

ECAM Engineering is an innovative program combining a strong mechanical and electrical engineering basis and a specialization in challenging rewarding fields. It is taught entirely in English.

This Course Description will provide the reader with a detailed overview of this program. It is the DNA of our engineering course: made up of Teaching Units (UE: unité d'enseignement), which are themselves composed of Teaching Components (EC: élément constitutif). This handbook highlights the theoretical knowledge and hands-on skills to be acquired in each teaching component, each with its own learning outcomes, prerequisites, and assessment methods.

EENG YEAR 1

Semester 1				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Physics & Chemistry 1	5	Chemistry 1	<p>Description :</p> <p>Introduction: Matter properties. Units of measurement. Atoms, Molecules and Ions. Atomic mass. Nomenclature of chemical compounds. Chemical equations. Stoichiometry. The mole. Limit reactant.</p> <p>Electronic structure of atoms and periodic properties: Electronic structure of atoms. Orbitals representation. Electron spin and the Pauli Exclusion Principle. The Aufbau Principle: building up the Periodic Table. Periodic properties: atomic radii, ionization potentials, electron affinity.</p> <p>Chemical bonding: Interatomic bonding: ionic and covalent bonds. Polarity and electronegativity. Lewis structures. Metallic bond. Bonding energy. Intermolecular forces: Hydrogen bonding, dipole-dipole, ion-dipole, London.</p> <p>Gases and liquids: Ideal gases. Law of gas. Dalton's law of partial pressures. Kinetic molecular theory. Real gases. Aqueous solutions: polar and non-polar solutions. Precipitation. Solubility. Concentration of solutions: molarity. Phase changes. Vapour pressure. Phase diagrams. Ideal solutions. Colligative properties.</p> <p>Solids: Crystalline and amorphous solids. Crystal lattice. Unit cell. Crystal systems. Phase diagrams.</p> <p>Chemical kinetics: Reaction rates: factors that affect the reaction rate. Concentration and rate. Reaction orders. Temperature and rate. Activation Energy. The Arrhenius equation. Catalysis.</p> <p>Chemical equilibrium: Chemical equilibrium. Equilibrium constant. The law of mass action. Stresses equilibrium: Le Chatelier's principle. Equilibrium in aqueous solutions. Acid-base equilibrium. pH scale.</p>	<p>Lectures : 18h00</p> <p>Tutorials : 18h00</p> <p>Lab Work : 9h00</p>
		Electricity 1	<p>Description :</p> <p>- Basic concepts (signals, linearity, networks), voltage, current, energy and power. Circuits elements, dipoles. Concepts of static operating points, application to non-linear systems. Ideal and real sources (voltage and current), Controlled sources. Ohm's law. Thevenin and Norton theorems. KVL, KCL, Superposition and Millman theorems. Circuit analyses methods (Mesh, Node).</p> <p>-Basic concepts related to harmonic mode of operation, generation and properties. Introduction to phasors and complex notations. KVL, KCL and so forth revisited. Presentation of an ideal inductance and an ideal capacitor. Concepts of Impedance. Circuits analyses. Resonance.</p>	<p>Lectures : 18h00</p> <p>Tutorials : 18h00</p> <p>Lab Work : 9h00</p>

Semester 1				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Engineering Sciences 1	5	Mechanical design 1	<p>Description :</p> <ul style="list-style-type: none"> -Technical Drawing: Projections principals , Types of drawings - Presentation of CAO software - Software environment, 2D sketches principals, 3D constructing base features <p>-Standards- Drawing Rules: Threads, Assemblies Screwing and Bolting ,drawing Screw Threads and other threaded elements Creating sheet drawing on paper based on 3D view Surface-to-surface intersection Cavalier Perspective CAO: Creating additional features, Constructing features+hreads</p> <p>-Standardized Elements Assembly Drawing (recognize standard parts and elements), mechanism understanding, extract pieces from the assembly. Introduction to kinematic diagram CAO: advanced features + advanced sheet drawing and dimensioning Technical Analysis Kinematic Diagram introduction: External analysis, internal analysis (schematic representation of joints, Minimum kinematic diagram, Perspective diagram)</p> <p>-Elementary technological Functions (Assembly surfaces, Joints , Complete joints function, Guiding in translation and rotation function-Analysis of Mechanism CAO Assembly , Creating a prismatic and revolute joint, Reducing the passive resistances, Dimensioning The Functional Surfaces</p> <p>-Geometric Dimensioning and Tolerancing for Mechanical Design, Dimensions, Surfaces, And Their Measurement, writing dimension and tolerance, Functional surfaces Operating conditions clearance conditions tightening conditions play conditions</p> <p>-Fundamentals of manufacturing processes preparation for the practical work in the second semester TP)</p>	<p>Lectures : 15h00</p> <p>Tutorials : 33h00</p>
		General Mechanics 1	<p>Description :</p> <p>Introduction (The Scientific Method. Physical quantities and units. Accuracy, precision and significant figures. Vector algebra).</p> <p>Kinematics: Reference frame. Particle. Position vector. The equations of Motion. Displacement vector. Trajectory. Instantaneous and average velocity vectors. Instantaneous and average acceleration vectors. Equations of uniform motion and motion under constant acceleration. Projectile motion. Circular motion equations with constant and variable velocity. Centripetal acceleration. Relative motion.</p> <p>Statics and Kinetics: Mass. Newton's laws. Inertia. Gravitation. Force. Force and interactions. Free-body diagrams. Equilibrium and resultant force. Type of forces. Friction. Drag force. Centripetal force. Non-inertial reference frames. Fictitious and Inertial forces. Coriolis force. Oscillations. Harmonic motion. Pendulum. Elasticity. Hooke's law, stress and strain.</p>	<p>Lectures : 18h00</p> <p>Tutorials : 18h00</p>

