ANNEE : 3ème année / 3rd year - 60 ECTS

SEMESTRE : 1er semestre 3GM / 1st semester 3GM - 30 ECTS

PARCOURS : Parcours standard 3GM-S1 / standard track 3GM-S1 - 30 ECTS

UE : Sciences Humaines et Sociales / Humanities and social sicences - 6 ECTS

EC : Education Physique et Sportive / Physical Education - ECTS

EC : Connaissance de l'entreprise et du monde professionnel - 1 ECTS

UE : Conception mécanique 1 - 6 ECTS

EC : Conception et analyse des systèmes mécaniques/Design and analysis of mechanical systems - 5 ECTS

EC : Ingénierie éco-systémique/Ecological and systemic engineering - 5 ECTS

UE : Modélisation en mécanique - 6 ECTS

EC : Sens Physique et Ordres de Grandeurs/Order of magnitude and physical sense - 5 ECTS

EC : Mécanique Lagrangienne et dynamique des systèmes/Lagrangian mechanics and dynamics of mechanical systems - 5 ECTS

UE : Mathématiques, données et méthodes numériques 1 - 6 ECTS

EC : Mathématiques/Mathematics - 5 ECTS

EC : Données : Analyse, Traitement, Apprentissage/Data processing - 5 ECTS

UE : Projet - 6 ECTS

EC : Objet technique : Imaginaire et société - 2 ECTS

EC : Projet Scientifique et Technique/Scientific and technical project - 6 ECTS

SEMESTRE : 2ème semestre / 2nd semester 3GM - 30 ECTS

PARCOURS : Parcours standard 3GM-S2 / standard track 3GM-S2 - 30 ECTS

UE : Mécanique des milieux continus - 6 ECTS

EC : Mécanique des fluides/Fluid mechanics - 5 ECTS

EC : Mécanique des solides déformables/Mechanics of deformable solids - 5 ECTS

UE : Sciences Humaines et Sociales - 5 ECTS

EC : Education Physique et Sportive / Physical Education - ECTS

UE : Vibrations et contrôle - 6 ECTS

EC : Commande de systèmes linéaires/Control of linear systems - 5 ECTS

EC : Mécanique des vibrations/Vibration mechanics - 5 ECTS

UE : Mathématiques, données et méthodes numériques 2 - 6 ECTS

EC : Méthodes numériques/Numerical methods - 5 ECTS

EC : Projet Instrumentation, Acquisition, Exploitation/Instrumentation engineering projects - 5 ECTS

UE : Stage - 2 ECTS

EC : Stage d'immersion - 2 ECTS

UE : Conception mécanique 2 - 5 ECTS

EC : Innovation et société - 2 ECTS

EC : Conception et dimensionnement/Mechanical design of machines elements - 5 ECTS

ANNEE : 4ème année / 4th year - 60 ECTS

SEMESTRE : 1er semestre / 1st semester 4GM - 30 ECTS

PARCOURS : Parcours standard 4GM-S1 / Standard track 4GM-S1 - 30 ECTS

UE : Sciences humaines et sociales - 5 ECTS

EC : Education Physique et Sportive / Physical Education - ECTS

UE : Projet - 10 ECTS

EC : Projet transversal : tutorat management - undefined ECTS

EC : Analyse du cycle de vie / Life cycle analysis - 4 ECTS

EC : Projet collectif de conception / Mechanical design group project - 8 ECTS

EC : Responsabilité sociétale de l'ingénieur / Societal responsability of the engineer - 2 ECTS

UE : Matériaux, procédés et méthode éléments finis - 9 ECTS

EC : Procédés de mise en forme et comportement thermomécanique des matériaux métalliques - 5 ECTS

EC : Calcul de structures par éléments finis / Finite element analysis of structures - 5 ECTS

EC : Rhéologie et procédés de mise en forme des matériaux polymères / Rheology and polymer processing - 5 ECTS

UE : Conception de systèmes et machines - 6 ECTS

EC : Transferts thermiques / Heat transfer - 5 ECTS

EC : Machines et transmissions de puissances / Machines and power transmissions - 5 ECTS

SEMESTRE : 2ème semestre / 2nd semester 4GM - 30 ECTS

PARCOURS : Parcours standard / standard track 4GM-S2 - 30 ECTS

UE : Sciences Humaines et Sociales / Humanities and social sicences - 5 ECTS

EC : Management et gestion pour ingénieurs en entreprise et en équipe / Professional and team management for engineers - undefined ECTS

EC : Options Sciences Humaines et Sociales, S2 Série 1 / Social and Human Sciences Options, S2 Series 1 - undefined ECTS

