluation.
Media employed	- Integrated course, tutorials, slide projection, internet ... - Software: Mathworks, Matlab, ISIS ...
Reading list	- Book Signals and systems Eyrolles-Paris bookstore, - DUNOD Signal Processing Work, - DUNOD Signal Processing and Data Acquisition. - Work Analog and digital signal processing Technosup Eyrolles-Paris bookstore.

Embedded Systems Module Handbook

Module designation	*Embedded Systems STM32*
Module level, if applicable	*2nd year of the aeronautical engineering cycle*
Code, if applicable	*EL07*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*1st semester*
Person responsible for the module	*Dr. Ibtissem Malouche*
Lecturer	*Dr. Ibtissem Malouche*
Language	*French*
Relation to curriculum	*This course introduces students to the C programming and helps mastering advanced microcontrollers architectures with low level drivers and basic applications developments*
Type of teaching, contact hours	*Lecture and practical: 3h per group (16 students) per week*
Workload	*2 hours of private study per week. A total of 28 hours per year*
Credit points	*3*
Requirements according to the examination regulations	*Authorized documents and internet access*
Recommended prerequisites	*Knowledge in the fundamentals of embedded C programming, Embedded systems and electronics basics is appreciated.*
Module objectives/intended learning outcomes	*Knowledge: The unit objective is mastering embedded C language with hints and tricks. Students will gain an understanding of 32 bits microcontrollers' drivers' and basic applications developments.* *Skills:* *Fundamental skills will be gained in the analysis, modelling and implementation of embedded applications.* *Competences:* *-Students will be able to address practical aspects* *-The unit prepares students to undertake future studies in more complex microcontroller's architecture with higher performances (such as multi-processors).*

Content	*CHAP 1: C PROGRAMMING HINTS AND TRICKS* *-Pointers* *-Tables* *-C Functions* *-Data structures* *-Bit manipulation* *-Scope of the variables* *-Preprocessor* *CHAP 2: CORTEXM3/CORTEX M4* *- Cortex-M3 vs Cortex-M4* *- Bit-Banding* *-Thumbs16 and 32* *-Instruction set* *-TailChaining* *- NVIC* *- SystickTimer* *- DMA* *- Matrix Bus, AHB and APB10.* *- Debug module : compare Jtag & SWD11.* *- Role of CMSIS* *CHAP 3: LOW LEVEL DRIVERS DEVELOPMENTS* *-GPIO* *-CRC* *-ADC* *-TIMER* *-RNG* *-WWDG* *CHAP 4: BASIC APPLICATION DEVELOPMENT (BASED ON LOW LEVEL DRIVERS)* *-LED Toggle* *-Different analog signals conversion* *-PWM signal generation (different frequencies and duty cycles)* *- Rundom number generator* *- Checksum verification*
Study and examination requirements and forms of examination	*At least two tests of about 20 minutes* *A final written exam of at least 1.5h*
Media employed	*Video projector* *Booklets for theoretical exercises* *Computers Internet*
Reading list	*STM32 Discovery Firmware user guide* *STM32F4 Programming manual* *STM32F407 Datasheet/ErrataSheet* *STM32F4 Reference Manual* *Cortex M4 Technical Reference Manual* *Cortex M- Hitex Insider Guide*

UML programming Module Handbook

Module designation	*UML Programming*
Module level, if applicable	*2nd year aeronautical engineering cycle*
Code, if applicable	*CP07*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Asma Ben Ahmed*
Lecturer	*Asma Ben Ahmed*
Language	*French*
Relation to curriculum	*UML programming provides a recognized tool for practical training of students in understanding and visualizing software design. Students will be then able to manage and design problems and projects using UML.*
Type of teaching, contact hours	*2 hours of contact with students per group and per week.* *20 students per group for lectures and practical courses.*
Workload	*3 hours per week*
Credit points	*2*
Requirements according to the examination regulations	*Unauthorized documents and unauthorized internet access*
Recommended prerequisites	*Familiarity and minimal knowledge with basic notions of software engineering and object oriented programming*
Module objectives/intended learning outcomes	- *Knowledge: Students know the fundamental principles and the key concepts of the UML design. Students know when and how to use the most important UML diagrams.* - *Skills: Students know how to design diagrams using UML paradigm.* - *Competences: Students are able to analyse and design problems and projects using UML.*

Content	***CHAP 1: Generalities: Development cycles and design methodology*** *1.1. Information system* *1.2. Software development cycle* *1.3. UML and its diagrams* *1.4. UML views of a system* *1.5. Contribution of UML modeling* ***CHAP 2 : Use case diagram*** *2.1. Use case diagram* *2.2. Basic elements* *2.3. Actor, use case* *2.4. Generalization between actors* *2.5. Use case relationships: inclusion, extension, generalization* *2.6. Textual description of use cases* ***CHAP 3 : Class diagram, Object diagram*** *3.1 Class diagram: definition, purpose of class and object concept* *3.2 Class characteristics* *3.3 Visibility of attributes and methods* *3.4 Relationship between class and multiplicities* *3.5 Aggregation, composition and generalization* ***CHAP 4 : Interaction diagram*** *4.1 Definition, objective, notation* *4.2 Concept of messages* *4.3 Types of messages* *4.4 Control structures (ALT, LOOP, ...)* ***CHAP 5 : Activity diagram*** *5.1. Activity diagram: definition, purpose* *5.2. Activities, connections* *5.3. Conditional connection, parallel ...* *5.4. Building an activity diagram* ***CHAP 6 : Transition-state diagram*** *6.1. Transition state diagram: definition, purpose* *6.2. State* *6.3. Event, transition* *6.4. Action* *6.5. Dynamics of a state*
Study and examination requirements and forms of examination	*At least two tests of about 20 minutes* *A mid-semester written exam of at least 1h30* *A written exam of at least 1h30*
Media employed	*Data show, videos* *Booklet for theoretical exercises, booklet for practical session, Computers*

Reading list	*'UML 2.0' by Martin Fowler* *'Unified Modelling Language: Systems Analysis, Design and Development Issues' by Halpin, Terry* *'Object-Oriented Analysis and Design Through Unified Modelling Language' by Gandharba Swain*

English Module Handbook

Module designation	*English*
Module level, if applicable	*2nd level in Aeronautic engineering cycle*
Code, if applicable	*SC03*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester1*
Person responsible for the module	*Samia Ben Salah.*
Lecturer	*Samia Ben Salah.*
Language	*English*
Relation to curriculum	*Teach students how to communicate in their professional lives/ it provides real world business: it addresses the language and communication needs of employees at all levels of an organisation who need to use English at work in a global environment the whole book focuses primarily on shaping effectively students' soft skills*
Type of teaching, contact hours	*Contact hours: 1.30h/ week* *class size: it should be no more than 20 students teaching method: speaking/ listening/ writing/ reading/ oral presentations/ role plays/ brainstormings/ interactions and communication/ case studies*
Workload	*Workload: 3h30* *Before/ after classes 2h self study at home weekly preparing lessons, exercises, speaking session, etc. private study, including oral tests and examination preparation/ correcting exams and preparing next sessions..*
Credit points	*2*
Requirements according to the examination regulations	*Oral exams: check students ability and skills in terms of communicating easily in work life* *Written exams: evaluate students' writing skills and grammar mainly technical engineering writing.*
Recommended prerequisites	*E.g. existing competences in speaking and writing technically in the field.*

Module objectives/intended learning outcomes	*Help students communicate in English in real-life work situation to acquire the key communication skills they will need in their future working life.* *All units are about helping students communicate in eng real life work situations. The priority is enabling them to do so more effectively and with confidence.* *The course recognizes that, With so many businesses now being staffed by people of different nationalities there is an increasing trend towards using English as the language of internal communication in many organisations.as well as learning appropriate language for communicating externally. With clients, suppliers; colleagues….* *The main emphasis is o the students speaking and trying out the target language in meaningful and authentic ways to activate students' interest and encouraging them to talk spontaneously.*
Content	*Careers/ change /risk / teamwork / progress* *Shaping soft skills through speaking activities/ video reviews/ listening/ communicative / interactive approach/ case studies*
Study and examination requirements and forms of examination	*Assess students' acquisition in terms of:* *Speaking/ listening* *Communicating/ interacting* *Reading/ understanding* *Writing* *Evaluation done via non-conventional tests.*
Media employed	*Videos: data show/ JBL/smart phones*
Reading list	*Business results teacher's book/ student book*

Air transport Economy Module Handbook

Module designation	Air transport Economy
Module level, if applicable	2nd year aeronautical engineering cycle
Code, if applicable	*SC04*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	Semester 1
Person responsible for the module	Dr. Soukaina FERSI
Lecturer	Dr. Soukaina FERSI
Language	French
Relation to curriculum	For all programmes
Type of teaching, contact hours	All hourly load: 21 hours per semester ▪ Lectures: 70% ▪ Presentations by students (mini-projects): 30%
Workload	*2.5 hours per week*
Credit points	*2*
Requirements according to the examination regulations	A student must have attended at least 75% of the lectures to sit in the exams.
Recommended prerequisites	Management course
Module objectives/intended learning outcomes	▪ Acquire a general culture on transport and the economy applied to transport ▪ Deepen certain aspects of the transport economy ▪ Make the link between (economic) theory and the reality of (transportation)

Content	**CHAP 1. *TRANSPORT IN ECONOMICS*** *1.1. The different modes of transport* *1.2. Transportation in economic growth* *1.3. The externalities of the transport sector* *1.4. External costs of the transport sector* *1.5. Transport and endogenous growth* ***CHAP 2. MONOPOLY AND PUBLIC SERVICE*** *2.1. The principle of optimal allocation* *2.2. Pricing of monopolies* *2.3. Public monopoly, or regulated private monopoly* *2.4. Different pricing methods* ***CHAP 3. MODES OF TRANSPORT (MINI-PROJECTS)*** *3.1. Road transport* *3.2. Rail transport* *3.3. Maritime transport* *3.4. Air transport*
Study and examination requirements and forms of examination	Mid-terms examination (40%) and Final examination (60%).
Media employed	Whiteboard, data show, laptop computer.
Reading list	4- Mathias Reymond, Economie des transports, M1 : Course. 5- Gregory N. Mankiw • Mark P. Taylor, Principes de l'économie. Traduction de la 3e édition anglaise par Élise Tosi. 4e édition, Ouvertures Economiques. Deboeck supérieur. 6- Martin Koning, Economie des transports. Cours, Master TLTE - Université Paris 4, Année 2016 – 2017.