Semester 1				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Humanities 1	6	Communication in English	<p>Description :</p> <p>Module 1 Written communication in English: Students will be able to: ? Write a short report or report summary with minimal grammar or syntax errors ? Build technical vocabulary in order to read, understand and discuss short scientific or technical documents ? Develop awareness of different writing styles ? Understand and write a professional email using correct expressions</p> <p>Module 2 Oral communication in English: Students will be able to: ? Become aware of voice and gestures when speaking in public ? Improve listening skills & use active listening ? Plan, structure and deliver a formal presentation without reading ? Create visuals which are both attractive and professional ? Discuss professional topics using appropriate language to express opinions</p> <p>Module 3 Professionalisation Students will be able to: ? Gain an insight into how a company and its different departments function ? Write a CV in French and English which is professional and succinct ? Write a professional cover letter or covering email in English ? Introduce themselves to a future employer and answer basic job interview questions ? Identify what a manager would expect from an intern in terms of professional behaviour.</p>	Tutorials : 28h00
		Foreign Language 2-1	<p>Description :</p> <ul style="list-style-type: none"> - A1/2 : daily life / society / culture - B1/2 : analysing cultural events / scientific awareness / discovering the world of work - C1/2 : geopolitics / scientific culture / getting deeper into the world of work 	Tutorials : 18h00
		FLE Advanced 1	<p>Description :</p> <p>The language-culture is taught from different materials (original and built up documents) : audio, video and abstracts from handbooks (mostly communicative methods), media (internet and printed press). Specific learning income in grammar is offered based on student requirements alternating inductive/deductive methods. Group work, role-playing are also offered and stimulate an active participation</p>	Tutorials : 30h00
		FLE Beginner 1	<p>Description :</p> <p>The language-culture is taught from different materials (original and built up documents) : audio, video and abstracts from handbooks (mostly communicative methods), media (internet and printed press). Specific learning income in grammar is offered based on student requirements alternating inductive/deductive methods. Group work, role-playing are also offered and stimulate an active participation</p>	Tutorials : 82h00
		FLE Intermediate 1	<p>Description :</p> <p>The language-culture is taught from different materials (original and built up documents) : audio, video and abstracts from handbooks (mostly communicative methods), media (internet and printed press). Specific learning income in grammar is offered based on student requirements alternating inductive/deductive methods. Group work, role-playing are also offered and stimulate an active participation</p>	Tutorials : 60h00
		International seminar	<p>Description :</p> <p>Day 1 Getting to know you - Learning to learn - Teambuilding Day 2 Globalisation Intercultural awareness Focus on the UK and USA Day 3 International Business Intercultural simulation Presentation of videos to the ECAM jury</p>	

Semester 1				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
		Orientation Week	Description :	Lab Work : 22h00
		Personal Development 1	Description : 1) Discovering MBTI dimensions & self scoring. Role plays (4 hours large group) 2) Discovering & experiencing team dynamics 3) Summarizing one's personality preferences and making the link to team dynamics & output 4) Finding your way and role in team processes: brainstorming, conflict resolution, negotiation, collective decision making,	Tutorials : 10h00
		Physical Education 1	Description : Volleyball: - Offense and defense at the same time without blocking the ball - Adequate movement in relation with the ball (anticipation/chance) - Crossing vertical obstacles (the net) to aim for a horizontal and moving target - Limited contact with the ball (see rules) Bodybuilding: - Risk awareness: Safe standards and practices - Associating objectives with methods - Associating activities with muscle-use - Associating load, intensity, form, series, repetitions, and recovery time	Tutorials : 22h00
Mathematics and Computer Science 1	6	Algorithmic & Computer Programming	Description : 1- General introduction to algorithms and MatLab 2- MatLab Grammar - Basic loops, arrays, functions 3- Introduction to scientific computing and some classical algorithms	Tutorials : 16h30
		Mathematics 1	Description : 0 - Logic and reasoning 1 - Generalities on functions 2 - Usual real-valued functions 3 - Complex numbers 4 - Indefinite integral 5 - Introduction to Ordinary Differential Equations 6 - Sequences 7 - Continuity 8 - Geometry	Lectures : 38h00 Tutorials : 40h00
Refresher courses	4	Refresher Courses	Description : Some short theoretical reminders are provided, but this module is mainly composed of exercises to give the students some automatism in mathematics for physics. - Vectors: Definition, representation, calculus: dot product, cross product, mixed product. - Angles, 2D and 3D vectors, direct bases - Systems of coordinates (cartesian, polar, cylindrical, spherical) and change of reference systems. Fundamentals of Electricity: - Basic Electrical circuits and Components : Introduction, International System of Units, common prefixes. Electrical circuits. - Signals (DC, AC). - Resistors, capacitors and inductors. - Ohm's law, Kirchhoff's laws, power. Associations (series, parallel), Voltage and current dividers. Sinusoidal quantities. - Voltage and current sources, characterisation. Thevenin's and Norton's theorems. - Measurement of Voltages and Currents : Sine wave. Square wave. Measuring voltages and currents. Analogue vs. Digital multimeters. Oscilloscopes.	Tutorials : 81h00
Transversal Projects 1	4	Transversal Project INSA	Description : 2-week long project in team of 5 to 6 students. Students are asked to work on improving an existing product.	Lectures : 4h00 Project : 50h00

Semester 1				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
		Sustainable Development 1	<p>Description :</p> <p>Conceptual frameworks</p> <ul style="list-style-type: none"> • What is a sustainable and responsible society? • The approaches and methods of sustainable development and CSR • Ethical issues, social solidarity • Understanding of a value chain <p>Specific topics</p> <ul style="list-style-type: none"> • nature capital and ecological footprint, triple bottom line • life cycle of products, waste management, recycling • circular economy , cradle to cradle • specific approach on energy, production and consumption, water, air, land, cities • climate problematic and carbon projects • tools and road maps for sustainable development <p>Industry, company, business</p> <ul style="list-style-type: none"> • environmental actions: waste, pollution, resource and energy management • CSR • economic activities: consumption and production, purchasing and logistics, real estate • Education and sensitization for SD • Green washing <p>In addition to the theoretical lesson all students are working on a group-project, which aims to solve an existing problem linked to the discussed subjects.</p>	Tutorials : 18h00
		Systemic Design 1	<p>Description :</p> <p>The class provides the basic knowledge of the techniques and tools of representation for the design project. Introduces and integrates the scientific approach to the representation with graphic-visual techniques and digital manual activities necessary for the designer, and with those specific to the construction of real and virtual models of the artifact, existing or planned.</p> <p>Provides the cultural and technical tools to effectively manage the relationship between two- and three-dimensional, real and virtual communication. It is divided into Theory of models, Digital graphics for communication, Digital design for two-dimensional technical representation.</p>	Lectures : 15h00
Semester 1	30			
Semester 2				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Engineering Sciences 2	7	Mechanical design 2	<p>Description :</p> <p>-writing dimension and tolerance Functional surfaces Operating conditions clearance conditions tightening conditions play conditions The I.S.O. fit system Recommended fits Writing the fits on a drawing Fundamental deviations of the shafts Functional conditions, Functional dimensions, Chain of dimensions method</p> <p>-Global comprehension of different mechanism examples. Movement end kinematics diagram analyze Proposing the optimal solutions to create a specific joints using elementary components. Draw and sketch the assembly with new modified or created joints. Indicate the Functional conditions, Functional dimensions and calculate their values.</p>	Lectures : 17h00 Tutorials : 32h00