EC : Education Physique et Sportive / Physical Education - ECTS

OPTION : Chaîne numérique en conception mécanique collaborative - 25 ECTS

UE : Projet thématique et projection professionnelle - 7 ECTS

EC : Immersion dans les métiers et enjeux de l'ingénierie mécanique - 2 ECTS

EC : Projet thématique - 3 ECTS

EC : Connaissance de l'entreprise et du monde professionnel - ECTS

UE : Création et maîtrise de la géométrie - 9 ECTS

EC : Conception évolutive et rétro-conception surfacique - 5 ECTS

EC : Tolérancement et maîtrise géométrique - 4 ECTS

UE : Calcul, optimisation, fabrication - 9 ECTS

EC : Outils numériques et mécanique des fluides - 3 ECTS

EC : Optimisation géométrique et topologique - 2 ECTS

EC : FAO - prototypage - 2 ECTS

EC : Calcul éléments finis de produits - 2 ECTS

OPTION : Systèmes de conversion d'énergies pour un avenir durable - 25 ECTS

UE : Projet thématique et projection professionnelle - 7 ECTS

EC : Projet thématique - 3 ECTS

EC : Immersion dans les métiers et enjeux de l'ingénierie mécanique - 2 ECTS

EC : Connaissance de l'entreprise et du monde professionnel - ECTS

UE : Fondamentaux des systèmes de conversion d'énergies - 10 ECTS

EC : Machines thermiques - 4 ECTS

EC : L'énergie sous toutes ses formes - 2 ECTS

EC : Modélisation des écoulements et des transferts thermiques pour la conversion d'énergie - 4 ECTS

UE : Technologies pour la conversion d'énergies - 8 ECTS

EC : Machines électriques et hybridation - 4 ECTS

EC : Turbomachines - 4 ECTS

OPTION : Ingénierie vibratoire et acoustique pour des systèmes fiables et silencieux - 25 ECTS

UE : Projet thématique et projection professionnelle - 7 ECTS

EC : Immersion dans les métiers et enjeux de l'ingénierie mécanique - 2 ECTS

EC : Projet thématique - 3 ECTS

EC : Connaissance de l'entreprise et du monde professionnel - ECTS

UE : Modèles et outils pour l'ingénierie vibratoire et acoustique - 8 ECTS

EC : Vibrations des structures et dynamique des systèmes en rotation - 4 ECTS

EC : Acoustique de l'ingénieur - 5 ECTS

UE : Expérimentation vibratoire et acoustique, contrôle et surveillance - 10 ECTS