A3.5 Semester 4 Modules' Handbook

Aircraft structures Module Handbook

Module designation	*Aircraft Stuctures*
Module level, if applicable	*2nd level in Aeronautic engineering cycle*
Code, if applicable	*AS01*
Subtitle, if applicable	
Courses, if applicable	*Aircraft Stuctures*
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Prof Moez CHAFRA*
Lecturer	*Prof Moez CHAFRA*
Language	*French*
Relation to curriculum	*This is an annual course taught for 4th grade classes. It is compulsory for the aeronautical engineering curriculum. It is in relation with simulation, sizing of aircraft structures and fatigue of materials.*
Type of teaching, contact hours	*Lecture: 3h per group (20 students) and per week* *Laboratory session: 3h per group every two weeks (semester 2)*
Workload	*7.5 hours per week*
Credit points	*3*
Requirements according to the examination regulations	*documents not authorized*
Recommended prerequisites	*have knowledge about:* *beams concept* *fundamental hypotheses of beam theory* *matrix calculation* *solid mechanics*

Module objectives/intended learning outcomes	*Knowledge:* *-understand the structure of an airplane and know its different components.* *-to know the architectures of the aircraft and the solicitations to which they are subjected during the different phases of flight.* *-understand the dynamics of aeronautical structures and understand their vibration behavior.* *Skills:* *-be able to do calculations of verification and sizing of the various elements of the aircraft based on the theory of beams, lattices and plates and hulls.* *-be able to do certain calculations (difficult to do analytically) using finite element codes (Ansys).* *Competences:* *-Realization of mini-simulation projects.* *-Problem solving of damaged structures.*
Content	*CHAP1 STUDY OF PLATES AND SHELLS* *1.1. Surface theory* *1.2. The love-kirchhoff model* *1.3. The reissner-bollé-mindlin model* *CHAP2 RESISTANCE STUDY AND SIZING CALCULATION OF SOME AIRCRAFT STRUCTURES* *2.1. Sizing of wing structures* *2.2. Sizing of the empennage structures* *2.3. Sizing of the landing gear* *CHAP3 STRUCTURAL DYNAMICS: MODAL ANALYSIS* *PRACTICAL WORK:* *In design, there are no theories that allow us to dimension a structure beforehand. Indeed, the theories used only allow the verification of resistance and therefore assume that the problem is defined from the beginning, i.e. that the geometry, connections, stresses and materials are already known. Validation generally depends on the criterion applied (Von-Mises, Tresca, etc.) and the level of acceptance (safety factor).*
	In this workshop, we propose to study beam structures subjected to simple stresses and then validate their strength.

Study and examination requirements and forms of examination	*-After each course or part of a course the knowledge is tested. - The most common form of examination is the written exam,* *-Other forms, such as the oral examination, project work, laboratory session or essay writing, are also used.* *Student will receive information about examination and grading at the beginning of each course.*
Media employed	*P-C video-projector*
Reading list	*- Maquoi R., Mécanique des structures –première partie- Notes de cours destinées aux étudiants de 3ème Bachelier Génie Civil, Université de Liège –Faculté des sciences appliquées, 2008.* *- Megson T. H., Structural and stress analysis, British library cataloguing in publication data, 1996.* *- Nash W. A., Theory and problems of strength of materials. 4th Ed. McGraw-Hill, New York, 1998.* *- Philippe B., Mécanique des Structures, ENPC, 2008.*

Flight Mechanics Module Handbook

Module designation	*Flight Mechanics*
Module level, if applicable	*2nd year Aeronautical engineering cycle*
Code, if applicable	*AS02*
Subtitle, if applicable	*-*
Courses, if applicable	*-*
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Mr TAREK NEJAH*
Lecturer	*Mr TAREK NEJAH*
Language	*English / French*
Relation to curriculum	*Compulsory*
Type of teaching, contact hours	*Lecture and Matlab coding and simulations,* *3 contact hours*
Workload	*4 hours per week*
Credit points	*2*
Requirements according to the examination regulations	*Midterm Exam* *Final Term Exam*
Recommended prerequisites	*Aerodynamics and Matlab coding*
Module objectives/intended learning outcomes	*This course will help the student to get familiar with the basics And fundamentals of Flight Mechanics for Subsonic, Transonic and Supersonic flight.* *After this course, the student should be capable of:* *- Understanding the different types of manoeuvres an aircraft must be capable of doing (Take-off, Climb, Cruise, Descent, Landing, Turns, etc...).* *- Mastering the necessary basics and fundamentals of Flight Mechanics that are required for Aircraft*

	Engineering and Design.
Content	*BASIC AERODYNAMICS, PROPULSION AND FLIGHT VEHICLE PERFORMANCE* *Flight Vehicle Performance, Aircraft Equations of Motion, axis systems, force & moment equations.* *CRUISE, CLIMB AND DESCENT AIRCRAFT EQUATIONS OF MOTION* *AIRCRAFT STATIC STABILITY: CONTROL POWER, LONGITUDINAL STATIC* *Stability and static margin.* *AIRCRAFT STATIC STABILITY: LATERAL AND DIRECTIONAL STATIC STABILITY* *Coordinated turns, wake vortex, nose vortex, spin, etc...* *AIRCRAFT DYNAMIC STABILITY* *Aircraft Dynamic Stability: dihedral effect, vertical tail sizing, end-plates, etc...*
Study and examination requirements and forms of examination	*Midterm Exam* *Final Term Exam*
Media employed	*Data show / laptops / Magnetic Board*
Reading list	*None*

Turbo Reactors Module Handbook

Module designation	*Turbo Reactor*
Module level, if applicable	*2nd level in Aeronautic engineering cycle*
Code, if applicable	*AS03*
Subtitle, if applicable	-
Courses, if applicable	-
Semester(s) in which the module is taught	*Semester 1 and 2*
Person responsible for the module	*Mr TAREK NEJAH*
Lecturer	*Mr TAREK NEJAH*
Language	*English / French*
Relation to curriculum	*Compulsory*
Type of teaching, contact hours	*Lecture and Matlab coding and simulations* *3h per week*
Workload	*5 hours per week*
Credit points	*3*
Requirements according to the examination regulations	*Midterm Exam* *Final Term Exam*
Recommended prerequisites	*Thermodynamics and Fluid Mechanics.*
Module objectives/intended learning outcomes	*The purpose of this course is to increase the student's knowledge of aircraft propulsion systems and their operating characteristics.* *This course presents aerospace propulsive devices as systems, with functional requirements and engineering and environmental limitations along with requirements and limitations that constrain design choices.* *At the end of this course, the student should be able to:* - *List and explain the characteristics and performance of aerospace propulsion systems.* - *Understand the working principle of gas turbine engines.* - *Understand thermodynamics and performance characteristics of gas turbine engines.* - *List the different types of jet engines.* - *Explain the different performance metrics, and the Corresponding performance limits, for gas turbine aeroengines and link these to the design features.* - *Separately understand the principle of operation of every single part in a jet engine.* - *Calculate the design thrust and overall efficiency of*

	turbojet and turbofan engines, with and without afterburners, from given component performance. *- Calculate pressure and temperature changes across the turbo machinery.*
Content	*CHAP1 OVERVIEW OF THERMODYNAMICS.* *CHAP2 OVERVIEW OF PROPULSION.* *8.1. Aircraft propulsion, configuration and components.* *8.2. Aircraft engine modelling; turbojet engine.* *8.3. Gas Turbine Engine Theory.* *8.4. Principles, Types, and Theory of Gas-turbine Engines.* *8.5. Gas Turbine-engine Performance and Efficiency.* *8.6. Major parts of gas-turbine engines.* *8.7. Turbojet engines (cont.), design parameters, mass flow and thrust.* *8.8. Jet engines performances, parts and subparts.* *CHAP3 TURBOFAN ENGINES* *CHAP4 INLETS OR DIFFUSERS* *CHAP5 EXHAUST NOZZLES* *CHAP6 COMPRESSORS AND FANS* *12.1. Compressor performances, blades and design.* *12.2. Turbines characteristics, solidity, mass flow, blade temperature, etc...* *CHAP7 ENGINE STRUCTURES* *CHAP8 COMBUSTORS AND AFTERBURNERS.* *16.1. Propeller theory, controls, instruments, classification,etc...*
Study and examination requirements and forms of examination	*Midterm Exam* *Final Term Exam*
Media employed	*Data show / laptops / Magnetic Board*
Reading list	*None*

AVIONIC SYSTEMS 2 Module Handbook

Module designation	*AVIONIC SYSTEMS 2*
Module level, if applicable	*2nd level in Aeronautic engineering cycle*
Code, if applicable	*AS04*
Subtitle, if applicable	*-*
Courses, if applicable	*On board alerting system (TCAS and EGPWS), data acquisition and recording systems, flight management system, on board weather radar, anti/de-icing systems, FADEC, Hyd and pressurisation control panels, power supply generation.*
Semester(s) in which the module is taught	*Semester1 and 2*
Person responsible for the module	*DRIDI SLIM*
Lecturer	*DRIDI SLIM*
Language	*French and English used for the schemes and data sheet*
Relation to curriculum	*AVIONICS MIGHT BE A SPECILIZATION FOR THE STUDENTS FOR THE ACADEMIC RESEARCH*
Type of teaching, contact hours	- *Classe size: 20 students* - *Course projection and exercises* - *Credit hours per course séance: 2h*
Workload	*3h30 per week*
Credit points	*2*
Requirements according to the examination regulations	*Two examinations and test per semester*
Recommended prerequisites	*-*
Module objectives/intended learning outcomes	*Knowledge:* *Familiarity with avionics systems in the aircraft, knowledge of relating ICAO standards* *Skills:* *Cognitive abilities for which knowledge of avionics systems and architecture in the aircraft is used* *Competences:* *Integration of knowledge, skills and social and methodological capacities in maintenance organization and aircrafts operator*

Content	*ON BOARD ALERTING SYSTEM (TCAS AND EGPWS)* *DATA ACQUISITION AND RECORDING SYSTEMS* *FLIIGHT MANAGEMENT SYSTEM* *ON BOARD WEATHER RADAR* *ANTI/DE-ICING SYSTEMS* *FADEC* *HYD AND PRESSURISATION CONTROL PANELS* *POWER SUPPLY GENERATION*
Study and examination requirements and forms of examination	*Two examinations and test per semester*
Media employed	-
Reading list	-

Workshop Computer Aided Design CAD (Catia) Module Handbook

Module designation	*Workshop Computer Aided Design CAD (Catia)*
Module level, if applicable	*2nd year Aeronautical Engineering cycle*
Code, if applicable	*ET01*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	Dr Mohemed CHOUCHENE
Lecturer	Dr Mohemed CHOUCHENE
Language	French
Relation to curriculum	*CAD (computer aided Design) has had a major influence on many industries, it has been particularly revolutionary in the field of product design.* *To better understand aircraft's performances besides to assess new design concept aeronautical structures*
Type of teaching, contact hours	*2 contact hours per week*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*Not authorized documents*
Recommended prerequisites	*Mechanical Design*
Module objectives/intended learning outcomes	***Knowledge:*** *study and dimensioning of mechanical systems* ***Skills:*** *Extract a sequence of assembly or disassembly of a mechanism and to recognize links from a real mechanism or a drawing* ***Competences:*** *Be able to schematize, describe a mechanism, dimension it, model itand optimize it.*

Content	*TP1 : INITIATION ON THE DESIGN OF SURFACE PARTS ON CATIA V5* *TP2 : DESIGN OF SURFACE PARTS P1* *TP3 : DESIGN OF SURFACE PARTS P2* *TP4 : INITIATION ON THE DESIGN OF SHEET METAL PARTS ON CATIA V5* *TP5 : DESIGN OF SHEET METAL PARTS P1* *TP6 : DESIGN OF SHEET METAL PARTS P2* *TP7 : ELABORATION OF DRAWING AND DEFINITION OF A SHEET METAL PART*
Study and examination requirements and forms of examination	*Mid-terms examination (40%) and Final examination (60%).*
Media employed	*Projectors (Epson), Whiteboard and Handouts*
Reading list	