Semester 2				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
		General Mechanics 2	<p>Description :</p> <p>Work and Energy: Work of a force. Kinetic energy. Work and energy Theorem. Conservative and non conservative forces. Potential energy. Gravitational and elastic potential energy. Mechanical energy. Conservation of energy, Power.</p> <p>System of particles: Impulse. Linear momentum. Conservation of the linear momentum. Center of mass. Elastic collisions. Inelastic collisions. Energy in a system of particles. Introduction to Rocket propulsion. Work and Energy Theorem in a system of particles. Angular momentum. Conservation of angular momentum.</p>	<p>Lectures : 20h00</p> <p>Tutorials : 15h00</p>
		Processes 1	<p>Description :</p> <p>INTRODUCTION TO MANUFACTURING: Manufacturing processes, materials in manufacturing, mechanical properties of materials,</p> <p>Fundamentals of metal forming : metal Forming, material behavior in metal forming, train rate sensitivity, friction and lubrication in metal forming</p> <p>Bulk deformation processes in metal working: rolling, forging, extrusion, wire and bar drawing</p> <p>Theory of metal machining: machining technology, theory of chip formation in metal machining, force relationships and the merchant equation, power and energy relationships in machining</p> <p>Machining operations and machine tools : machining and part geometry, turning and related operations, drilling and related operation, milling Cutting-tool technology: tool life, tool materials, tool geometry ? Surface texture: Two dimensional</p> <p>METROLOGY</p> <ul style="list-style-type: none"> o Geometrical and surface profile Roughness parameters o Measuring length o Filters and cut off o Amplitude parameter o The different types of profiles (ISO3247) o Analyze experimental data of roughness and waviness using the surface state measurement <p>TP:</p> <p>Turning and Related Operations</p> <p>Milling and Related Operations</p> <p>Measurement of Surface state</p> <p>Coordinate measuring machine (CMM)</p> <p>Computer-aided manufacturing control (for turning)</p> <p>Computer-aided manufacturing control (for milling)</p>	<p>Lectures : 4h00</p> <p>Lab Work : 12h00</p>

Semester 2				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Humanities 2	5	Communication in English 2	<p>Description :</p> <p>Module 1 Written communication in English: Students will be able to: ? Write a short report or report summary with minimal grammar or syntax errors ? Build technical vocabulary in order to read, understand and discuss short scientific or technical documents ? Develop awareness of different writing styles ? Understand and write a professional email using correct expressions</p> <p>Module 2 Oral communication in English: Students will be able to: ? Become aware of voice and gestures when speaking in public ? Improve listening skills & use active listening ? Plan, structure and deliver a formal presentation without reading ? Create visuals which are both attractive and professional ? Discuss professional topics using appropriate language to express opinions</p> <p>Module 3 Professionalisation Students will be able to: ? Gain an insight into how a company and its different departments function ? Write a CV in French and English which is professional and succinct ? Write a professional cover letter or covering email in English ? Introduce themselves to a future employer and answer basic job interview questions ? Identify what a manager would expect from an intern in terms of professional behaviour.</p>	Tutorials : 26h00
		Foreign Language 2-2	<p>Description :</p> <p>- A1/2 : daily life / society / culture - B1/2 : analysing cultural events / scientific awareness / discovering the world of work - C1/2 : geopolitics / scientific culture / getting deeper into the world of work</p>	Tutorials : 18h00
		FLE Advanced 2	<p>Description :</p> <p>The language-culture is taught from different materials (original and built up documents) : audio, video and abstracts from handbooks (mostly communicative methods), media (internet and printed press). Specific learning income in grammar is offered based on student requirements alternating inductive/deductive methods. Group work, role-playing are also offered and stimulate an active participation</p>	Tutorials : 30h00
		FLE Beginner 2	<p>Description :</p> <p>The language-culture is taught from different materials (original and built up documents) : audio, video and abstracts from handbooks (mostly communicative methods), media (internet and printed press). Specific learning income in grammar is offered based on student requirements alternating inductive/deductive methods. Group work, role-playing are also offered and stimulate an active participation</p>	Tutorials : 90h00
		FLE intermediate 2	<p>Description :</p> <p>The language-culture is taught from different materials (original and built up documents) : audio, video and abstracts from handbooks (mostly communicative methods), media (internet and printed press). Specific learning income in grammar is offered based on student requirements alternating inductive/deductive methods. Group work, role-playing are also offered and stimulate an active participation</p>	Tutorials : 60h00
		Humanitarian Project-Geopolitics	<p>Description :</p>	Tutorials : 10h00
		Introductory Internship	<p>Description :</p> <p>Introductory internship - 1 month</p>	

Semester 2				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
		Physical Education 2	Description : Volleyball: - Offense and defense at the same time without blocking the ball - Adequate movement in relation with the ball (anticipation/chance) - Crossing vertical obstacles (the net) to aim for a horizontal and moving target - Limited contact with the ball (see rules) Bodybuilding: - Risk awareness: Safe standards and practices - Associating objectives with methods - Associating activities with muscle-use - Associating load, intensity, form, series, repetitions, and recovery time	Tutorials : 30h00
Mathematics and Computer Science 2	7	Computer Programming 2	Description : 1- Classical algorithms, computer complexity recursion. 2- Group project.	Tutorials : 18h00
		Mathematics 2	Description : 1- Differentiation 2- Integration 3- Asymptotic analysis, series expansion 4- Planar curves, parametric curves 5- Functions of several variables 6- Infinite series 7- Introduction to matrices and system solving 8- Vector calculus	Lectures : 50h00 Tutorials : 42h00
Physics & Chemistry 2	4	Electricity 2	Description : Linear Time Invariant system. Focus on first and second order systems. Introduction to time domain analysis for LTI. Transient and permanent regime study for arbitrary deterministic source via ODE's. introduction to harmonic analysis via transfert functions to obtain a frequency response, response time. Basics of linear filtering, Bode plots. Fourier Series, Laplace Transforms.	Lectures : 8h00 Tutorials : 12h00 Lab Work : 3h00
		Electromagnetism	Description : Concept of electrical charge distributions, Coulomb force, electrostatic field and potential, Gauss theorem, capacitors. Current and magnetic field, Biot and Savart law. Magnetostatic law. Magnetic forces on charged particules, Lorentz and Laplace forces. Induction. Introduction to Maxwell Equations.	Lectures : 10h00 Tutorials : 12h00 Lab Work : 3h00
		Thermodynamics 1	Description : Fundamentals of thermodynamics: First law of thermodynamics: definition of energy. The second law of thermodynamics: definition of entropy. Heat and Temperature. Transformations and cycles. Energy balances applied to closed systems. Equations of state of gases: The ideal gas and its limitations. Real gas. Open systems: Enthalpy and energy balances of open systems. Application to compressions and expansions of gases. Thermochemistry of open and closed systems. Elementary stoichiometric balances of combustion processes. From heat of reaction to heating values of fuels. Air/Fuel ratios and real combustion reactions Application to internal combustion engines: Consequences of the 2nd law on heat engines: the Carnot cycle. Reciprocating engines: the Otto and Diesel cycles. Rotating and jet engines: the Brayton cycle.	Lectures : 12h00 Tutorials : 24h00
Transversal Projects 2	7	Robotic initiation project	Description : This introductory course in robotics is aimed to program a robot "Mbot". This kind of robots are thought to be programmed using Arduino language but, given the fact the students know MatLab, all codes are written using that language and transformed into Arduino code.	Tutorials : 30h00