EC : Essais vibratoires et acoustiques - 4 ECTS

EC : Solutions pour le contrôle passif et actif - 3 ECTS

EC : Surveillance et diagnostic - 3 ECTS

OPTION : Conception sobre - 25 ECTS

UE : Projet thématique et projection professionnelle - 7 ECTS

EC : Immersion dans les métiers et enjeux de l'ingénierie mécanique - 2 ECTS

EC : Projet thématique - 3 ECTS

EC : Connaissance de l'entreprise et du monde professionnel - ECTS

UE : Bureau d'étude frugal - 9 ECTS

EC : Outils pour une modélisation frugale des structures - 5 ECTS

EC : Matériaux : Ressources et impacts - 4 ECTS

UE : Cycle de vie des objets - 9 ECTS

EC : Fin de vie des produits - 5 ECTS

EC : Imaginaires de la sobriété - 4 ECTS

OPTION : Industrialisation : de la CAO à la chaîne de production - 25 ECTS

UE : Projet thématique et projection professionnelle - 7 ECTS

EC : Immersion dans les métiers et enjeux de l'ingénierie mécanique - ECTS

EC : Projet thématique - 3 ECTS

EC : Connaissance de l'entreprise et du monde professionnel - ECTS

UE : Chaîne numérique pour la fabricabilité - 9 ECTS

EC : Procédés d'usinage - 3 ECTS

EC : Fabrication additive - 3 ECTS

EC : Procédés d'obtention de bruts - 3 ECTS

UE : Chaîne numérique pour la productibilité - 9 ECTS

EC : Mesure et contrôle de pièces - 3 ECTS

EC : Maîtrise de la qualité produit-processus - 3 ECTS

EC : Gestion de production - 3 ECTS

OPTION : Mécatronique - 25 ECTS

UE : Contrôle et estimation des systèmes mécaniques - 9 ECTS

EC : Représentation d'état - 3 ECTS

EC : Optimisation et identification - 3 ECTS

EC : Contrôle vibratoire - 3 ECTS

UE : Méthodologie des systèmes multi-physiques - 9 ECTS

EC : Modélisation multi-physique - 4 ECTS

EC : Systèmes embarqués - 2 ECTS

EC : Commande des machines électriques - 3 ECTS

UE : Projet thématique et projection professionnelle - 7 ECTS

EC : Projet thématique - 3 ECTS

EC : Connaissance de l'entreprise et du monde professionnel - ECTS

EC : Immersion dans les métiers et enjeux de l'ingénierie mécanique - 2 ECTS

OPTION : Simulation, optimisation et expérimentation - 25 ECTS

UE : Projet thématique et projection professionnelle - 7 ECTS

EC : Projet thématique - 3 ECTS

EC : Immersion dans les métiers et enjeux de l'ingénierie mécanique - 2 ECTS

EC : Connaissance de l'entreprise et du monde professionnel - ECTS

UE : Optimisation et expérimentation - 9 ECTS

EC : Expérimentation en fluide et structures - 4 ECTS

EC : Optimisation des structures - 5 ECTS

UE : Simulations fluide-structures - 9 ECTS

EC : Calcul avancé en Mécanique - 5 ECTS

EC : Simulation numérique pour la mécanique des fluides - 4 ECTS

OPTION : Matériaux polymères et composites : procédés, performance et recyclage - 25 ECTS

UE : Projet thématique et projection professionnelle - 7 ECTS

EC : Connaissance de l'entreprise et du monde professionnel - ECTS

EC : Projet thématique - 3 ECTS

EC : Immersion dans les métiers et enjeux de l'ingénierie mécanique - 2 ECTS

UE : Performance des matériaux polymères et composites - 9 ECTS

EC : Conception pièce plastique et composite - 4 ECTS

EC : Structure et propriétés - 5 ECTS

UE : Procédés de transformation des polymères composites - 9 ECTS

EC : Procédés : Aspects expérimentaux et numériques - 5 ECTS

EC : Recyclage et fin de vie - 4 ECTS

OPTION : Mécanique appliquée à la santé - 25 ECTS

UE : Projet thématique et projection professionnelle - 7 ECTS

EC : Projet thématique - 3 ECTS

EC : Immersion dans les métiers et enjeux de l'ingénierie mécanique - 2 ECTS

EC : Connaissance de l'entreprise et du monde professionnel - ECTS

UE : Solides et structures - 8 ECTS

EC : Mécanique des solides pour les matériaux vivants - 5 ECTS

EC : Dispositifs médicaux et imagerie - 3 ECTS

UE : Mouvement et flux - 10 ECTS

EC : Mécanique du mouvement humain - 4 ECTS

EC : Mécanique du contact articulaire - 2 ECTS

EC : Mécanique des fluides pour la santé - 4 ECTS

OPTION : Performance et efficacité dans les systèmes de transmission de puissances - 25 ECTS

UE : Thematic project and professional projection - 7 ECTS

EC : Immersion in mechanical engineering professions and challenges - 2 ECTS

EC : Thematic project - 3 ECTS

EC : Connaissance de l'entreprise et du monde professionnel - ECTS

UE : Hydraulic and electric power transmissions - 9 ECTS

EC : Efficient hydraulic power transmissions - 5 ECTS

EC : Electric power transmission and control - 4 ECTS

UE : Gear power transmissions - 9 ECTS

EC : Tribology of gears and bearings - 4 ECTS

EC : Advanced gear power transmissions - 5 ECTS

ANNEE : 5ème année / 5th year - 60 ECTS

SEMESTRE : 1er semestre / 1st semestre 5GM - 30 ECTS

PARCOURS : Parcours standard / standard track 5GM-S1 - 30 ECTS

OPTION : Option pédagogique Conception et Etudes / special track design and studies 5GM-S1 - 30 ECTS

UE : Stage en entreprise / Internship - 30 ECTS

EC : Stage en entreprise / Internship - 30 ECTS

OPTION : Option pédagogique Polymères et Composites / special track Polymers and Composites 5GM-S1 - 30 ECTS

UE : Spécialisation PC / Polymer and composites specialisation - 9 ECTS

EC : Introduction aux procédés hybrides et innovants / Introduction to innovative forming processes - 5 ECTS

EC : Mécanique avancée pour la prévision des propriétés d'usage / Advanced mechanics for the prediction of material properties - 5 ECTS

EC : Ingénierie numérique de la mise en forme / Numerical engineering of forming processes - 5 ECTS

UE : Sciences Humaines et Sociales / Humanities and social sicences - 5 ECTS

EC : Projet Personnel en Humanités / Personal Project in Humanities - undefined ECTS

EC : Projet Personnel et Professionnel / Personnal and professional project - 1 ECTS

EC : Options Sciences Humaines et Sociales, S1 Série 3 / Social and Human Sciences Options, S1 Series 3 - undefined ECTS

EC : Education Physique et Sportive / Physical Education - ECTS

UE : Projet Recherche et Ingénierie / Research and engineering project master thesis - 16 ECTS

EC : Projet Recherche et Ingénierie / Final project master thesis - 16 ECTS

OPTION : Option pédagogique Modélisation et Experimentations / special track Modeling and Experiments 5GM-S1 - 30 ECTS

UE : Stage en entreprise / Internship - 30 ECTS

EC : Stage en entreprise / Internship - 30 ECTS

OPTION : Option pédagogique Mécatronique et Systèmes / special track Mechatronic and Systems 5GM-S1 - 30 ECTS