CFD and numerical analysis under Ansys Module Handbook

Module designation	*Numerical Simulation 1 - ANSYS*
Module level, if applicable	*2nd year Aeronautical Engineering cycle*
Code, if applicable	*ET02*
Subtitle, if applicable	----
Courses, if applicable	----
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Mohamed Montassar Doggui*
Lecturer	---
Language	*French*
Relation to curriculum	*Numerical simulation of aircraft structure is of great interest in aeronautical engineering since it's a practical way to better understand aerodynamics and aircraft's performances besides to assess new design concept for wings and aeronautical structures*
Type of teaching, contact hours	*Practical teaching for 2h per week regarding a class of 22 students*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	-----
Recommended prerequisites	*General Knowledge about aerodynamic and aircraft structure*
Module objectives/intended learning outcomes	***Knowledge:*** *Implementation of the digital tools.* ***Skills:*** *Understanding all necessary steps to resolve a physical problem numerically.* ***Competences:*** *To be able to resolve a sample problem.*

Content	*CHAP1 HANDLING ANSYS/FLUENT* *1.1 The cfd problem and tools* *1.2 Draw the geometry* *1.3 Mesh of the fluid domain* *1.4 Data entry and simulation* *1.5 Post-processing* *CHAP2 OPTIMIZATIONS OF THE 1ST CASE* *2.1 Objectives* *2.2 Mesh optimization* *2.3 Boundary layer mesh* *2.4 Necessary checks* *2.5 Post-processing with paraview* *CHAP3 3D SIMULATION* *3.1 3d geometries under ansys designmodeler* *3.2 Import a cao* *3.3 3d mesh with ansys meshing* *3.4 3d simulation* *3.5 Cfdpost* *3.6 3d with paraview*
Study and examination requirements and forms of examination	*01 test for 2h* *01 exam for 2h*
Media employed	---
Reading list	---

Numerical Simulation2 -ABAQUS Module Handbook

Module designation	Numerical Simulation2 -ABAQUS
Module level, if applicable	*2nd year of aeronautical engineering cycle*
Code, if applicable	*ET03*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Khalil MANSOURI.*
Lecturer	*Khalil MANSOUR*
Language	*French*
Relation to curriculum	
Type of teaching, contact hours	*2 hours per week.*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*Not authorized documents*
Recommended prerequisites	- *Continuum mechanics* - *Heat transfert.* - *Strenght of Materials.* - *Theory of Plate and shells*
Module objectives/intended learning outcomes	*Knowledge:* *-Solve a deformable solid mechanics problem with Abaqus finite element code* *-Ability to model a solid or a thermal problem with Abaqus.* *Skills:* *-Become familiar with the Abaqus tool* *Competences:* *-Be able to communicate and present obtained knowledge.*

Content	*WORKSHOP 1. Approached resolution of equilibrium problems in thermo-elasticity.* *WORKSHOP 2. The concept of isoparametric final element.* *WORKSHOP 3. The finite element method in 2D and 3D.* *WORKSHOP 4. Getting started via single examples of linear elasticity of analysis tools (abaqus): example of 3D beam, 2D problem (plane deformation and plane constraints), interpretation of results (post-processor), analysis of 'fault.* *WORKSHOP 5. Thermal study: cooling a processor (ABAQUS)*
Study and examination requirements and forms of examination	*exam in the end of the semester.*
Media employed	*Pc's with installed Abaqus code*
Reading list	

Workshop Finite Elements Method (FEM) Module Handbook

Module designation	*Workshop Finite Elements Method (FEM)*
Module level, if applicable	*2nd year aeronautical engineering cycle*
Code, if applicable	*ET04*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*A.Karoui.*
Lecturer	*A. Karoui*
Language	*French*
Relation to curriculum	
Type of teaching, contact hours	*Lesson and practical : 20 students/class* *2 hours per week*
Workload	*3 H per week*
Credit points	*2*
Requirements according to the examination regulations	*Not authorized documents*
Recommended prerequisites	*Basic mathematical tools.* *Matlab programming skills (beginner level)*
Module objectives/intended learning outcomes	*Knowledge:* *Implementation of the Finite element method.* *Skills:* *Understanding all necessary steps to resolve a physical problem numerically.* *Competences:* *To be able to write a computation code able to resolve a sample one dimensional problem.*

Content	*POJECT 1 : ONE DIMENISONNAL HEAT PROBLEM* *1.1 Variationnal formulation of the problem* *1.2 Implenting Matlab program with respect to the following approach:* *1.2.1 Meshing the domain* *1.2.2 Computing and plotting shape functions* *1.2.3 Computing the local matrices* *1.2.4 Determining the global/local numerotation correspendance table* *1.2.5 Assembling the global system* *1.2.6 Boundary conditions consideration by means of penality method* *1.2.7 Resolution of th problem and result plots* *1.3 Modification of the program in order to use P2 elements* *1.4 Convergence study and comparision between P1 and P2 elements* *1.5 Treatment of particulars problems : the example a sinusoidal variation solution* *POJECT 2 : ONE DIMENISONNAL BEAM BENDING PROBLEM TREATMENT BY MEANS OF HERMITE ELEMENTS* *1.1 Variationnal formulation of the problem* *1.2 Implenting Matlab program with respect to the following approach:* *1.2.1 Meshing the domain* *1.2.2 Computing and plotting shape functions* *1.2.3 Computing the local matrices* *1.2.4 Determining the global/local numerotation correspendance table* *1.2.5 Assembling the global system* *1.2.6 Boundary conditions consideration by means of penality method*
Study and examination requirements and forms of examination	*01 Exam and evaluation during the work*
Media employed	*whiteboard*
Reading list	

Automatic Control Module Handbook

Module designation	*Automatic Control*
Module level, if applicable	*2nd year aeronautical engineering cycle*
Code, if applicable	*EL08*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Dr. Rahma SMAILI*
Lecturer	*Dr. Rahma SMAILI*
Language	*French*
Relation to curriculum	
Type of teaching, contact hours	*1.5 contact hours per week. 21hours per semester*
Workload	*2.5 hours per week*
Credit points	*2*
Requirements according to the examination regulations	*Not authorized documents*
Recommended prerequisites	*Basic information on system modelling, linear, non linear systems…*

Module objectives/intended learning outcomes	*Knowledge:* *Students learn the concept and types of systems. This module mainly covers:* - *The basic Terminologie of automatic control systems.* - *The different elements of closed loop control systems.* - *How to model a system.* - *Getting familiar with performances of control system.* - *The block diagram of a closed loop control system.* - *How to use Laplace transform to find transfer function.* - *The response of system (first and second order) in time domain.* - *The response of system in frequency domain (Bode plots, Nichols plots and Nyquist plots).* - *Various types of controllers.* - *The frequency and time synthesis of control systems.* *Skills:* - *Students make a difference between orders of systems.* - *They know tools to determine system performances (rapidity, stability and precision).* *Competences:* - *Students are able to model various types of systems with a transfer function.* - *They are able to plot and analyse response of system in time and frequency domain.* - *They know how to ameliorate performances of system by introducing a suitable controller.*

Content	*CHAP 1: SECOND ORDER SYSTEMS* *5.1 Definition* *5.2 Parameters* *5.3 Laplace transform* *5.4 Transfer function and et characteristic equation* *5.5 Step response of Second Order System* *5.6 Pole Placement* *5.7 Maximum overshoot and Peak time tp (0<m<1)* *5.8 Settling time* *CHAP 2: HARMONIC STUDY OF CONTROL SYSTEMS* *2.1. Introduction* *2.2. First order systems* *2.3. Generalized first order systems* *2.4. Second order systems* *CHAP 3: ANALYSIS AND SYNTHESIS OF LINEAR CONTROL SYSTEMS USING TIME-DOMAIN METHOD* *3.1. Overview* *3.2. Stability* *3.3. Rapidity of control system* *3.4. Precision of control system* *CHAP 4: HARMONIC STUDY OF HIGH ORDER SYSTEMS (n> 2)* *4.1. Introduction* *4.2. Geometric criteria (Nyquist, Bode and Black-Nichols)*
Study and examination requirements and forms of examination	*At least two tests of about 20 minutes* *A mid-semester written exam of at least 1h30* *A written exam of at least 1h30*
Media employed	-
Reading list	-

Signal Processing Module Handbook

Module designation	*Signal processing*
Module level, if applicable	*2nd year aeronautical engineering cycle*
Code, if applicable	*EL06*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1 and 2*
Person responsible for the module	*Mohamed Ktari*
Lecturer	*Mohamed Ktari*
Language	
Relation to curriculum	*Application area:* *- Transmission of analog (AM, PM and FM) and digital (ASK, PSK, FSK and QAM) signals,* *- Automatic,* *- DSP: Digital Signal Process,* *- Embedded systems,* *- Mecatronics systems.*
Type of teaching, contact hours	Hours of contact: - 1 h30 lesson and tutorials for each week, - 2 hours of practical work for each week. 18 is the number of students per class both in class and practical work.
Workload	*5.5 hours per week*
Credit points	*3*
Requirements according to the examination regulations	Continuous Control Rating and Final Exam Rating
Recommended prerequisites	Applied mathematics, signals and system, automatic: continuos and discret linear servo-systems.

Module objectives/intended learning outcomes	*Knowledge:* *- Distinguish the different types of analog and digital signals,* *- Distinguish the properties of a signal: Fourier series and Fourier transform,* *- Know the concept of filtering: Convolution and correlation.* *- Sampling techniques: Shanon's theory,* *- TFD: Discrete Fourier Transform,* *- Know the concept of digital filtering: RIF and RII.* *Skills:* *- Master the signal filtering techniques: template of an analog filter low pass, high pass and pass band,* *Competences:* *- The students are able to design and develop simple and useful systems* *- They are able to solve complex problems* *- The unit prepares students to undertake future studies in Signal processing/Communication Engineering.*

Content	**CHAP 1 Generalities** 3.7. Signal Generalies 3.8. Fields of signal processing applications, 3.9. Signal classification, 3.10. Base signals and basic operation. **CHAP 2 Continuous time deterministic signals** 4.1. Temporal and frequency representation (notion on amplitude and phase spectral), 4.2. Real and complex Fourier series development (notion of the uni and bi lateral spectrum), 4.3. Fourier transform of the continuous signals and its properties, the temporal truncation and the periodization of a signal on its spectrum, 4.4. Notion of power and energy. 4.5. Convolution product 4.6. Inter-correlation and autocorrelation functions. **CHAP 3 Continuous time deterministic signal filtering** 5.1. Filtering of finite energy and finite power signals, 5.2. Ideal filters, 5.3. Linearity, 5.4. Stationarity 5.5. Causality 5.6. Filter stability. **CHAP 4 AM analog amplitude modulation** 8.1. Spectral analysis of an AM signal 8.2. Notion of transmission power 8.3. Spectral analysis of AM signals with carrier 8.4. AM-DSB and AM-SSB. **CHAP 5 Digital Systems** 10.1. Equipping and digital conversion ADC digital and digital analog DAC, 10.2. Discrete Fourier Transform TFD and Fast Fourier Transform FFT: Kenly Algorithm, 10.3. Digital systems: Z-transform, RIF digital filtering and RII.
Study and examination requirements and forms of examination	Continuous control with a final exam for evaluation.
Media employed	- Integrated course, tutorials, slide projection, internet ... - Software: Mathworks, Matlab, ISIS ...
Reading list	- Book Signals and systems Eyrolles-Paris bookstore, - DUNOD Signal Processing Work, - DUNOD Signal Processing and Data Acquisition. - Work Analog and digital signal processing Technosup Eyrolles-Paris bookstore.