Semester 2				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
		Sustainable Development 2	<p>Description :</p> <p>Conceptual frameworks</p> <ul style="list-style-type: none"> • What is a sustainable and responsible society? • The approaches and methods of sustainable development and CSR • Ethical issues, social solidarity • Understanding of a value chain <p>Specific topics</p> <ul style="list-style-type: none"> • nature capital and ecological footprint, triple bottom line • life cycle of products, waste management, recycling • circular economy , cradle to cradle • specific approach on energy, production and consumption, water, air, land, cities • climate problematic and carbon projects • tools and road maps for sustainable development <p>Industry, company, business</p> <ul style="list-style-type: none"> • environmental actions: waste, pollution, resource and energy management • CSR • economic activities: consumption and production, purchasing and logistics, real estate • Education and sensitization for SD • Green washing <p>In addition to the theoretical lesson all students are working on a group-project, which aims to solve an existing problem linked to the discussed subjects.</p>	Tutorials : 12h00
		Systemic Design 2	<p>Description :</p> <p>HISTORY OF DESIGN: This course teaches students the history of contemporary design and visual communication paying particular attention to the relationships between manufactured products/artefacts and industrial development. It provides multiple visions of the historical events . The class is interdisciplinary and integrates the contributions from the history of industry, technology, design, architecture, communication and advertising.</p> <p>PRODUCT DESIGN: Within this class the student addresses the question of "how to do?" in developing a project, starting from a well-defined product category and a specific function. At the end of the course, the student will be able to deal with the design experience starting from a specific brief that expresses a detailed request, paying particular attention to the choice of materials and technologies to be used. In the Product Design class, the students learn to control and manage the complexity of the design question of "How to do?" . The class is carried out in groups (maximum 3-4 per group), working to elaborate new products rich in cultural and expressive contents, and sustainable from a technical and productive point of view.</p>	Lectures : 45h00
Semester 2	30			

EENG YEAR 2

Semestre 3				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Electrical Engineering 1	30	Electricity 3	Description : Single-phase power network, three-phase power network, the electrical network from power plan to BT distribution, BT electrical devices, the BT installation device, transformers	Lectures : 8h00 Tutorials : 8h00 Lab Work : 6h00
		Electronics 1	Description : Logic families and package types, Introduction to State Machine Design for Synchronous circuits, Design and simulation of examples using CPLD/FPGA Design Software (XILINX/ALTERA)	Lectures : 16h00 Tutorials : 16h00 Lab Work : 14h00
Humanities 3	4	Communication in English 3	Description : Module 1 written communication in English Students will be able to: ? Write a technical article or an article summary with minimal grammar or syntax errors ? Read, understand and discuss engineering or scientific papers ? Develop their own writing style Module 2 Oral communication in English Students will be able to: ? Use voice and gestures appropriately when speaking in public ? Listen to, understand and question a technical presentation ? Research & deliver an effective, attractive and professional team presentation without reading ? Actively debate complex issues linked to geopolitics, cutting edge scientific developments etc. Module 3 Professionalisation Students will be able to: ? Understand basic financial and marketing strategies and discuss ? Work in teams to solve simple business problems ? Identify qualities and roles of different people within the company ? Gain an understanding of different types of skills and behaviours to be developed ? Participate in professional meetings – asking for and giving opinions, defending an argument, interrupting	Tutorials : 24h00
		Foreign language 2-3	Description : - A1/2 : daily life / society / culture - B1/2 : analysing cultural events / scientific awareness / discovering the world of work - C1/2 : geopolitics / scientific culture / getting deeper into the world of work	Tutorials : 18h00
		FLE Advanced 3	Description : The language-culture is taught from different materials (original and built up documents) : audio, video and abstracts from handbooks (mostly communicative methods), media (internet and printed press). Specific learning income in grammar is offered based on student requirements alternating inductive/deductive methods. Group work, role-playing are also offered and stimulate an active participation	Tutorials : 30h00
		FLE Beginner 3	Description : The language-culture is taught from different materials (original and built up documents) : audio, video and abstracts from handbooks (mostly communicative methods), media (internet and printed press). Specific learning income in grammar is offered based on student requirements alternating inductive/deductive methods. Group work, role-playing are also offered and stimulate an active participation	Tutorials : 90h00
		FLE intermediate 3	Description : The language-culture is taught from different materials (original and built up documents) : audio, video and abstracts from handbooks (mostly communicative methods), media (internet and printed press). Specific learning income in grammar is offered based on student requirements alternating inductive/deductive methods. Group work, role-playing are also offered and stimulate an active participation	Tutorials : 60h00

Semestre 3				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
		MOOC Francophonie	Description : The Founding Fathers and Linguistics bases of Francophonie. The Francophonie's geopolitical situation. History of the Francophonie. Who does what in Francophonie sphere. What does the future hold for the Francophonie	Lectures : 1h00 Project : 14h00
		Personal Development 2	Description : 1) MBTI questionnaire, discussions and role plays (5 hours) 2) Feedback in teams : learning to give and receive feedback exercise 3) Discovering softskill requirements in business Today: using the NASA softskill competency model, selfscoring and peer feedback on concrete examples. 4) Designing your future: CAN do, FIT, WILL do. Identifying key skills one has and confronting them to jobs	Tutorials : 12h00
		Sports 1	Description :	
Mathematics & Computer Science 3	30	Databases	Description : Introduction to Relational database Models of database systems Theory of database systems Implementation of database systems	Tutorials : 18h00
		Mathematics 3	Description : Gaussian Elimination, Complete solving of $Ax=b$ Fundamental Vector Spaces and Linear transformations. Orthogonality, Gram Schmidt; Least Squares Diagonalisation Positive Definite Matrices, quadratic forms Singular Value Decomposition.	Lectures : 25h00 Tutorials : 22h00
Mechanical Engineering 1	30	Energy Systems 1	Description : Lecture 1: Review of basics (the mathematics of Lines, surfaces and volumes; Scalars and Vectors; Vector math/calculus), Physical properties of fluids, Forces due to Static Fluids, Pressure, Manometers. Lecture 2: Forces on submerged surfaces, Buoyancy and stability of floating objects. Lecture 3: Fluid flow (Lagrangian and Eulerian Descriptions), Newtonian Fluids, Navier-Stokes Equation, Euler's equation of motion. Steady flow energy equation, Bernoulli equation Lecture 4: Dimensionless analysis and application Lecture 5: Reynolds Number, Laminar Flow and Turbulent Flow, Entrance region, Analytical solutions Lecture 6: Energy Losses due to friction, Minor Losses, The Moody Chart and Darcy friction factor, Pipe network, Pumps Lecture 7: Drag of immersed bodies, Skin friction, Form drag, Variation of drag coefficient with Reynold's number	Lectures : 9h00 Tutorials : 6h00 Lab Work : 6h00
		Processes 2	Description : Realisation / assembly drawing including mech. Linkage & power transmission solutions • Introduction of manufacturing engineering • Cutting parameters • Turning: operations related to turning, recommended tooling and insert shape • Milling: types of milling operations, milling machines • Drilling and related operations • Engineering metrology and instrumentation • Computer numerical control machining (CNC)	Lab Work : 8h00
		Solid and Structures 1	Description : elastic behaviour: stress, strain and their relation for an homogeneous isotropic material, Young's modulus of elasticity, shear modulus and Poisson's ratio Properties of sections (A and I), axial, torsional and bending loads.	Lectures : 12h00 Tutorials : 10h00 Lab Work : 6h00