UE : Spécialisation MS / Mechatronics and systems specialisation - 9 ECTS

EC : Dynamique des véhicules / Vehicule dynamics - 5 ECTS

EC : Optimisation pour la conception / Optimisation for systems design - 5 ECTS

EC : Robotique / Robotics - 5 ECTS

EC : Conversions d'énergie / Energy conversions - 5 ECTS

EC : Eco/Conception / Ecodesign - 5 ECTS

EC : Smart structures - 5 ECTS

UE : Sciences Humaines et Sociales / Humanities and social sicences - 5 ECTS

EC : Projet Personnel en Humanités / Personal Project in Humanities - undefined ECTS

EC : Projet Personnel et Professionnel / Personnal and professional project - 1 ECTS

EC : Options Sciences Humaines et Sociales, S1 Série 3 / Social and Human Sciences Options, S1 Series 3 - undefined ECTS

EC : Education Physique et Sportive / Physical Education - ECTS

UE : Projet Recherche et Ingénierie / Research and engineering project master thesis - 16 ECTS

EC : Projet Recherche et Ingénierie / Final project master thesis - 16 ECTS

OPTION : Option pédagogique Industrialisation et Procédés / special track Industrialisation and processes 5GM-S1 - 30 ECTS

UE : Sciences Humaines et Sociales / Humanities and social sicences - 5 ECTS

EC : Projet Personnel en Humanités / Personal Project in Humanities - undefined ECTS

EC : Projet Personnel et Professionnel / Personnal and professional project - 1 ECTS

EC : Options Sciences Humaines et Sociales, S1 Série 3 / Social and Human Sciences Options, S1 Series 3 - undefined ECTS

EC : Education Physique et Sportive / Physical Education - ECTS

UE : Spécialisation IP / Industrial engineering and process specialisation - 9 ECTS

EC : Ingénierie des Systèmes de Production / Production systems engineering - 5 ECTS

EC : Maintenance Industrielle / Industrial maintenance - 5 ECTS

EC : Mise en forme des renforts de Composites / Composite manufacturing - 5 ECTS

EC : Intégrité des structures sous sollicitations extremes / Structural integrity under extreme loadings - 5 ECTS

EC : Modélisation des procédés : fabrication additive, soudage, usinage / Modeling of manufacturing processes: additive amnufacturing, welding, machining - 5 ECTS

UE : Projet Recherche et Ingénierie / Research and engineering project master thesis - 16 ECTS

EC : Projet Recherche et Ingénierie / Final project master thesis - 16 ECTS

SEMESTRE : 2ème semestre / 2nd semester 5GM - 30 ECTS

PARCOURS : Parcours standard / standard track 5GM-S2 - 30 ECTS

OPTION : Option pédagogique Modélisation et Experimentations / special track Modeling and Experiments 5GM-S2 - 30 ECTS

UE : Spécialisation ME / Modeling and expriments specialisation - 9 ECTS

EC : Dynamique des Machines Tournantes / Rotor dynamics - 5 ECTS

EC : Analyse des groupes Moto Propulseurs / Engin and power train analysis - 5 ECTS

EC : Mécanique des Fluides Expérimentale / Experimental fluid mechanics - 5 ECTS

EC : Solutions acoustiques et vibratoires dans l'industrie / Nois and vibration control in industry - 5 ECTS

EC : Tribologie / Tribology - 5 ECTS

EC : Méthodes Numériques pour la Modélisation en Mécanique / Numerical methods for modeling in mechanics - 5 ECTS

EC : Transferts thermiques avancés / Advanced heat transfer - 5 ECTS

EC : Modélisation numérique des écoulements / Computational fluid dynamics - 5 ECTS

EC : Rayonnement acoustique des structures / Structural acoustics - 5 ECTS

UE : Projet Recherche et Ingénierie / Research and engineering project master thesis - 16 ECTS

EC : Projet Recherche et Ingénierie / Final project master thesis - 16 ECTS

UE : Sciences Humaines et Sociales / Humanities and social sicences - 5 ECTS

EC : Projet Personnel en Humanités / Personal Project in Humanities - undefined ECTS

EC : Options Sciences Humaines et Sociales, S2 Série 2 / Social and Human Sciences Options, S2 Series 2 - undefined ECTS

EC : Projet Personnel et Professionnel / Personnal and professional project - ECTS

EC : Education Physique et Sportive / Physical Education - ECTS

OPTION : Option pédagogique Industrialisation et Procédés / special track Industrialisation and processes 5GM-S2 - 30 ECTS

UE : Stage en entreprise / Internship - 30 ECTS

EC : Stage en entreprise / Internship - 30 ECTS

OPTION : Polymères et Composites / special track Polymers and Composites 5GM-S2 - 30 ECTS