Workshop of Embedded Systems Module Handbook

Module designation	*Workshop of Embedded Systems STM32*
Module level, if applicable	*2nd year of the aeronautical engineering cycle*
Code, if applicable	*EL10*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*2nd semester*
Person responsible for the module	*Dr. Ibtissem Malouche*
Lecturer	*Dr. Ibtissem Malouche*
Language	*French*
Relation to curriculum	*This Workshop helps mastering advanced microcontrollers architectures with complex embedded applications developments*
Type of teaching, contact hours	*Practical: 1h30 per group (16 students) per week*
Workload	*2.5 hours per week*
Credit points	*2*
Requirements according to the examination regulations	*Authorized documents and internet access*
Recommended prerequisites	*Knowledge in the fundamentals of embedded C programming, Embedded systems and electronics basics is appreciated.*
Module objectives/intended learning outcomes	*Knowledge: Students will gain an understanding of 32 bits and microcontrollers' advanced applications development.* *Skills:* *Fundamental skills will be gained in the analysis, modelling and implementation of embedded applications.* *Competences:* *-Students will be able to address practical aspects* *-The unit prepares students to undertake future studies in more complex microcontroller's architecture with higher performances (such as multi-processors).*

Content	**PROJECT 1: COMMUNICATION WITH GSM MODULE SIM900A** **PROJECT 2: DATA COLLECTION FROM GPRS MODULE SIM900A** **PROJECT 3: HANDLE MULTIPLE TASKS USING FREERTOS**
Study and examination requirements and forms of examination	*At least two tests of about 20 minutes* *A final written exam of at least 1.5h*
Media employed	*Video projector* *Booklets for theoretical exercises* *Computers* *Internet*
Reading list	*STM32 Discovery Firmware user guide* *STM32F4 Programming manual* *STM32F407 Datasheet/ErrataSheet* *STM32F4 Reference Manual* *Cortex M4 Technical Reference Manual* *Cortex M- Hitex Insider Guide* *STM32CubeMX User guide*

Statistical Process Control SPC Module Handbook

Module designation	*Statistical Process Control SPC*
Module level, if applicable	*2nd year aeronautical engineering cycle*
Code, if applicable	*IM01*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Mariem Khechine*
Lecturer	
Language	*French*
Relation to curriculum	*A comprehensive coverage of modern quality control techniques to include the design of statistical process control systems, lean 6 sigma, and process improvement.*
Type of teaching, contact hours	*This course will be presented by using lectures, in-class exercises, homework and case studies and projects.* *2 hours of contact with students per group and per week.* *20 students per group for lectures*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*Unauthorized documents and unauthorized internet access*
Recommended prerequisites	
Module objectives/intended learning outcomes	*After successfully completing the course, students should be able to do the following:* *- Understand the philosophy and basic concepts of quality improvement.* *- Describe the DMAIC processes (define, measure, analyze, improve, and control).* *- Demonstrate the ability to use the methods of statistical process control.* *- Demonstrate the ability to design, use, and interpret control charts for variables.* *- Demonstrate the ability to design, use, and interpret control charts for attributes.* *- Perform analysis of process capability and measurement system capability.* *- Understand and interpret the basic concepts and usage of Lean Six Sigma.*

Content	*CHAP 1: GENERALITIES: DEFINITIONS OF QUALITY AND QUALITY IMPROVEMENT* *1.1. Generalities* *1.2. Quality* *1.3. Quality Improvement* *CHAP 2: STATISTICAL METHODS AND MANAGEMENT ASPECTS FOR QUALITY CONTROL AND IMPROVEMENT* *CHAP 3: DMAIC PROCESS* *3.1. - Statistical Process Control* *3.2. - Applications of SPC* *CHAP 4: CONTROL CHARTS* *4.1. - Control Charts for Variables* *4.2. - Control Charts for Attributes* *4.3. - Applications of Control Charts* *CHAP 5: PROCESS CAPABILITY ANALYSIS* *5.1. Process Capability Ratios* *5.2. Six Sigma* *CHAP 6: CASE STUDIES PRESENTATIONS*
Study and examination requirements and forms of examination	*At least two tests of about 20 minutes* *A mid-semester written exam of at least 1h30* *A written exam of at least 1h30*
Media employed	*Data show* *Booklet for theoretical exercises*
Reading list	*Montgomery, Douglas C. (2009). Introduction to Statistical Quality Control, Sixth Edition. John Wiley and Sons, Inc. (ISBN: 978-0-470-16992-6).* *SPC Charts - Statistical Process Control Charts, by Mutahir Khan*

English Module Handbook

Module designation	*English*
Module level, if applicable	*2nd level in Aeronautic engineering cycle*
Code, if applicable	*SC03*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester1 and Semester 2*
Person responsible for the module	*Samia Ben Salah*
Lecturer	*Samia Ben Salah*
Language	*English*
Relation to curriculum	*Teach students how to communicate in their professional lives/ it provides real world business: it addresses the language and communication needs of employees at all levels of an organisation who need to use English at work in a global environment the whole book focuses primarily on shaping effectively students' soft skills*
Type of teaching, contact hours	*Contact hours: 1.30h/ week* *class size: it should be no more than 20 students teaching method: speaking/ listening/ writing/ reading/ oral presentations/ role plays/ brainstormings/ interactions and communication/ case studies*
Workload	*Workload: 3.5h per week* *Before/ after classes 2h self study at home weekly preparing lessons, exercises, speaking session, etc*
Credit points	*2*
Requirements according to the examination regulations	*Oral exams: check students ability and skills in terms of communicating easily in work life* *Written exams: evaluate students' writing skills and grammar mainly technical engineering writing.*
Recommended prerequisites	*E.g. existing competences in speaking and writing technically in the field.*

Module objectives/intended learning outcomes	*Help students communicate in English in real-life work situation to acquire the key communication skills they will need in their future working life.* *All units are about helping students communicate in eng real life work situations. The priority is enabling them to do so more effectively and with confidence.* *The course recognizes that, With so many businesses now being staffed by people of different nationalities there is an increasing trend towards using English as the language of internal communication in many organisations.as well as learning appropriate language for communicating externally. With clients, suppliers; colleagues….* *The main emphasis is o the students speaking and trying out the target language in meaningful and authentic ways to activate students' interest and encouraging them to talk spontaneously.*
Content	*Careers/ change /risk / teamwork / progress* *Shaping soft skills through speaking activities/ video reviews/ listening/ communicative / interactive approach/ case studies*
Study and examination requirements and forms of examination	*Assess students' acquisition in terms of:* *Speaking/ listening* *Communicating/ interacting* *Reading/ understanding* *Writing* *Evaluation done via non-conventional tests.*
Media employed	*Videos: data show/ JBL/smart phones*
Reading list	*Business results teacher's book/ student book*

Annual Research Project

Module designation	*Annual Research Project*
Module level, if applicable	*2nd year aeronautical engineering cycle*
Code, if applicable	*PR01*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 2*
Person responsible for the module	*Dr Nawel Souissi / Dr Henda Jabberi*
Lecturer	*Dr Henda Jabberi* *Dr Ibtissem Malouche* *Dr Asma Ben Ahmed* *Dr Nader Ben Jaber* *Dr Talel Ben Mbarek* *Dr Zied Zarrouk* *Mrs Maroua Bouali* *Mrs Taycir Bouasker*
Language	*English / French*
Relation to curriculum	*Students will be able to arrange and present those findings and conclusions to inform a broad academic audience. Students will be then able to develop the research project, reviews the literature on the topic, and collects data and analyzes the data. The depth of knowledge in that discipline is enhanced and academic skills in writing and research are refined.*
Type of teaching, contact hours	*Supervision, coding and simulations* *2 contact hours per week*
Workload	*4h per week*
Credit points	*2*
Requirements according to the examination regulations	*During the course, students will demonstrate their progress by the following activities:* *1. producing a literature review and securing the agreement of a project supervisor* *2. meeting with their supervisor regularly to discuss progress* *3. recording notes on their work: reading, original empirical work, draft chapters, questionnaire responses, or other material* *4. presenting a work-in-progress talk* *5. submitting a manuscript by the specified deadline*
Recommended prerequisites	

Module objectives/intended learning outcomes	*This project provides an opportunity to pursue an independent project under the guidance of a supervisor. The main aims are:* - *pursue an independent project broadly in mathematical modelling, electronics, embedded systems, programming, mechanic and aeronautic developing some of the student's own academic interests;* - *review and appraise existing literature;* - *develop research, analysis, writing and editing and organization skills, synthetical spirit through an extended exploration of a single topic* - *integrate different themes and approaches in science and technology studies;* - *work independently and critically, with tutorial support;* - *enhance the understanding of the demands, and the inevitable compromises, of academic work, including project definition and management* *Knowledge:* - *Know how to use reference works* - *Know how to interpret results* *Skills:* *Development of autonomy* *Acquire an editorial skill* *Find and use documentation* *Development of teamwork skills* *Competences:* - *To be able to evaluate his training or self-training needs* - *Master the written and oral technical communication fluently*
Content	*PROJECT OVERVIEW AND PROJECT METHODOLOGY FOR LEARNING;* *INTRODUCTION TO THE RESEARCH PROCESS AND DETERMINING A PLAUSIBLE STUDY;* *GENERAL APPROACHES TO RESEARCH AND THE DESIGNS* *IDENTIFYING APPROPRIATE RESEARCH PROBLEMS; WRITING THE PROBLEM STATEMENT AND HYPOTHESES; STATING THE PURPOSE OF A STUDY;* *COLLECTING ORIGINAL DATA AND ANALYZING THE DATA TO DRAW CONCLUSIONS;* *SOLUTION IMPLEMENTATION;* *DECISIONS ON DESIGN, VALIDITY AND RELIABILITY OF RESULTS.*

Study and examination requirements and forms of examination	*The evaluation will focus on the quality of the work (study and implementation). It will also be based on a written report and an oral presentation, so as to assess the candidate's ability to identify and highlight the main points of the study. Proficiency in the French or English language and communication skills will be an integral part of the evaluation. The note will consider the following, depending on the projects:* • *the progress and the results obtained,* • *the written report,* • *the oral presentation,* • *responsiveness to questions*
Media employed	*Laptops/ project board*
Reading list	

A3.6 Semester 5 Modules' Handbook

Radar Telecom Module Handbook

Module designation	Radar Telecom
Module level, if applicable	*3rd year of aeronautic engineering cycle*
Code, if applicable	*AC01*
Subtitle, if applicable	…
Courses, if applicable	…
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Rabie SGHAIER*
Lecturer	*Rabie SGHAIER*
Language	*French*
Relation to curriculum	*Telecom specialization, semester*
Type of teaching, contact hours	*courses and work derailed: 3hours/ week*
Workload	*4h30 hours per week*
Credit points	*3*
Requirements according to the examination regulations	*Not authorized documents*
Recommended prerequisites	*Existing competences in telecommunications.*
Module objectives/intended learning outcomes	