Semestre 3				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
		Technical drawing and design 3	Description : Specification of sequence in which features are to be machined, costs	Lectures : 24h00 Tutorials : 24h00
Transversal Projects 3	30	Multidisciplinary Project 1	Description : Teams of 3 students. Mechanical Design: - using the CREO CAD software, create the parts starting from the real & sectioned prototype by measuring dimensions using adapted measurement tools (metrology) - Create the subassemblies - Create the final assembly using the necessary dynamic joints. - Create the assembly drawing draft with nomenclature. Represent at least one section to allow the visualization of the mechanism. - Represent in the assembly drawing two main necessary fittings and the functional conditions required in the mechanism. - Using CREO mechanism: run the simulation using the calculated data Electronics: - Sensors characterization (reading and interpreting the specifications of mode of operation). - Arduino Code development - Prototyping - Project demonstration with creation of a video	Tutorials : 6h00 Project : 30h00
		Sustainable Development 3	Description :	Lectures : 3h00 Project : 30h00
		Systemic Design 3	Description : The topics addressed revolve around the product lifecycle and concern four main themes: • Historical evolution and principles of the Sustainable Development • Design strategies to enhance the environmental sustainability of products, services, and systems • Environmental issues and challenges within the different steps of a product lifecycle, from production to transportation, to use, to disposal. The role of Design is investigated from the perspective of participatory planning and shared responsibility. • Communicate the environmental sustainability of products and design a sustainable communication. Upon completion of the theoretical training, the course includes a practical activity where students can apply the design strategies and principles of Sustainable Design to analyse an existing design case study.	Lectures : 30h00
Semestre 3	30			
Semester 4				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Electrical Engineering 2	30	Automation 1	Description : -Boolean algebra, numeration, key logic functions. -Combinatory logic, POS, SOP forms, Karnaugh mapping. Reduction -Digital functions such as coders – multiplexers, EPLD, etc. -Sequential logic (flip-flops, latches, counters, clocks, RAM, ROM, Flash). -Microcontroller (Arduino environment) -Technologies	Lectures : 12h00 Tutorials : 12h00 Lab Work : 9h00
		Electronics 2	Description : Introduction to key components semi-conductor based ; diodes, Bipolar and FET transistors, operational amplifiers, thyristors and IGBT ; Basic circuit design for linear and non linear applications (rectifier, inductive load).	Lectures : 24h00 Tutorials : 16h00 Lab Work : 3h00

Semester 4				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Fundamental Sciences 1	30	Mathematics 4	Description : 0- Systems of differential equations 1- Improper integral 2- Function series, power series 3- Conic sections 4- Functions of several variables and optimization 5- Multiple integrals	Lectures : 24h00 Tutorials : 20h00
		Simulations and Numerical calculations	Description : Introduction to numerical simulation and scientific computing, mathematical formulation Classical numerical methods (discretization, Bisection method, Newton's method, Euler's method, Gaussian elimination, curve fitting, numerical integration, numerical differentiation, finite elements) Applications using Matlab.	Tutorials : 20h00
Humanities 4	5	Communication in English 4	Description : Module 1 written communication in English Students will be able to: ? Write a technical article or an article summary with minimal grammar or syntax errors ? Read, understand and discuss engineering or scientific papers ? Develop their own writing style Module 2 Oral communication in English Students will be able to: ? Use voice and gestures appropriately when speaking in public ? Listen to, understand and question a technical presentation ? Research & deliver an effective, attractive and professional team presentation without reading ? Actively debate complex issues linked to geopolitics, cutting edge scientific developments etc. Module 3 Professionalisation Students will be able to: ? Understand basic financial and marketing strategies and discuss ? Work in teams to solve simple business problems ? Identify qualities and roles of different people within the company ? Gain an understanding of different types of skills and behaviours to be developed ? Participate in professional meetings – asking for and giving opinions, defending an argument, interrupting	Tutorials : 24h00
		Dance 4	Description :	
		Foreign Language 2-4	Description : - A1/2 : daily life / society / culture - B1/2 : analysing cultural events / scientific awareness / discovering the world of work - C1/2 : geopolitics / scientific culture / getting deeper into the world of work	Tutorials : 18h00
		FLE Advanced 4	Description : The language-culture is taught from different materials (original and built up documents) : audio, video and abstracts from handbooks (mostly communicative methods), media (internet and printed press). Specific learning income in grammar is offered based on student requirements alternating inductive/deductive methods. Group work, role-playing are also offered and stimulate an active participation	Tutorials : 30h00
		FLE Beginner 4	Description : The language-culture is taught from different materials (original and built up documents) : audio, video and abstracts from handbooks (mostly communicative methods), media (internet and printed press). Specific learning income in grammar is offered based on student requirements alternating inductive/deductive methods. Group work, role-playing are also offered and stimulate an active participation	Tutorials : 90h00
		FLE intermediate 4	Description : The language-culture is taught from different materials (original and built up documents) : audio, video and abstracts from handbooks (mostly communicative methods), media (internet and printed press). Specific learning income in grammar is offered based on student requirements alternating inductive/deductive methods. Group work, role-playing are also offered and stimulate an active participation	Tutorials : 60h00