UE : Stage en entreprise / Internship - 30 ECTS

EC : Stage en entreprise / Internship - 30 ECTS

OPTION : Option pédagogique Conception et Etudes / special track design and studies 5GM-S2 - 30 ECTS

UE : Spécialisation CE / Design and technology specialisation - 9 ECTS

EC : Conception surfacique. rétroconception et optimisation / Mechanical design and optimisation - 5 ECTS

EC : Biomécanique, Arts, Luxe, Architecture / Biomechanics, art, luxury, architecture - 5 ECTS

EC : Transmissions de puissance / Power transmission - 5 ECTS

EC : Géométrie et Imagerie 3D : contrôle géométrique /surfacique et tomographie / Geometry and 3D imaging - 5 ECTS

EC : Outils Innovants d'Aide à la Conception / Innovative tools for design - 5 ECTS

EC : Tolérancement, Simulation Géométrique, Fabrication Assistée par Ordinateur / Manufacturing and innovative processes - 5 ECTS

EC : Architecture des systèmes mécaniques / Multi/physics systems modeling - 5 ECTS

EC : Conversions d'énergie / Energy conversions - 5 ECTS

EC : Bio/inspiration. Écoconception et Design / Bio/inspiration and ecodesign - 5 ECTS

UE : Projet Recherche et Ingénierie / Research and engineering project master thesis - 16 ECTS

EC : Projet Recherche et Ingénierie / Final project master thesis - 16 ECTS

UE : Sciences Humaines et Sociales / Humanities and social sicences - 5 ECTS

EC : Projet Personnel en Humanités / Personal Project in Humanities - undefined ECTS

EC : Options Sciences Humaines et Sociales, S2 Série 2 / Social and Human Sciences Options, S2 Series 2 - undefined ECTS

EC : Projet Personnel et Professionnel / Personnal and professional project - ECTS

EC : Education Physique et Sportive / Physical Education - ECTS

OPTION : Option pédagogique Mécatronique et Systèmes / special track Mechatronic and Systems 5GM-S2 - 30 ECTS

UE : Stage en entreprise / Internship - 30 ECTS

EC : Stage en entreprise / Internship - 30 ECTS

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

CENTRE DES SPORTS
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Sports

IDENTIFICATION

CODE : CDS-3-S1-EC-EPS
ECTS :

HOURS

Cours :	0h
TD :	1.5h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	1.5h
Travail personnel :	0h
Total :	1.5h

ASSESMENT METHOD

Assessment in Physical Education concerns the teaching of Sports and Artistic Physical Activities (APSA), and will take the form of continuous assessment with half-yearly marking.

The mark depends on the degree of acquisition of the skills expected in each of the activities, and the progress made over all the sessions in the cycle. The mark takes into account :

Individual and/or team performance
mastery of execution
Progress in the sports project
Responsibility and autonomy

TEACHING AIDS

All physical, sporting, artistic and competitive activities

TEACHING LANGUAGE

French

CONTACT

Mme JAUSSAUD Marie :
marie.jaussaud@insa-lyon.fr

AIMS

This EC is part of the Teaching Unit: SHS and contributes to the development of the School's transversal competences

1*Auto-evaluating one's own performance
Knowledges :
- Fundamentals, principles of action and terminology of sports activities
- Criteria for observation, achievement and success.
Abilities :
- Assess your level of practice
- Build up a warm-up
- Set goals for progress
- Manage physical and mental potential

2* Work, learn and develop independently
Knowledge :
- PSAA rules
- Observation criteria
- Principles of warm-up and cool-down
Abilities :
- Mobilise resources
- Analyse, observe, question
- Take on different roles (referee, choreographer)

3* Interact with others, work as part of a team
Knowledges :
- Roles and functions in each sports activity
Abilities :
- Communicate appropriately: verbal, non-verbal and postural communication.
- Integrate into a group
- Take part in and develop a group project
- Take the initiative
- Be a good listener

4* Be creative, innovative and enterprising
Knowledge :
- Artistic disciplines
Abilities :
- Draw on knowledge and resources from different artistic fields to produce an original work.
- Mobilise the imagination and sensibility and make them visible through dance movement
- Access the symbolism of the body

5* Act responsibly in a complex world
Knowledge :
- Safety and operating rules
Abilities :
- Identify uncertainties and risks and act to reduce them
- Integrate a responsible dimension into their actions
- Show respect and fair play in a power struggle

6* Working in an international context
Knowledge :
- Socio-cultural differences
Abilities :
- Integrate cultural diversity into group work
- Act with respect for self and others

CONTENT

Physical Education and Sport lessons are organised around traditional Physical Education lessons, or advanced lessons, or appropriate practices (EPSA), or competitive practices within the framework of the Section Sportive Haut Niveau.