Content	*INTRODUCTION GÉNÉRALE À LA TÉLÉCOMMUNICATION* *CHAP I. THEORIE DE L'INFORMATION ET CODAGE DE LA SOURCE* *1.1. Théorie de l'information et codage de la source* *• Introduction, Mesure de l'information* *• Canaux de Communication discrets sans mémoire* *• Information mutuelle, entropie de la source de Markov* *• Capacité d'un canal, canal de communication avec bruit blanc gaussien* *• Codage de la source d'information, codage entropique : Huffman et Shannon-Fano* *1.2. Codage pour le contrôle d'erreur* *• Introduction, codage du canal de communication* *• Codes par blocs, Codes cycliques* *•Codes récurrents Décodage des codes récurrents, décodage de Viterbi* *CHAP II. SYSTEMES DE TRANSMISSION NUMERIQUE :* *2.1. Codage en ligne* *2.2. Modulations numériques* *2.3. Transmission en bande de base* *2.4. Démodulation et synchronisation* *CHAP III. COMMUNICATIONS RADIO-MOBILES ET SATELLITAIRES :* *3.1. Réseaux GSM (architecture, gestion du réseau, technique d'étalement du spêctre)* *3.2. GPRS et UMTS, Systèmes d'accès multiples* *3.3. Systèmes de transmission par satellite VSAT 1/2* *3.4. Systèmes de transmission par satellite VSAT 2/2* *3.5. Satellite Data Link : ACARS - FANS et ATN* *3.6. Systèmes : GPS, GLONNASS et Galileo* *CHAP IV. RADARS :* *4.1. Radar Primaire PSR 1/2* *4.2. Radar Primaire PSR 2/2* *4.3. Radar Secondaire MSSR 1/2* *4.4. Radar Secondaire MSSR 2/2* *4.5. Mode S* *4.6. Radar Doppler* *4.7. ADS-B* *4.8. Radar Météo 1/2* *4.9. Radar Météo 2/2*
Study and examination requirements and forms of examination	*exercises and problem to solve*
Media employed	*Video projector, board*
Reading list	*NA*

Aero elasticity Module Handbook

Module designation	*Aero elasticity*
Module level, if applicable	*3rd year aeronautical engineering cycle*
Code, if applicable	*AC02*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Amine .Karoui.*
Lecturer	*Amine. Karoui*
Language	*French*
Relation to curriculum	
Type of teaching, contact hours	2 contact hours
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	
Recommended prerequisites	*Aerodynamics and mechanical elastic behaviour*
Module objectives/intended learning outcomes	*Objective of the module :* *Knowledge: Understanding fluid-solid interaction phenomena in aeronautics: divergence and flutter.* *Skills: Determining divergence and flutter speed for many configurations.* *Competences: Mastering different techniques for aeroelastic problem treatment and resolution.*

Content	CHAP 1 AERODYNAMICS : RECALLS AND PRERESQUESTIES 1.1 General equations of aerodynamics 1.2 Drag and lift 1.3 Classical theories of lift : the kutta-joukowski theory 1.4 The joukowski transformation for airfoils 1.5 Airfoil caracteritic points and shear center CHAP 2 STATIC AEROELASTICITY 2.1 The sehar and the shear center of an airfoil 2.2. Elasticity of airfoils 2.3 The divergence of a lifting surface 2.4 The divergence of a typical section with a control surface CHAP 3 DYNAMIC AEROEALSTICITY 3.1 Vibration theory and lagrange's formalism 3.2 Equations of motion of a two degrees of freedom model of an aircraft wing 3.3 Quasi-steady aerodynamics theory 3.4 Flutter phenomenon 3.5 Dynamics of airfoil CHAP 4 ONE DIMENSIONAL AEROELASTIC MODEL FOR AIRFOILS 4.1 Torsion of airfoils 4.2 Flutter and motions due to torsion 4.3 Aerodynamic approximations and resolution technics
Study and examination requirements and forms of examination	*02 Exams*
Media employed	*whiteboard*
Reading list	*N. Addison. The Illustrated Wavelet Transform Handbook. Institute of Physics Publishing, CRC Press, 2002.* *J. Boussinesq. Théorie de l'Ecoulement Tourbillonnant. Mémoire présenté par la division savante, Paris, 1887.* *L. Cavagna, G. Quaranta, and P. Mantegazza. Application of NavierStokes simulations for aeroelastic assessment in transonic regime. Computers & Structures, vol. 85 :pp. 818–832, 2007.* *G. Dufour, F. Sicot, G. Puigt, A. Dugeai, and C. Liauzun. OscillatingFlap Simulations with the Time-Spectral and Linearized Methods. soumis pour publication dans AIAA Journal, 2009.*

Composite Materials Module Handbook

Module designation	*Composite Materials*
Module level, if applicable	*3rd year aeronautical engineering cycle*
Code, if applicable	*AC03*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*First semester.*
Person responsible for the module	*Ouassim GHODBANE*
Lecturer	*Ouassim GHODBANE*
Language	*French*
Relation to curriculum	*1) Engineering degree in Aeronautic and Technology. Compulsory. First Semester.* *2) Licence in Automobile Mechanic. Compulsory. Second Semester.*
Type of teaching, contact hours	*Engineering degree: 1.5 hours (lessons and exercises)/ week and*
Workload	*2.5h per week*
Credit points	*2*
Requirements according to the examination regulations	*Not authorized documents*
Recommended prerequisites	*Existing competences in Chemistry, Material Sciences and Non-destructive analyses' techniques.*
Module objectives/intended learning outcomes	*Knowledge:* *Familiarity with (i) organic polymers: their chemical composition, their common classification, their specific categories in aeronautic (or automobile) fields and their maintenance.* *(ii) Composite materials constituents, including the fibre, the resin and additives: their chemical nature, compositions and mechanical properties. The synergetic effects between the composite materials constituents. Application of composite materials in aeronautic fields, their damages and their maintenance.* *Competences* *Students are able to design a composite material depending on its location in the airplane (or automobile). Ability to monitor the advantages and drawbacks of each carbon, glassy or aramid fibre in terms of physical, chemical, thermal and mechanical properties. Ability to control the synergetic effect between the composite material constituents. Update of technological knowledge in modern structures of airplanes.*

Content	*CHAP1 INTRODUCTION TO CHEMISTRY OF MATERIALS.* *1.1. Atomistic chemistry. Periodic table of elements* *1.2. Chemical bonds and their energy balance* *1.3. Classification of Materials types:* *Metals* *Ceramics* *Organic polymers* *CHAP2 POLYMERS IN AERONAUTIC (OR AUTOMOBILE) FIELDS* *2.1. Organic polymers* *2.2. Characterization techniques of organic polymers* *2.3. Syntheses of polymers* *CHAP3 POLYMERS IN AERONAUTIC (OR AUTOMOBILE) FIELDS* *3.1. Classification* *3.2. Maintenance* *CHAP3 COMPOSITE MATERIALS* *4.1. Introduction and generalities* *4.2. Constituents* *Fibers: glassy, carbon and aramid fibers* *Resins: thermoplastic and thermosetting resins* *Additives* *4.3. Composites materials in aeronautic (or automobile)* *Properties* *Location in airplanes (or automobiles)* *Design in relationship to location* *4.4. Damages of composite materials* *4.5. Inspection and control of composite materials* *Ultrasonic techniques* *Percussion techniques* *X-ray techniques* *Infra-red techniques* *CHAP4 MAINTENANCE OF COMPOSITE MATERIALS* *5.1. Detection and inspection of damages* *5.2. Classification of damages* *5.3. Repair of damages*
Study and examination requirements and forms of examination	*Mid-term exam 40%, final exam 60%*
Media employed	*Videos*
Reading list	

Aircraft Hydraulic Systems Module Handbook

Module designation	*Aircraft Hydraulic Systems*
Module level, if applicable	*3rd year aeronautical engineering cycle*
Code, if applicable	*AC04*
Subtitle, if applicable	
Courses, if applicable	*Aircraft Hydraulic Systems*
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Djmel Mohamed*
Lecturer	*Djmel Mohamed*
Language	*French*
Relation to curriculum	
Type of teaching, contact hours	*1.5 of contact hours*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*Unauthorized calculator, unauthorized documents and internet access.*
Recommended prerequisites	*AIRFRAME & SYSTEMS* *MAINTENANCE & OPERATIONS OF AIRCRAFTS*
Module objectives/intended learning outcomes	*Knowledge:* *-Understand the phenomena of hydraulic system* *-Identify hydraulic system component disputes* *- Maintenance of hydraulic systems:* *Skills:* *- Analysis spirit and problem-solving skills* *Competences:* *- To be able to handle hydraulic systems problems' treatment and resolution.*

Content	*CHAP 1: PRESENTATION* *1.1. General Introduction to Hydraulic Systems* *1.2. Fluid Description* *1.3. Simplified Diagram Basic Hydraulic Circuit* *CHAP 2: COMPONENTS OF HYDRAULIC SYSTEM* *2.1. Hydraulic Tanks Classifications* *2.2. Pump Classifications* *2.3. Accumulators : Role & Operation* *2.4. Taps Classifications* *2.5. Cylinders Classifications* *2.6. Hydraulic Motors: Operation & Applications* *2.7. Ram Air Turbine: Operation & Applications* *2.8. Valves Classifications* *2.9. Filters Classifications*
Study and examination requirements and forms of examination	*Tests* *A mid-semester written exam of at least 1h* *A written exam of at least 1h30*
Media employed	*whiteboard*
Reading list	

Aircraft Technical Data Module Handbook

Module designation	*Aircraft Technical Data*
Module level, if applicable	*3rd year aeronautical engineering cycle*
Code, if applicable	*AC05*
Subtitle, if applicable	
Courses, if applicable	*Aviation Technical Data*
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Fehmi Chetouane*
Lecturer	*Fehmi Chetouane*
Language	*French-Arabic*
Relation to curriculum	*Mandatory*
Type of teaching, contact hours	*20 Students / course and seminar* *1.5 contact hour*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*N/A*
Recommended prerequisites	*Comptences in : - General aviation skills, Maintenance ase of roules, ICAO regulations (MRO, CAMO, SMS …)*
Module objectives/intended learning outcomes	*In terms of:* - *Familiarity with definition and abbreviations* - *Familiarity with mintenance documents (manufacturers).* - *Familiarity with Maintenance process used in aeronautics.* - *Familiarity with aircraft modifications & aircraft elements process.* - *Familiarity with elaboration set up and update of the maintenance manual.*
Content	*CHAP 1 INTRODUCTION TO TECHNICAL DATA AERONAUTICS* *CHAP 2 MAINTENANCE* *CHAP 3 MAINTENANCE DOCUMENTS (MANUFACTURERS)* *CHAP 4 MAINTENANCE PROCESS USED IN PART 145 MRO CENTER* *CHAP 5 AIRCRAFT MODIFICATIONS & AIRCRAFT ELEMENTS PROCESS* *CHAP 6 ELABORATION, SET UP AND UPDATE OF THE MAINTENANCE MANUAL*

Study and examination requirements and forms of examination	*Mid-term exam 40%, final exam 60%*
Media employed	*PPT Presentation & Video*
Reading list	*N/A*

Aircraft Certifications Module Handbook

Module designation	*Aircraft Certifications*
Module level, if applicable	*3rd year aeronautical engineering cycle*
Code, if applicable	*AC06*
Subtitle, if applicable	
Courses, if applicable	*Aircraft Certifications*
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Ben Yahia Mohamed Alaeddine*
Lecturer	*Ben Yahia Mohamed Alaeddine*
Language	*French*
Relation to curriculum	
Type of teaching, contact hours	*1.5 of contact hours*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*Unauthorized documents and internet access.*
Recommended prerequisites	*General Aviation Skills* *ICAO Regulation (MRO, AIRWORTHINESS, …)*