Semester 4				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
		Humanitarian Project-Methodology	Description : - project management (basic tools) - specificity of the humanitarian sector	Tutorials : 6h00
		Personal Project 4	Description : Social commitment and responsibility	Lectures : 2h00
		Physical Education 4	Description :	Tutorials : 30h00
		Theater 4	Description :	
Mechanical Engineering 2	30	Materials 1	Description : Classes of materials, elastic properties of isotropic materials, real crystals and crystalline defects, plasticity in crystalline solids, relationship between mechanical properties and microstructure. Physical, chemical and thermal properties of materials. Materials selection for mechanical design and other applications.	Lectures : 18h00 Tutorials : 14h00 Lab Work : 9h00
		Solid and Structures 2	Description : Simplifications allowing transfer from the theory of elasticity to beam theory, linear calculation hypotheses, stress and displacement Calculation methods used with beam structures (tension, compression, bending, shearing and torsion), problem-solving methods for simple statically determinate and indeterminate problems, introduction to nonlinearities and materials	Lectures : 16h00 Tutorials : 16h00 Lab Work : 9h00
		Processes 3	Description : CAM approach learning, study of the influence of machining dispersions on manufacturing dimensions, adjustment setting techniques of numerical control tool machines. • Introduction of manufacturing engineering • Cutting parameters • Turning: operations related to turning, recommended tooling and insert shape • Milling: types of milling operations, milling machines • Drilling and related operations • Engineering metrology and instrumentation • Computer numerical control machining (CNC)	Lab Work : 6h00
		Technical drawing and design 4	Description : Realisation, assembly drawing including mech. Linkage & power transmission solutions	Lectures : 12h00 Tutorials : 12h00
Transversal Projects 4	30	Multidisciplinary Project 2	Description :	Tutorials : 6h00 Project : 30h00
		Entrepreneurship Project 1	Description : After completion of the full module (3 semesters) students will have developed Advanced knowledge on: - how to assess business opportunities and what characterize successes and failures - key processes necessary to bring new products and services to market - an understanding of scientific research methods and theories relevant for the field Students will also acquire the following skills: - ability to carry out scientific research in the field of entrepreneurship - ability to plan, organize, and execute a project or new venture with the goal of bringing new products and service to the market - ability to write scientific reports and communicate the results in a professional manner	Tutorials : 15h00 Project : 30h00
		Sustainable Development 4	Description :	Tutorials : 6h00 Project : 30h00
Semester 4	30			

EENG YEAR 3

Semester 5				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Electrical Engineering 3	5	Electronics 3	Description : Association of standard electronic components: sinusoidal oscillators, astable multi-vibrators, ADC and DAC converters, sample and hold circuits, instrumentation amplifiers, linear and switch-mode power supplies, inverters and thyristors. Reading and analysis of graphics and circuits	Lectures : 12h00 Tutorials : 10h00 Lab Work : 8h00
Fundamental Sciences 2	4	Mathematics 5	Description : Introduction to statistics and probability One variable descriptive statistics Two variables descriptive statistics Parametric models Parameter estimations	Lectures : 12h00 Tutorials : 8h00
Humanities 5	4	Personal Project 2	Description : Roles and responsibilities, risk management	Tutorials : 4h00
		Languages 5 FL1	Description : • Exercises to develop effective oral communication throughout the programme • Work on grammatical structures in situation via pairwork, mini-meetings and roleplays • Confidence-building exercises - presenting groupwork/pairwork • Use of video debates / conferences as a basis for discussion • Listening exercises ? - to improve general ability ? - to promote and stimulate debate	Tutorials : 24h00
		Languages 5 FL2	Description :	Tutorials : 18h00
Mechanical Engineering 3	5	Materials 2	Description : Phase diagrams, phase transformations in metals, relationship between structure and mechanical properties, thermal processing of metal alloys	Lectures : 10h00 Tutorials : 8h00 Lab Work : 12h00
		Solid and Structures 2	Description : Approximation principle, post-treatment of results, lab work on the ANSYS software: choice of modeling system (element type, use of symmetries, mesh factor), type of analysis (linear or non-linear), analysis of results and dimensioning criteria (yield criterion, failure criterion)	Lectures : 10h00 Tutorials : 8h00 Lab Work : 12h00
Robotics - SPECIALIZATION 1	8	Robotics 1	Description :	Lectures : 10h00 Tutorials : 8h00
		Control 1	Description : modelling of typical elements of a servo mechanism, block diagram representation of systems, open and close loop simplification, transfer function analysis of transient and steady state response, S-plane and frequency response analysis, gain and phase margins, how to improve the response of a system (Integrator, PID...)	Lectures : 10h00 Tutorials : 8h00 Lab Work : 12h00
		Information Systems & Technology	Description : OSI model, TCP/IP, network design and documentation, ethernet routing and switching, CLI and configuration, network Troubleshooting LAN switched networks and campus architectures including VLAN's, network Management and Access Control Lists, Wireless networks based on 802.11	Lectures : 12h00 Lab Work : 12h00

Semester 5				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Systemic Design - SPECIALIZATION 1	8	Advanced design	<p>Description :</p> <p>During the teaching experience, the student will acquire cultural and technical-methodological skills as well as a wider awareness of his role and the professional, ethical, social responsibilities of the profession.</p> <p>ABILITY</p> <p>This course will allow the student to mature his ability in defining the development perspectives of the product system. Students will be able to</p> <ul style="list-style-type: none"> • define new production fields, new types of product and service; • give shape to the relative supply chains of value and matter, in an aware and responsible way. • critical abilities, analysis and interpretation of the context: • orient design choices with sustainability performances • understand and manage sensorial relationships between the mind and artefacts. 	
		Processes 4	<p>Description :</p> <p>Transformation processes, machining dispersions study and analysis, validation of the preliminary draft manufacturing study, introduction to non-conventional manufacturing processes, functional analysis of mechanisms, selection of materials</p>	<p>Lectures : 10h00</p> <p>Tutorials : 6h00</p>
		Product Design	<p>Description :</p> <p>Realisation / assembly drawing including mech. Linkage & power transmission solutions</p> <p>Complete plan for the design or re-design of the product from ideation to the pre-engineering phase</p>	<p>Lectures : 8h00</p> <p>Tutorials : 6h00</p> <p>Lab Work : 18h00</p>
Transversal Project 5	4	Entrepreneurship Project 2	<p>Description :</p> <p>After completion of the full module (3 semesters) students will have developed Advanced knowledge on:</p> <ul style="list-style-type: none"> - how to assess business opportunities and what characterize successes and failures - key processes necessary to bring new products and services to market - an understanding of scientific research methods and theories relevant for the field <p>Students will also acquire the following skills:</p> <ul style="list-style-type: none"> - ability to carry out scientific research in the field of entrepreneurship - ability to plan, organize, and execute a project or new venture with the goal of bringing new products and service to the market - ability to write scientific reports and communicate the results in a professional manner 	<p>Tutorials : 15h00</p>
Semester 5	30			
Semester 6				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Humanities 6	5	Communication & Management 3	<p>Description :</p> <p>Working together across cultures, intercultural management skills, managing intercultural conflicts</p>	<p>Tutorials : 12h00</p>
		Applied Internship	<p>Description :</p> <p>Applied engineering internship (4 months - France or UK)</p>	<p>Traineeship : 560h00</p>