1. Physcical Education lessons :
Students choose one or two physical and sporting activities per year from among the activities offered by the sports centre (individual, group, dual).
2. Appropriate Physical Education lessons: For all students who are exempt from physical activity for at least 2 months:
Swimming, Body-building, Nordic Walking, Somatic Exercise, Sophrology, Wheelchair Basketball, Pilates, Table Tennis, etc.
3. Advanced Physical Education courses :
Specialisation in a sporting activity, University training and competitions
4. SSHN (High-Level Athlete section)

University training and competitions

EPS 3GEN and GENEPI :
1st course in Hauteville in October: 2 days: outdoor activities Objective: Create team cohesion
1st term: PE lessons on Wednesdays from 8.00 to 9.30am: 9 team sports sessions

BIBLIOGRAPHY

PRE-REQUISITES

- EPS: none
- Appropriate Physical Education: subject to medical advice
- Advanced courses and competitive practice: previous practice required subject to specific selection according to each activity
- SHN: ministerial list

Levels 1 and 2: Physical Education, Appropriate physical education
Level 3: Advanced courses and competitive practice, SHN

Conferences and Seminars

IDENTIFICATION

CODE : GM-3-S1-EC-CEMP
ECTS : 1

HOURS

Cours :	10h
TD :	1h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	12h
Travail personnel :	15h
Total :	27h

ASSESMENT METHOD

- initial reflection sheet: 10% of the overall mark;
- MCQs on conferences: 4 times 10% of the overall mark;
- Final exam: 50% of the overall mark.

TEACHING AIDS

A methodology sheet will be provided and should be followed by the student throughout the semester.
Brief company presentations will be made available on INSA LMS platform.

TEACHING LANGUAGE

French

CONTACT

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AIMS

The aim of this course is to give students the elements they need to start building their professional project.
At the end of this course students must be able to:
- describe at least 4 typical engineering days in the field of Mechanical Engineering using examples;
- produce a document that lays the foundations of their personal and professional project explaining the sectors of activity in which they will be looking for their first internship;
- describe the similarities and differences between the various engineering careers presented to them during the semester.

CONTENT

The programme is divided into two parts:
- an introduction to personal and professional projects, with the presentation of methodological tools for personal reflection
- four conferences with engineers from various companies talking about their job and experiences.

BIBLIOGRAPHY

PRE-REQUISITES

none

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Design and analysis of mechanical systems

IDENTIFICATION

CODE : GM-3-S1-EC-CONAN
ECTS : 5

HOURS

Cours :	10h
TD :	24h
TP :	8h
Projet :	0h
Evaluation :	4h
Face à face pédagogique :	46h
Travail personnel :	33h
Total :	79h

ASSESMENT METHOD

Practical work
Intermediate exam
Final exam

TEACHING AIDS

Course handout
Exercise handout
Digital resources (moodle)

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

At the end of this course, each student should be able to :
- read a definition drawing of a mechanical part or system and transcribe it into a hand-drawn sketch

- identify the components used to perform the technological functions of positioning, holding, mechanical transmission and sealing

- explain how the mechanism works from an overall drawing, a CAD or a real system:
* Identify the motion and force transmission components.
* Identify the kinematic equivalence classes

- Draw and analyse the 3D kinematic diagram corresponding to a mechanism

- calculate an input-output law in terms of forces and speeds

- check mechanical components to meet imposed design requirements (direct contact and plain bearings)

- translate a functional specification into a kinematic diagram and mechanical pre-design sketch

- create, open and manipulate a 3D CAD model of a part or assembly

CONTENT

* Power chain, calculating forces and speeds at joints
* Kinematics, hyperstatism, tolerancing
* Positioning, holding in position
* Static and dynamic sealing
* Fits, calculations of clearances / tightenings
* Calculation of plain bearings
* Bearing layout
* Design and technical drawing
* CAD

BIBLIOGRAPHY

Simmons, C. H., & Maguire, D. E. (2012). Manual of engineering drawing: Technical product specification and documentation to British and International Standards. Butterworth-Heinemann.

PRE-REQUISITES

* Knowledge of CAD software: opening and manipulating a digital model
* Reading technical drawings (layout)
* Force calculations (Torsors, Fundamental Principle of Dynamics)

Ecological and systemic engineering

IDENTIFICATION

CODE : GM-3-S1-EC-IES
ECTS : 5

HOURS

Cours :	2h
TD :	30h
TP :	4h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	38h
Travail personnel :	33h
Total :	71h

ASSESMENT METHOD

Oral restitution and written evaluation

TEACHING AIDS

Scientific documentation

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

At the end of this course, students should be able to analyze engineering-related environmental and societal issues in a systemic way:
- reformulate an engineering problem in a more global, multi-criteria vision, taking into account all socio-technical and environmental interactions
- Develop scenarios of continuity or rupture, then arbitrate between efficiency, robustness and goals, in a systemic approach.
- Produce a response that goes beyond the conventional (primacy of ethics over norms)
- Know how to denounce, resist, choose, demand, but also propose, create, participate in and commit to transformation projects: be both critical and a force for proposal.