Module objectives/intended learning outcomes	*Knowledge:* *-Understand the different types of Certification and the Certificate of Conformity* *-The Tests on Airplane on the Ground and Flight* *- Examination of the Plane by the Authorities* *Skills:* *- Effective technical skills.* *Competences:* *-Be able to development of the Certification Program* *- Analytical and synthetics spirit*
Content	*CHAP 1: INTERNATIONAL ORGANIZATIONS INTRODUCTION* *1.1. International Civil Aviation Organization ICAO* *1.1.1. Mission, annexes (1-19)* *1.1.2. SARP (s), PANS* *1.2. North America: Federal Aviation Agency FAA* *1.3. National: Civil Aviation Authority CAA* *1.4. European: Join Aviation Authority JAA / European Air Safety Agency EASA* *1.4.1. General* *1.4.2. Mission of EASA* *CHAP 2: AIRCRFAT CERTIFICATION* *2.1. The Main Regulations used for Aircraft Certification* *2.2. General and Definitions of Certification* *2.3. Certificate of Conformity* *2.3.1. Type Airworthiness Certification* *2.3.2. Certificate of Airworthiness Individual* *2.3.3. Certificate of Airworthiness for Operation* *2.3.4. Procedure of Issue (Regulation) of a Certificate* *2.3.5. Regulations used FAA and EASA* *CHAP 3: ATA 100* *3.1. Navigability of Aircraft* *3.2. Development of the Certification Program* *3.2.1. Preliminary Actions to Undertake the Certification Process* *3.2.2. The Constructor is on Role for the New Product* *3.2.3. Application for a Type Certificate to the Authorities* *3.2.4. Example Chosen to Illustrate the Progress of a Certification program* *3.3. Reasons for Certification* *3.4. Descriptive Documents* *3.5. Justification by Analysis and / or Calculation* *3.6. Safety Analysis* *3.7. The Laboratory Tests* *3.8. The Tests on Airplane on the Ground and Flight* *3.9. Examination of the Plane by the Authorities* *3.10. The Tests at the Simulator* *3.11. Qualification of Equipment* *Example: FAA Boeing Certification Process*

Study and examination requirements and forms of examination	*Tests* *A mid-semester written exam* *A written exam*
Media employed	*whiteboard*
Reading list	

Project Computer Aided Design CAD (CATIA) Module Handbook

Module designation	Workshop Computer Aided Design CAD
Module level, if applicable	3rd year aeronautical engineering cycle
Code, if applicable	ET05
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	Semester 1
Person responsible for the module	Mohemed CHOUCHENE
Lecturer	Mohemed CHOUCHENE
Language	French
Relation to curriculum	CAD (computer aided Design) has had a major influence on many industries, it has been particularly revolutionary in the field of product design. To better understand aircraft's performances besides to assess novel design concept aeronautical structures
Type of teaching, contact hours	2 contact hours
Workload	*4h*
Credit points	2
Requirements according to the examination regulations	Not authorized documents
Recommended prerequisites	-TECHNICAL DRAWING -BASIC CONCEPTS OF MECHANICAL DESIGN

Module objectives/intended learning outcomes	**Knowledge:** Study and dimensioning of mechanical systems **Skills:** Extract a sequence of assembly or disassembly of a mechanism and to recognize links from a real mechanism or a drawing. **Competences:** Be able to schematize, describe a mechanism, dimension it, model it, optimize it and create the design file for the final system selected.
Content	MINI PROJECT 1: STUDY AND DESIGN OF A HYDRAULIC CYLINDER TEST BENCH MINI PROJECT 2: STUDY AND DESIGN OF A BENDING TEST BENCH MINI PROJECT 3: STUDY AND DESIGN OF A TURBINE TEST BENCH MINI PROJECT 4: STUDY AND DESIGN OF A LIBRARY PERSONALIZED BY CATIA MINI PROJECT 5: STUDY AND DESIGN OF A HYDRAULIC PUMP TEST BENCH MINI PROJECT 6: STUDY AND DESIGN OF A TORSION TEST BENCH MINI PROJECT 7 : STUDY AND DESIGN OF A TRACKING PHOTOVOLTAIC PANEL MINI PROJECT 8: STUDY AND DESIGN OF A HELICOPTER
Study and examination requirements and forms of examination	Mid-terms examination (40%) and Final examination (60%).
Media employed	projectors (Epson), Whiteboard and handouts
Reading list	

Numeric Simulation Ansys Module Handbook

Module designation	*Numeric Simulation ANSYS*
Module level, if applicable	*3rd year aeronautical engineering cycle*
Code, if applicable	*ET06*
Subtitle, if applicable	----
Courses, if applicable	----
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Mohamed Montassar Doggui*
Lecturer	---
Language	*French - English*
Relation to curriculum	*Numerical simulation of aircraft structure is of great interest in aeronautical engineering since it's a practical way to better understand aerodynamics and aircraft's performances besides to assess new design concept for wings and aeronautical structures*
Type of teaching, contact hours	*Practical teaching for 28 hours per semester regarding a class of 22 students*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*Not authorized documents*
Recommended prerequisites	*General Knowledge about aerodynamic and aircraft structure*
Module objectives/intended learning outcomes	*Knowledge: Implementation of the digital tools.* *Skills: Understanding all necessary steps to resolve a physical problem numerically.* *Competences: To be able to resolve a complex problem (mechanics and aerodynamics).*

Content	*- Introduction to finite element theory and computational fluid dynamics notions needed in Ansys* *- Understanding the Ansys Simulation workflow and involved modules.* *- Design of wing's NACA 4 digits airfoils under Ansys Design Modeler* *- Design of Airflow Domain surrounding the structure* *- Meshing of structures using Ansys Mesh module (Advanced Meshing functions : sizing, body of influence...)* *- Setting up initial conditions and turbulence model in Ansys Fluent module* *- Parallel computing process within Ansys fluent* *- Results extraction for different angle of Attack of Naca Airfoil (aerodynamics forces : lift, Drag, Pressure Contour, Velocity contours and vectors, Shock wave position...)* *Post- treatments and results discussion* *- CFD Analysis of 3D wing.*
Study and examination requirements and forms of examination	*01 practical test for 2h* *01 practical exam for 2h*
Media employed	---
Reading list	---

Workshop Feedback Control (Matlab) Module Handbook

Module designation	Workshop Feedback Control (Matlab)
Module level, if applicable	*3rd year of the aeronautical engineering cycle*
Code, if applicable	*ET07*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Ibtissem Malouche*
Lecturer	*Dr. Ibtissem Malouche*
Language	*French*
Relation to curriculum	*The course block consists of a project related part and a theoretical coursework part. The aim with sharp industrial projects in relation with process control (such as mobile robots, drones…controls) is to prepare students for work in industry directly after the completion of their education, and to make our students highly competitive on the national and international job market.*
Type of teaching, contact hours	*Lecture and practical: 3h per group per week*
Workload	*4h per week*
Credit points	*2*
Requirements according to the examination regulations	*Authorized documents and internet access*
Recommended prerequisites	*Knowledge* *- Fundamentals of process control (Open loop and Closed loop control, black, Bode, Nyquist diagrams, stability fundamentals and study…).*

Module objectives/intended learning outcomes	*- Theoretical knowledge to solve the problems that the students are faced to. It consists of three areas:* *1) Embedded Systems – provides knowledge about development of safety-critical, real-time applications for advanced embedded devices in the context of systems control. It also covers hardware for embedded systems, energy efficiency, testing and debugging.* *2) Intelligent systems – provides knowledge about, advanced sensor and measurement systems, in the context of system control.* *3) Implementation of the already acquired theoretical and practical knowledges on a real system. In fact, the closed loop process control is applied and implemented for for a trajectory tracking using STM32 devices, converted Matlab PID algorithm and several sensors.* *Skills* *- Build real life useful applications* *- Develop team spirit* *- Practical aspects* *- Communication and presentation skills* *Competences:* *- Acquire necessary methods and tools for successful project management.*

Content	***<u>SECTION 1 : CONTROL SYSTEMS IN THEORY</u>*** ***INTRODUCTION*** *INSTALL MATLAB* *MATLAB AND SIMULINK BRIEF PRESENTATION* *SYSTEM AND PROCESS DEFINITION* *WHAT'S CONTROL SYSTEMS* *SOME CONTROL ALGORTHIM* *PID CONTROL ALGORITHM* ***PROJECT 1 & 2: SIMULATE 1st ORDER, 2nd ORDER OPEN LOOP SYSTEM*** *USING MATLAB* *USING SIMULINK* ***PROJECT 3 & 4: SIMULATE 1st ORDER AND 2nd AND PLUS CLOSED LOOP SYSTEM*** *USING MATLAB* *USING SIMULINK* *STUDY THE IMPACT OF THE P, I AND D FACTORS ON STABILITY, RAPIDITY AND PRECISION CRITEREA* ***<u>SECTION 2: USING EMBEDDED SYSTEMS TO CONTROL FOR TRAJECTORY TRACKING</u>*** ***INTRODUCTION*** *SOME BASIC SAFETY RULES* *DISCOVER THE STM32F4 PLATFORM* *THE MICROCONTROLLER AND SENSORS* ***PROJECT 5: REFERENCE TRAJECTORY TABLE*** *DECLARATION OF A REFERENCE TRAJECTORY TABLE USING KEIL µVISION* *HOW TO COMPARE REFERENCE TRAJECTRORY WITH REAL TRAJECTORY* ***PROJECT 6 & 7: GYROSCOPE AND ACCELEROMETER SENSORS CODE*** *INTRODUCTION ON GYROSCOPE AND ACCELEROMETER SENSORS* *COFIGURATION CODE OF ON GYROSCOPE AND ACCELEROMETER SENSORS (USING ADC..)* ***PROJECT 8: AUTMATIC CODE GENERATION USING MATLAB*** *INSTALL EMBEDDED CODER PLUGIN FOR STM32F4 DEVICE ON MATLAB* *CONVERT AUTOMATICALLY THE ALREADY SIMULATED CODE USING AUTOMATIC EMBEDDED CODER OF MATLAB TOOL* ***PROJECT 9: EMBEDDED SYSTEM CODE FOR TRAJECTORY TRACKING*** *CONCEPT A MAIN CODE WITH ALL ALREADY DEVELOPPED CODE (REFERENCE, SENSORS, PID, PLANT MODEL…)*

Study and examination requirements and forms of examination	*At least two tests of about 20 minutes* *A final written exam of at least 1.5h*
Media employed	*Video projector* *Booklets for theoretical exercises* *Computers* *Internet*
Reading list	*STM32 Discovery Firmware user guide* *STM32F4 Programming manual* *STM32F407 Datasheet/ErrataSheet* *STM32F4 Reference Manual* *Cortex M4 Technical Reference Manual* *Cortex M- Hitex Insider Guide* *STM32CubeMX User guide* *Matlab Embedded Coder User Guide*