Semester 6				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
		Languages 6 FL1	Description : <ul style="list-style-type: none"> • Exercises to develop effective oral communication throughout the programme • Work on grammatical structures in situation via pairwork, mini-meetings and roleplays • Confidence-building exercises - presenting groupwork/pairwork • Use of video debates / conferences as a basis for discussion • Listening exercises ? - to improve general ability ? - to promote and stimulate debate	Tutorials : 24h00
		Languages 6 FL2	Description :	Tutorials : 18h00
		Personal Project 3	Description : CVs & cover letters	Tutorials : 4h00
Mechanical Engineering 4	9	Materials 3	Description : Macromolecules, polymers, composites, specific applications of polymers	Lectures : 10h00 Tutorials : 6h00 Lab Work : 8h00
		Energy Systems 2	Description : Conduction, convection, radiation, combined transfers, heat exchangers, heat pumps	Lectures : 8h00 Tutorials : 6h00 Lab Work : 12h00
		Solid and Structures 3	Description : Vibrations in 1DOF systems: conservative and non-conservative systems, vibrations in discrete systems with nDOF Displacement formula, free vibrations of a beam, forced vibration of a beam, vibration modelling.	Lectures : 18h00 Tutorials : 12h00 Lab Work : 6h00
Robotics - SPECIALIZATION 2	9	Robotics 2	Description : Introduction to robots systems and controllers, introduction to robot programming for mobile systems, Braitenberg vehicles and subsumption architecture, BEAM and legged robotics, robot simulation	Lectures : 12h00 Tutorials : 10h00
		Control 2	Description : Servo-control and control of continuous linear systems, PID control methods, study of non-linear systems, sampled-data linear system control, discrete PID, RST control, PFC control, full state feedback, Identification method. Digital implementation of control system and examination of parameters that affect response (sampling rate, aliasing, pre-filtering and quantisation).	Lectures : 14h00 Tutorials : 14h00 Lab Work : 8h00
		Electronics 4	Description : Architecture of a microcomputer industrial system, microcontrollers, numerical memories, serial transmission, microcontroller 8051, microcontroller 80C552, application. Power semiconductor devices, naturally commutated converters, self commutated converters, waveform distortion.	Lectures : 18h00 Tutorials : 14h00 Lab Work : 12h00
Systemic Design - SPECIALIZATION 2	9	Design for Industrialization	Description : Through brainstorming, students reflect on the meta- field through a methodological feedback action, describing in small groups cultural and technical scenarios from which the meta-project of a product or service could be defined.	
		Industrial Management	Description :	

Semester 6				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
		Virtual Design	Description : This course provides the methodological and cultural tools of Interaction Design through lectures and analysis of characteristic case studies of literature and history of discipline.	
Transversal Projects 6	7	Robotics and Design Project	Description : Introduction to an industrial company, production methods (5S, SMED), study of the workplace, workshop setup, stream studies and simulation, stream analysis and improvement, quality, production management. Health, Safety, Security, Environment and Quality	Lectures : 4h00 Project : 52h00
		Entrepreneurship Project 3	Description : After completion of the full module (3 semesters) students will have developed Advanced knowledge on: - how to assess business opportunities and what characterize successes and failures - key processes necessary to bring new products and services to market - an understanding of scientific research methods and theories relevant for the field Students will also acquire the following skills: - ability to carry out scientific research in the field of entrepreneurship - ability to plan, organize, and execute a project or new venture with the goal of bringing new products and service to the market - ability to write scientific reports and communicate the results in a professional manner	Tutorials : 15h00
Semester 6	30			

EENG YEAR 4

Semester 7 - POLITECNICO				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Product Component	30	Product Component	<p>Description :</p> <p>The laboratory's activity follows a theme: the configuration of an industrial product starting with the analysis of the components that make it up and considering the culture of the subject that will use it and the territorial, cultural and social ambit in which the product will be used. The activity is developed by groups of students (around three per group).</p> <p>Starting with the disassembly of a complex product - supplied by a company that will collaborate for the entire module supplying technical investigations - we will identify its components, how they are connected, the flows of matter and energy that link them. Each group will be asked to analyse the above individually and to discuss it with the others so as to share a common critical vision of the subject. As the project progresses, presentations will be held on the individual works with experts from the collaborating company and open discussions on the results between the various parties.</p> <p>The laboratory is interdisciplinary. The disciplinary contributions include: DESIGN FOR COMPONENTS (6 CFU, 60 hours) DESIGN MATERIALS AND COMPONENTS (6 CFU, 60 hours) CHEMICAL PRODUCTION PROCESSES (6 CFU, 60 hours) HISTORY OF MATERIAL CULTURE (6 CFU, 60 hours)</p>	Lectures : 240h00
Semester 7 - POLITECNICO	30			
Semester 7 - STAFFORDSHIRE				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Electricity, Electronics & Automation 1	30	Control System	<p>Description :</p> <p>Review of transfer function techniques and feedback. Frequency response methods Process Control and transportation delay Digital Control Systems and the Z-Transform Nonlinear systems analysis Transfer function parameter estimation State space representation</p>	Lectures : 36h00
		Design Technologies for Masters	<p>Description :</p> <p>CAD Modelling: Review of solid modelling techniques (feature creation, parametric design, assembly, mechanisms). Surface modelling techniques (shape creation, dynamic modification). Automation of CAD (HTML, Interface design, Java-Script programming, CAD Interfacing). Mathematics of Curves and Surfaces: Matrix mathematics. Geometric Transformations. Derivation of Polynomial, Bezier, B-Spline curves and surfaces. Discussion of programming implementation issues. Reverse Engineering: CMM Operation (Linear dimensions, Diametric Dimensions, Angular Dimensions, generation of defining curves for CAD modelling). Laser Scanner Operation (Data Healing Techniques, Integration with CAD/RP). Rapid Prototyping: Data Transfer, STL file format, RP Systems, RP Tooling, RP Applications (ceramic, product, medical etc), Tooling from RP.</p>	Lectures : 36h00

Semester 7 - STAFFORDSHIRE				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
		Digital Electronic Systems	<p>Description :</p> <p>This module is designed to enable students to understand advanced digital electronic systems, to apply selection skills in choosing appropriate solutions to design problems and to be aware of design limitations both theoretical and technological.</p> <ul style="list-style-type: none"> - Advanced design methods and technologies - State machine systems - advanced architectures - Linear digital circuits - filters - Modulo-2 Arithmetic and design - Asynchronous systems - analysis, modelling - Digital synthesis - High level synthesis - Hardware Description language VHDL - Regular arrays - Test and testability - Software tools Xilinx 	Lectures : 36h00
		Digital Signal Processing	<p>Description :</p> <p>MECH70581 This module provides an advanced study of modern digital signal processing (DSP) and some of its major applications including algorithms and architectures:</p> <ul style="list-style-type: none"> - Frequency and time analysis of discrete time systems - Finite Impulse Response (FIR) digital filter design - Infinite Impulse Response (IIR) digital filter design - Multi-rate processing and oversampling - Non-ideal effects - Mixed analogue-digital signal processing, delta-sigma conversion - Linear estimation and adaptive filtering - Coding, Wavelet, Fast Fourier Transform (FFT) and Discrete Cosine Transform (DCT) algorithms - 2D/3D processing - DSP devices and architectures - Practical DSP implementation 	Lectures : 36h00
		Photovoltaic Technology	<p>Description :</p> <p>Semiconductors: Crystal Structures, Electronic States, Organic semiconductors, Doping and Carrier Transport, Optical properties of Semiconductors, Optical absorption, Excitonic states in Semiconductors, Semiconductor Junction Theory, Photocurrent in a P-N Diode, Amorphous Silicon Solar cells, Fabrications, Resistive coating, RF Sputtering, Spin Coating, Optical/electrical and surface Characterisation, Efficiency measurements</p>	Lectures : 36h00
Semester 7 - STAFFORDSHIRE	30			