CONTENT

Integrate multi-disciplinary issues right from the design stage, in particular by taking into account the end-of-life of products, the rebound effects of use and the growing need for energy and materials.
Understanding of the interdependencies between matter and energy in the light of planetary limits.
Take a critical look at technological innovations in terms of their environmental and societal impacts, and their functional needs, in order to design responsibly and with an awareness of their impact.
Mastery of the following concepts: Energy, extractivism, ecological impacts, rebound effect, social justice, living issues, optimality, performance VS robustness, social acceptability, regulatory constraints, end-of-life (multiple obsolescence), possible alternatives.
Ability to calculate an order of magnitude for/estimate the energy and material requirements of a technical system.
Vision of the engineer's role in supporting the transition.¿¿Example of a sequence applied to road traffic:
- Links between a technical object and our lifestyles, in the case of the hypermarket car.
- Using a life cycle assessment to propose strategies for reducing impact, case of mobility
- Assessing the impact of a technical object on biodiversity, case of road networks
- Integrate EROI and material intensity in the choice of an energy source, case of oil
- Integrating the possibilities and limits of end-of-life recovery in the choice of a material, in the case of end-of-life vehicles
- Integrate socio-technical and economic effects such as the rebound effect, network or fleet, in the case of electric cars
- Using the results of life-cycle analyses, in the case of electric cars
-Use a low-tech socio-technical approach, in the case of cargo bikes
- Identify the political, organizational and social issues involved in technical change, case of the car at the turn of the century
- Propose alternatives that are socially acceptable, as in the case of bicycles
- Ethically discern one's role as mediator of technology, as in the case of road safety.
- Integrate the need for emancipation, equity and social justice.

BIBLIOGRAPHY

Documents to be translated

PRE-REQUISITES

Be able to calculate an order of magnitude for/estimate the energy and material requirements of a technical system

Order of magnitude and physical sense

IDENTIFICATION

CODE : GM-3-S1-EC-SPOG
ECTS : 5

HOURS

Cours :	10h
TD :	24h
TP :	8h
Projet :	0h
Evaluation :	4h
Face à face pédagogique :	46h
Travail personnel :	33h
Total :	79h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French
English

CONTACT

M. Elguedj Thomas :
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AIMS

The general objective of this course can be summarized as follows: Carry out the entire process of modeling, solving and critically analyzing results on a simple case of the mechanical engineer's pre-dimensioning type.
In more detail, on completion of this course, students will be able to:
1. Manipulate and convert the units of physical quantities used by mechanical engineers (primary and derived units).
2. Conduct a dimensional analysis of a physical problem, extracting the relevant dimensionless quantities and discussing possible simplifications of the underlying model.
3. Manipulate and master the notions of power and energy, calculate these in a given model, and compare numerical values with the mechanical engineer's orders of magnitude.
4. Identify energy transformation mechanisms/energy flows in a mechanical engineer's pre-sizing model.
5. List and analyze the assumptions made in modeling a real problem, and qualify their impact on the degree of confidence/expected accuracy of the model in relation to the real problem.
6. Analyze and quantify the degree of confidence / accuracy of a pre-sizing model.
7. Carry out the numerical application of a model using the correct numerical precision of quantities and in calculations according to the degree of confidence / accuracy of the model in relation to the real problem.
8. Include uncertainty calculations where necessary in the numerical application of a model.
9. Understand and analyze a provided (pre-dimensioning type) modeling of a real problem, including the asymptotic behavior of the model or its application in particular cases.
10. Reason by analogy between different physics or between different models based on their partial differential equations.
11. Transform a model supplied in the form of partial differential equations into a dimensionless form.
All these skills will be applied to physics relevant to the mechanical engineer, such as (non-exhaustive list): beam theory, fluid statics, heat conduction, performance indices, etc.

CONTENT

1. Units, concepts of forces, energy and power and orders of magnitude in mechanics.
2. Dimensionless quantities and equations.
3. Modeling assumptions - model and calculation accuracy.
4. Critical modeling approach

BIBLIOGRAPHY

PRE-REQUISITES

1st cycle mathematical tools: torsors, integration, derivation, real analysis, solving simple differential equations, linear algebra.
Point mechanics / rigid solids: kinematics, kinetics, dynamics, general theorems, PFS, PFD, notion of mechanical equilibrium.
Schematization and reading of simple technical drawings.

Lagrangian mechanics and system dynamics

IDENTIFICATION

CODE : GM-3-S1-EC-MLAG
ECTS : 5

HOURS

Cours :	10h
TD :	24h
TP :	8h
Projet :	0h
Evaluation :	4h
Face à face pédagogique :	46h
Travail personnel :	33h
Total :	79h

ASSESMENT METHOD

Intermediate exam (2 hours, 30%), Final exam (2 hours, 50%), assessment in practical work session (20%).