Quality System and Lean Management Module Handbook

Module designation	*Quality System and Lean Management*
Module level, if applicable	*3rd year aeronautical engineering cycle*
Code, if applicable	*IM02*
Subtitle, if applicable	
Courses, if applicable	*Quality System and Lean Management*
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Mariem Khechine*
Lecturer	*Mar iem Khechine*
Language	*French*
Relation to curriculum	
Type of teaching, contact hours	*3 of contact hour*
Workload	*4h*
Credit points	*2*
Requirements according to the examination regulations	*Unauthorized documents and internet access.*
Recommended prerequisites	*General knowledge about industry*
Module objectives/intended learning outcomes	*Knowledge:* *Total quality management; management tools for quality; benchmarking; quality assurance. management systems; ISO9000 series; national quality awards; design of industrial experiments; environmental management systems; business process reengineering; customer services quality; lean manufacturing* *Skills:* - *Critical and analytical thinking* - *Creative thinking* *Competences:* *- Planning and organization* *- Problem solving and decision making*

Content	*CHAP 1: QUALITY AND QUALITY MANAGEMENT* *1.1. Introduction to Quality Definition* *1.1.1. Internal Quality* *1.1.2. External Quality* *1.1.3. The Lack of Quality* *1.1.4. The Over Quality* *1.1.5. Cost of Quality Curve* *1.2. Evolution of Quality Concepts* *1.2.1. History* *1.2.2. Quality Control* *1.2.3. Mastery of Quality* *1.2.4. Quality Assurance* *1.2.5. Quality Management* *1.2.6. Total Quality Management:TQM* *1.2.7. From Quality to Total Quality* *1.2.8. Effectiveness & Efficiency* *1.3. Presentation of the ISO 9000 Quality Standards Family* *1.3.1. ISO9000:2015* *1.3.2. ISO9001:2015* *1.3.3. ISO9004:2009* *1.3.4. ISO19011:2012* *1.3.5. Evolution of the ISO9000 Quality Standards Family* *1.4. The 7 Quality Management Principles of ISO9001:2015* *1.4.1. PRINCIPLE 1: Client Orientation* *1.4.2. PRINCIPLE 2: Leadership* *1.4.3. PRINCIPLE 3: Staff Involvement* *1.4.4. PRINCIPLE 4: Process Approach* *1.4.5. PRINCIPLE 5: Improvement* *1.4.6. PRINCIPLE 6: Evidence-Based Decision-Making* *1.4.7. PRINCIPE 7: Management of Relationships with Interested Parties* *CHAP 2: GENERAL PRESENTATION OF ISO9001:2015* *2.1. Structure Based on the Deming Wheel ACDP Cycle* *2.2. Step-By-Step Reading of ISO9001:2015* *2.2.1. Area of Application* *2.2.2. Normative References* *2.2.3. Terms and Definitions* *2.3. Context of the Organization*

2.4. Leadership

2.5. Planning

2.6. Support

2.7. Conduct of Operational Activities

2.8. Evaluation of performance

2.9. Improvement

2.9.1. SWOT Matrix

2.9.2. Risk Management (ISO31000)

CHAP 3: LEAN MANUFACTURING

3.1. Definition of LEAN

3.2 History

3.3. The 5 Major Steps of LEAN Thinking:

3.4. Features of the LEAN Model

3.4.1. The Components of the LEAN:

3.4.2. The Concepts of LEAN:

- Waste (MUDA)

- Variability's (MURA)

- Overload (MURI)

3.5. The 8 MUDA:

3.5.1. Definition and Example

3.5.2. Main Causes and Consequences

3.5.3. Main Actions Against the MUDA

3.6. Overproduction:

3.7. The Stocks

3.8. The Expectations are:

3.9. The Non-Quality

3.10. Unnecessary Travel and Movement of Operators

3.11. Transportation

3.12. Unnecessary Operations or Excessive Processes

3.13. Loss of Lost Skills/Lost Creativity:

3.14. LEAN Objectives and Principles

3.14.1. The Basics:

- Stability of Processes

- Continuous Improvement

- The Standardization

- Smoothing

3.14.2. The Pillars:

- Produce just in time

- Self Quality

3.14.3. objectives:

- Elimination of Waste

- The Shortest Transit Time

- The Best Quality

- The Lowest Costs

	3.15. Continuous Improvement and LEAN: *KAIZEN State of Mind* *3.15.1. The field of interest* *3.15.2. The observation of* *3.15.3. Action in groups* *3.16. LEAN Methods: Lean Tools* *3.16.1. VSM: Value Stream Mapping:* *Value Chain Mapping: Flow Mapping* *3.16.2. 5S:(Seiri, Seiton, Seiso,* *Seketsu, Shitsuke)* *(Rid, Ranger, Clean,* *Standardize, Sustain)* *3.16.3. Problem Resolution Methods:* *- Ishikawa* *- The 5 Why Technique* *- Method 8 Do: 8 Actions* *- PARETO: Law 20/80* *3.16.4. AMDEC process* *3.16.5. SMED* *3.16.6. KANBAN* *3.16.7. Poka Yoké* *3.16.8. TPM* *3.16.9. 6 Sigma* *3.16.10. KAIZEN* *3.16.11. HOSHIN*
Study and examination requirements and forms of examination	*tests* *A mid-semester written exam* *A final Written exam*
Media employed	*whiteboard*
Reading list	

Industrial Production Management Module Handbook

Module designation	*Industrial Production Management*
Module level, if applicable	*3rd year aeronautical engineering cycle*
Code, if applicable	*IM03*
Subtitle, if applicable	
Courses, if applicable	*Industrial Production Management*
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Mokhtar Khlass*
Lecturer	*Mokhtar Khlass*
Language	*French*
Relation to curriculum	
Type of teaching, contact hours	*1.5h per week*
Workload	*2.5*
Credit points	*2*
Requirements according to the examination regulations	*Unauthorized documents and internet access.*
Recommended prerequisites	
Module objectives/intended learning outcomes	*Knowledge: Students will obtain extended knowledge of Production management issues, focusing in particular on pre-production and innovation processes and trends in production, Operations management of production, Production maintenance management, Logistics processes in production and the role of Production management in a protection of intellectual property.* *Skills:* - *Critical and analytical thinking* - *Creative thinking* *Competences:* *- Planning and organization* *- Problem solving and decision making*

Content	*CHAP 1: PRODUCTION MANAGEMENT* *1.7. Forecasts* *1.8. Aggregate Planning of Production* *1.9. Stock Management with Deterministic & Stochastic Demand* *1.10. Planning in Need Matter* *1.11. Scheduling* *1.12. Project Planning* *1.13. Recording of Production Data* *1.14. Production Control* *1.15. Methods and Tools* *CHAP 2: OPTIMIZATION TECHNIQUES IN PRODUCTION* *2.1. Introduction to Operational Research* *2.2. Modelling* *2.3. Simplex Method* *2.4. Graphic Resolution* *2.5. Duality and Sensitivity Analysis* *2.6. Transport Method* *CHAP 3: MODELLING AND SIMULATION OF PRODUCTION SYSTEMS* *3.1. Introduction to Simulation* *3.2. Manufacturing Systems: Structure, Performance Measurements and Simulation Examples* *3.3. Simulation Basics* *3.4. Design Steps for a Simulation Project* *3.5. Languages and Types of Simulation*
Study and examination requirements and forms of examination	*Tests* *A mid-semester written exam* *A final Written exam*
Media employed	*whiteboard*
Reading list	*HEIZER, J. - RENDER, B. - MUNSON, CH. [2016]: Operations Management: Sustainability and Supply Chain Management (12th Edition), Pearson, ISBN-13: 978-0134130422.*

Project Startup Module Handbook

Module designation	*Project Startup*
Module level, if applicable	*3rd year aeronautical engineering cycle*
Code, if applicable	*IM04*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Dr. Soukaina FERSI*
Lecturer	*Dr. Soukaina FERSI*
Language	*French*
Relation to curriculum	*For all programmes*
Type of teaching, contact hours	*All hourly load: 21 hours per semester* ▪ *Lectures: 70%* ▪ *Exercises and Assignments: 30%*
Workload	*2.5h per week*
Credit points	*2*
Requirements according to the examination regulations	*A student must have attended at least 75% of the lectures to sit in the exams.*
Recommended prerequisites	*Management course*
Module objectives/intended learning outcomes	▪ *Knowledge to equip students with the necessary knowledge related to business creation.* ▪ *Competences: to allow the students to master the different tools and methods related to the creation of companies and the development of projects.* ▪ *Skills: enable students to develop certain personal skills necessary for success in an entrepreneurial and business creation context.*
Content	*CHAP1 THE FORMS OF ENTREPRENEURSHIP* *CHAP2 SOCIO-ECONOMIC ENVIRONMENT OF THE ENTREPRENEUR* *CHAP3 THE IDEA / OPPORTUNITY: THE ROOT OF THE PROJECT* *CHAP4 THE ADEQUACY OF THE CREATOR/PROJECT COUPLE* *CHAP5 FEASIBILITY STUDY OF BUSINESS CREATION (BUSINESS PLAN):* *5.1. Commercial component (market study)* *5.2. Technical component* *5.3. Human Resources Component* *5.4. Economic and financial aspect* *5.5. Legal, fiscal and social aspect* *CHAP6 BUSINESS CREATION AND KEY STAKEHOLDERS*

Study and examination requirements and forms of examination	*Mid-terms examination (40%) and Final examination (60%).*
Media employed	*Whiteboard, data show, laptop computer.*
Reading list	*7- Christel Tessier-Dargent, Les paradoxes de l'entrepreneuriat de nécessité : Strapontin ou tremplin ? Entreprendre & Innover 2014/1 (n° 20), pp.24 à 38.* *8- Verstracte T. et Saporta B. Création d'entreprise et entrepreneuriat. Les éditions de l'ADREG, 2006.* *9- Henri Capron, Entrepreneuriat et création d'entreprises. Facteurs déterminants de l'esprit d'entreprise. de boeck, 2000.*

English Module Handbook

Module designation	*English: TOEIC Preparation*
Module level, if applicable	*3rd year aeronautical engineering cycle*
Code, if applicable	*SC05*
Subtitle, if applicable	
Courses, if applicable	*English course TOEIC +EAP*
Semester(s) in which the module is taught	*Semester1*
Person responsible for the module	*LOBNA BEN NASR*
Lecturer	*LOBNA BEN NASR*
Language	*ENGLISH*
Relation to curriculum	*Programme English language teaching* *compulsory*
Type of teaching, contact hours	*Contact hours and class size separately for each teaching method: lecture, lesson, practical, project, seminar etc.* *1.5h contact hours per week*
Workload	*3.5h per week*
Credit points	*2*
Requirements according to the examination regulations	
Recommended prerequisites	*A2 + / B1 level*