Semester 8 - POLITECNICO				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Open systems	30	Open Systems	<p>Description :</p> <p>The Laboratory activity is centred on one theme: the configuration of an open and autopoietic system starting from an holistic survey of the current state identifying the flows of matter and energy that are used. The activity is carried out by the students in groups (around 3 per group). Starting from the current linear system of a concrete case provided by an industry or agricultural business, an event or a territorial ambit, we identify the resources used, waste obtained, the public and private participants in the creation and their relationships in order to redefine the process and obtain an open system in which the output generated becomes an input to be used as a resource. We obtain a general vision of all the flows that lead to a consistent decrease of environmental impact; we will also study in depth the single steps of transformation with the environmental, economic and social spinoffs. Each group will be required to carry out individual analysis and discuss it with the others so as to be able to share a common critical vision on the topic. During the project, the presentation of the individual works will be carried out with external experts and organisations with whom we collaborate, to discuss the results reached in open dialogue between the parties.</p> <p>The laboratory is interdisciplinary in character. The disciplinary contributions include: SYSTEM DESIGN (6 CFU, 60 hours) PROCEDURES FOR ENVIRONMENTAL SUSTAINABILITY (6 CFU, 60 hours) THEORY AND HISTORY OF SYSTEMIC DESIGN (6 CFU, 60 hours) ECONOMIC EVALUATION OF THE PROJECTS (6 CFU, 60 hours)</p>	Lectures : 240h00
Semester 8 - POLITECNICO	30			
Semester 8 - STAFFORDSHIRE				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Electricity, Electronics & Automation 2	30	Advanced Engineering Materials	Description :	
		Embedded Real Time Systems	<p>Description :</p> <p>Exposure to and application of a range of Real-Time system concepts and Development techniques. These include; (1) System Design and Architecture Comparisons (2) Real-time Operating Systems (3) Peripheral configuration (4) Development, Analysis and Debugging (5) Design Solutions for Embedded Products Exposure to these techniques will be via both class attendance and directed self-study.</p>	Lectures : 36h00
		Industrial Robotics and Control	<p>Description :</p> <p>Overview of industrial robot arms and how to program them Overview of PLCs and how they interface to robots and automatic processes Digital implementation of PID control Forward kinematics using D-H matrices Inverse kinematics The Jacobean matrix and its use in force and speed determination Trajectory control Introduction to vision Current advances in robotics"</p>	Lectures : 36h00
		Optical Fibre communication systems	Description :	

Semester 8 - STAFFORDSHIRE				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
		Optional Course	<p>Description :</p> <p>ELEC70268 Introduction to wireless Navigation Systems (basic architecture and measurements), Coverage and Link Budget design, Antennas for wireless navigation system, Modulation and multiple access schemes in wireless navigation systems, Satellite links in Wireless Navigation Systems, Standards, Introduction to RADAR, basic signal processing in RADAR, RADAR Transmitters and Receivers, RADAR antennas (reflector and Phase array) for application, MIMO Systems in RADAR application, Types of RADAR (Pulse-Doppler, CW, SAR, MTI etc.) and their applications, Signal detection, tracking and integration, Response of RADAR to spread-fluctuating target, RADAR Guidance. Introduction to SONAR, Tracking algorithms in SONAR, Beam-forming techniques for RADAR and SONAR,</p> <p>Introduction location based services (LBS), Introduction to GPS, Signal Equalization and detection in GPS, Designing accuracy for different Wireless Navigation targets, Wireless Navigation using Cellular Networks(2G [GSM, IS-95], 3G [UMTS] and 4G [WLAN]), Integration of Navigation Modules with cellular phones, Performance analysis and comparison of cellular communication elements in wireless navigation.</p> <p>MECH70535 Properties of monolithic and conventional engineering materials Hybrid materials - composites and coatings Advanced and smart materials Composite and laminate properties modelling techniques Materials and process selection strategies and tools, constraint and objective based selection (Ashby model), multiple (and conflicting) objective Digital logic ranking techniques Materials failure prediction techniques - Weibull statistics of brittle fracture, fatigue models.</p>	Lectures : 36h00
		Research Method and Project Management	<p>Description :</p> <p>Literature Survey Methods and Skills of literature research, gathering of data from a range of sources, selecting and using appropriate technologies available (e.g. library, digital library, Internet facilities and other sources). How to appraise, debate and present complex issues relating to technical literature within the chosen field of study.</p> <p>Writing and managing a research proposal Exposure to a range of project management techniques, which will enable the student to successfully manage complex science / technical based research projects. Research proposal specification, regulations and supervisors role. Application of a range of project management techniques to formulate a comprehensive work plan for a typical MSc Dissertation.</p> <p>Writing an MSc Dissertation The structure and format of a dissertation. Effective presentation of scientific results. Reflection and appraisal of work undertaken. Using Microsoft Word to write large documents efficiently.</p> <p>Industrial project management A broad coverage of different project management techniques. Different approaches and methodologies to the management of major projects within an engineering framework such as the introduction of a new product and/or implementation of new technological processes."</p>	Lectures : 36h00
		Sustainable Design and Manufacture	Description :	Lectures : 36h00
		Technical Paper Authoring	Description :	
		Wireless Navigation Systems	Description :	

Semester 8 - STAFFORDSHIRE				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Semester 8 - STAFFORDSHIRE	30			

EENG YEAR 5

Semester 9				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Final Engineering Internship	30	Final Engineering Internship	Description :	Traineeship : 770h00
Semester 9	30			
Semester 10				
TEACHING UNIT	ECTS	TEACHING UNIT COMPONENT	Content	TEACHING HOURS
Industrial Management & Transversal Projects	30	Entrepreneurial - Consulting Project	Description : Application of innovation project management methods (including eco-innovation) to real-case studies (consulting activities). Application of business model methods to real-case studies (consulting activities).	Lectures : 10h00 Tutorials : 10h00
		Systemic Design and Management	Description : Creative process development, product technical architecture, planning, technical development. Contemplation - Desire - Design - Creation cycle. Innovation necessity and opportunities through innovation, definition & success factors of innovations, product life cycle, sources of ideas, innovation management methods, innovation circle: input, innovation management, implementation; organizational factors. Basics in the economics of innovation, incentive based approach, knowledge based approach, entrepreneurial decisions.	Lectures : 72h00 Tutorials : 76h00
Master's Project Dissertation	30	Master's Project Dissertation	Description : MSc research project at ECAM - 8 weeks	Tutorials : 30h00
Semester 10	30			