Module objectives/intended learning outcomes	The objectives of TOEIC course are: • To develop students' reading sub-skills • To develop students' listening sub-skills • To develop students' exam taking techniques and strategies • To help students revise important grammar structures and functions tested in the TOEIC® • To familiarize students with the format and timing of the TOEIC® test Learning outcomes : By the end of this course, the learners will have: 1. Developed TOEIC test taking skills by using context and vocabulary clues to infer meaning. 2. revised important grammar structures and functions tested in the TOEIC test, advanced grammar and cohesive devices 3. Developed reading strategies such as skimming and scanning. 4. Enabled students to understand a wide range of spoken English. 5. Developed a clear understanding of each component of the TOEIC test as well as its format. English for Academic Purposes (EAP) Reading • Use skimming and scanning techniques to get the gist of text and find specific information • Guess the meaning of new vocabulary from context • Identify structural features of a written text, for example topic sentences, points in arguments etc • Identify a different genres of text and identify their purpose • Identify an author's point of view, bias and tone • Read academic texts, make notes from them and write a summary of the text Writing • Keep a personal journal to improve fluency and reflect on learning • Write grammatically in English, with an ability to write simple sentences and with reasonable control of complex sentence structures • Write well-structured and formatted paragraphs of various types • Express ideas in a logical order • Make and take notes and write a summary of a text • Write short explanation and opinion essays Listening • Listen for a range of purposes, e.g. to predict, identify stages, answer short-answer questions etc • Listen to and follow instructions • Listen to differentiate between opinion and fact, solutions, explanations • Listen to a short talk or video and retell or write a short piece based on the listening • Listen to a short lecture and take notes, then complete a writing task based on the notes. Speaking

	• *Listen to and follow instructions* • *Listen to differentiate between opinion and fact, solutions, explanations* • *Listen to a short talk or video and retell or write a short piece based on the listening* • *Listen to a short lecture and take notes, then complete a writing task based on the notes.* *Speaking* • *Communicate effectively in the classroom with other students and the teacher* • *Speak fluently about familiar topics* • *Use stress, tone and intonation to convey meaning clearly* • *Participate in an academic debate* • *Give a presentation using visual aids e.g. Powerpoint, Presi or Flash* etc

Content	The syllabus is presented on a ninety-minute lesson-by-lesson basis. • Each lesson focuses on one or two grammar phenomena, on 4 listening activities from two different listening parts, and on different genres of reading passages. • The different parts of the test are introduced gradually, focusing on the skills the students need to develop for each part. • Various techniques and strategies are presented and practiced in order to help students perform to the best of their abilities in the listening and reading sections of the test (e.g. predicting, listening to similar sounds, prepositions, words out of context, answering wh- questions, making correct interpretations, making semantic associations, focusing on the purpose of the question, recognizing errors, understanding business texts and articles, etc.). Each grammar unit may be supplemented by a chapter from the grammar book Business Grammar & Practice. This is a fast-paced course; therefore, the teacher needs to be selective and concise when presenting grammar phenomena to the students. The teacher may want to focus only on those parts she feels her students find more challenging or have problems with. The teacher could first introduce problematic grammar phenomena from the reference source and then move to exam type activities. It is extremely important that students develop the necessary skills for all parts of the test and not just improve their grammar skills. The focus on professional/business vocabulary is one other pole of this training as the teacher makes the learners better exposed to the target language which is supposed to enrich their knowledge. The integration of the skills (speaking, reading, writing and listening) is an important aspect of this training as it empowers the learners to consolidate their techniques. As the examination date draws nearer, students should do mainly exam type questions and practice tests in class, under exam conditions, so that their progress can be measured before they attempt to take the official test. **The approach** It is an eclectic approach which amalgamates the best of all approaches. Focus on a balanced use of the four skills, Which is the key to progress of the learners' linguistic competence. It is interactive, experiential (Kolb's experiential model) and communicative. NB: The conception of the TOEIC course is inspired from different TOEIC resources such as Hellenic American Union 2008 - New TOEIC Syllabus. It is interactive, experiential (Kolb's experiential model) and communicative. NB: The conception of the TOEIC course is inspired from different TOEIC resources such as Hellenic American Union 2008 - New TOEIC Syllabus.

Study and examination requirements and forms of examination	TOEIC samples for examination.
Media employed	*Data show* *Youtube videos* *Laptop* ***Resources*** Barron's Essential Words For the TOEIC, 4th Edition by Dr Lin Lougheed. Barron's TOEIC , 6th Edition Full-length practice tests by Dr Lin Lougheed. Website materials: https://learnenglish.britishcouncil.org/en/grammar-exercises http://www.english-4u.de/tenses_exercises.html http://www.perfect-english-grammar.com/grammar-exercises.html https://learnenglish.britishcouncil.org/en/grammar-exercises Business materials https://www.businessenglishpod.com/2016/09/24/business-english-pod-292-english-project-management-implementing-a-plan-1/ http://www.businessenglishsite.com/ http://www.learn-english-today.com/business-english/A-business-english-contents.html https://hsp.berkeley.edu/sites/default/files/HOW%20TO%20WRITE%20AN%20ABSTRACT.pdf http://www.ukm.my/permatapintar/wp-content/uploads/2016/05/Examples-of-abstracts.pdf?fbclid=IwAR2wwFO2RCiBIcPqN-gwbU4UqgSPD19vpMZzBW0LB1sX_IFtn6oQlObTtP8 http://cw.routledge.com/textbooks/bailey/material.asp?fbclid=IwAR1jZKBg2diCAjWs_aYqVs240miXNWiu506yrS_eyJC3jlND25PDnUv_S6E https://www.du.se/contentassets/4ef9711439e54d0a8ac9a9cb5efd79ac/2018-eap-course-handbook.pdf

French Communication technique Module Handbook

Module designation	*French Communication technique*
Module level, if applicable	*3rd year aeronautical engineering cycle*
Code, if applicable	*SC06*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Mahrassi Doniez*
Lecturer	*Mahrassi Doniez*
Language	*French*
Relation to curriculum	*For all programmes, including those running out, in which the module is taught: programme, specialization if applicable, compulsory/elective, semester*
Type of teaching, contact hours	*1H30 per week, the whole class on average 22 students, course*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*supervised duty and semester exam: assess written and oral language skills*
Recommended prerequisites	*- satisfactory command of the French language* *- editorial and oral competence*
Module objectives/intended learning outcomes	*to ensure the integration of students into professional life*
Content	*- introduction to communication* *- the communication processes* *- the skills of a good communicator* *- writing a resume* *- the reaction of a motivational letter* *- prepare an oral presentation* *- prepare a job interview*
Study and examination requirements and forms of examination	*supervised duty and semester exam: assess written and oral language skills*
Media employed	*whiteboard*
Reading list	

Synthesis Project Module Handbook

Module designation	*Synthesis Project*
Module level, if applicable	*3rd year aeronautical engineering cycle*
Code, if applicable	*PR02*
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Semester 1*
Person responsible for the module	*Khalil MANSOURI.*
Lecturer	*Khalil MANSOURI.*
Language	*French*
Relation to curriculum	
Type of teaching, contact hours	*2h per week*
Workload	*3h per week*
Credit points	*2*
Requirements according to the examination regulations	*--*
Recommended prerequisites	*Mechanical design, Fluid Mechanics, Computational fluid dynamics, Project Management.*
Module objectives/intended learning outcomes	*Key question: what learning outcomes should students attain in the module?* • *Reverse engineering of a mechanical system using CAD-FEM-CFD codes* • *Project management, CAD-FEM-CFD.* *E.g.: "Students know that/know how to/are able to…"*
Content	*CHAP1 REVERSE ENGINEERING OF AN EJECTOR USING STRUCTURED ANALYSIS AND DESIGN TECHNIQUE.* *CHAP2 THERMODYNAMIC ANALYSIS OF THE SYSTEM.* *CHAP3 CFD ANALYSIS USING ANSYS CODE TO CHARACTERISE THE SYSTEM.*
Study and examination requirements and forms of examination	*A detailed report in which a group of students (2 or 3) explain the operation of the system*
Media employed	*Some CFD – FEM Codes*
Reading list	

A3.7 Semester 6 Modules' Handbook

End of Studies/Graduation Research Project

Module designation	*Graduation Research Project*
Module level, if applicable	*5 GA*
Code, if applicable	
Subtitle, if applicable	
Courses, if applicable	
Semester(s) in which the module is taught	*Second Semester*
Person responsible for the module	*Dr Nawel Souissi / Dr Henda Jabberi*
Lecturer	*Dr Henda Jabberi* *Dr Ibtissem Malouche* *Dr Nader Ben Jaber* *Mrs Taycir Bouasker* *Dr Talel Ben Mbarek* *Dr Zied Zarrouk* *Mrs Maroua Bouali* *Dr Asma Ben Ahmed* *Dr Yacine Mabrouki*
Language	*English / French*
Relation to curriculum	*Students will be able to arrange and present those findings and conclusions to inform a broad academic and industrial audience. Students will be then able to develop the research/industrial project, reviews the literature on the topic, collects data, analyzes the data and validate them in the industrial context. The depth of theoretical and practical knowledge in that discipline is enhanced and student's skills in writing, in research and professional life integration are refined.*
Type of teaching, contact hours	*Project management, project definition in collaboration with industrial supervisor(s), regular supervision, coding, simulation, implementation and validation.*
Workload	*50 hours per week*
Credit points	
Requirements according to the examination regulations	*Students will demonstrate their progress by the following:* *1. producing a literature review and securing the agreement of a project supervisor* *2. meeting with their supervisor regularly to discuss progress* *3. recording notes on their work: reading, original empirical work, draft chapters, questionnaire responses, or other material* *4. presenting a work-in-progress talk* *5. submitting a manuscript by the specified deadline*
Recommended prerequisites	

Module objectives/intended learning outcomes	The targets of the Final Year Project are diverse. On the one hand, since it is the student's last activity at the university, it fulfills a purpose of synthesis of all the knowledge they have acquired throughout the different years. Besides, this knowledge must be used in a particular way, in order to solve a specific problem. Thus, students are able to demonstrate their aptitudes by applying this knowledge. On the other hand, it helps the student to mature as an engineer, giving him/her the chance of finding the solution to a similar problem as he/she might do in his/her future profession. Therefore, it also constitutes a preparation for starting work. Summing up, the final year project targets are the following: • Synthesis of knowledge. •To demonstrate the aptitude of applying the own knowledge to solve a specific problem. • To mature the knowledge. • Preparation for joining the working world. The last aim imposes some determining factors that must be taken into account. First of all, engineers must assume both material and human responsibilities. In the same way, and due to the complexity of nowadays' challenges, it is necessary both to work in multidisciplinary groups and to be able to adapt to the different scientific and technological advances. For this reason, engineers must be capable of learning and looking for information in order to solve the new problems they face in a practical, efficient and fast way. Summarizing, the current working world demands that the engineer is able to: • Assume responsibilities. • Work in a multidisciplinary group. •Adjust to the different scientific and technological advances: 1 Auto learning capacity. 2 Search of information. 3 Pragmatism.
Content	*Project Overview and Project methodology for learning;* *Introduction to the Research/Industrial Process and determining a plausible study;* *General Approaches to Research and the Designs* *Identifying Appropriate Research Problems; writing the problem statement and Hypotheses; stating the purpose of a study;* *Collecting original data and analyzing the data to draw conclusions;* *Solution implementation and validation;* *Decisions on Design, validity and reliability of results.*

Study and examination requirements and forms of examination	*The evaluation will focus on the quality of the work (study and implementation). It will also be based on a written report and an oral presentation, so as to assess the candidate's ability to identify and highlight the main points of the study. Proficiency in the French or English language and communication skills will be an integral part of the evaluation. The note will consider the following, depending on the projects:* • *the feedback of industrial supervisors on the personal and professional attitude of the student during the final year project period,* • *the progress and the results obtained,* • *the written report,* • *the oral presentation,* • *responsiveness to questions*
Media employed	*Laptops/ project board*
Reading list	