TEACHING AIDS

Course handouts with examples and exercises. Tutorials with corrections. Past exam papers with detailed corrections.

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

The aim of this course is to teach students to model a mechanical system using the Lagrangian approach to mechanics. Thanks to the targeted learning outcomes (AAV in French), students will be able to :
- AAV1: determine the velocities, energies and powers involved in the movement of a mechanical system.
- AAV2: apply the conservation laws of classical mechanics to a simple dynamics problem.
- AAV3: set up a calculation strategy based on the principle of virtual powers for compatible or incompatible virtual transformations in order to obtain the equations of motion of the system and possibly the mechanical actions.
- AAV4: determine the constraint equations linking generalised coordinates, implement a strategy taking into account these constraint equations either by incompatible virtual transformations or by introducing Lagrange multipliers.
- AAV5: write the equations of small motions of a system and determine its equilibrium positions (by 'a priori' or 'a posteriori' methods) and study the stability of the response.
- AAV6: analyse a system based on system dynamics with a CSR (Corporate Social Responsibility) objective and identify the quantities that play a role in the system's performance.
- AAV7: set up and run an experiment to observe and quantify dynamic phenomena.

CONTENT

1. Parameterisation of a mechanical system, calculation of kinetic and potential energies, calculation of power, conservation laws.
2. Principle of virtual powers on a system described by independent generalized coordinates for compatible or incompatible virtual transformations in order to obtain the equations of motion of the system and possibly of the mechanical actions.
3. Introduction of holonomic and non-holonomic constraint equations, obtaining the equations of motion by virtual transformation incompatible with the constraint equations or by introducing Lagrange multipliers.
4. Obtaining the equations of small motions and equilibrium positions either by 'a priori' or 'a posteriori' linearisation, studying the stability of the system response for small motions.

BIBLIOGRAPHY

Classical mechanics : an undergraduate text, R. Douglas Gregory, ISBN : 0-521-82678-0, 2006.
A treatise on analytical dynamics, L.A. Pars, ISBN : 0-918024-07-2, 1979.

PRE-REQUISITES

General theorems of dynamics. Calculation of velocities of rigid solids.

Mathematics

IDENTIFICATION

CODE : GM-3-S1-EC-MATH
ECTS : 5

HOURS

Cours :	10h
TD :	24h
TP :	8h
Projet :	0h
Evaluation :	4h
Face à face pédagogique :	46h
Travail personnel :	33h
Total :	79h

ASSESMENT METHOD

Intermediate exam (1H30) without documents (33%), Final exam (2H) with personal A4 handwritten sheet and Laplace sheet (45%), Lab session reports (22%)

TEACHING AIDS

Course handouts with examples and exercises. Course overheads. Tutorial sheets with corrections. Examination papers.

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

The main aim of mathematics teaching is to develop engineering students' skills in understanding and manipulating mathematical tools that are essential to their training and form an integral part of the mathematical culture of a mechanical engineer: analysis and solution of differential equations and differential systems, Laplace and Fourier transforms and their applications, projection, orthogonal bases (especially Fourier series and orthogonal polynomials), and least-squares methods.

At the end of this course, the engineering student will be able to (intended learning outcomes):

- identify the nature and solve by hand sufficiently simple differential equations and systems of differential equations.

- linearize and study the stability of a system of differential equations.

- determine the existence and calculate the Laplace and Fourier transforms of functions and distributions.

- understand what is a solution of a differential equation in the sense of distributions.

- calculate the orthogonal projection on a vector subspace.

- orthogonalize a finite- and infinite-dimensional basis.

- calculate the least-squares approximation of a function using Fourier series and orthogonal polynomials.

CONTENT

1. Reminder of differential equations, systems of differential equations, linearization, stability, Newton's method.

2. Fourier transform and applications (definition, properties, convolution, application to solving differential equations, distributions, transform of a distribution, discrete transform).

3. Laplace transform and applications (definition, properties, application to solving problems with initial values).

4. Projection, least squares, Hilbert spaces, bases, Fourier series, orthogonal polynomials, approximate integration.

BIBLIOGRAPHY

- C. Gasquet, P. Witomski, Fourier analysis and applications, Springer 1998
- J.-P. Demailly, Analyse numérique et équations differentielles, EDP Sciences, 2006.
- J.-M. Gilsinger, M. Jaï, Éléments d'analyse fonctionnelle, fondements et applications aux sciences de l'ingénieur. PPUR 2010.
- Laplace Transform, Schaum Outlines, McGraw-Hill 1991.

PRE-REQUISITES

FIMI mathematics program: analysis (continuity, derivability, limit calculations, limited developments), integrals of continuous functions, improper integrals, matrix linear algebra, eigenvalues and eigenvectors, function sequences and series.

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Data processing

IDENTIFICATION

CODE : GM-3-S1-EC-DATA
ECTS : 5

HOURS

Cours :	10h
TD :	24h
TP :	8h
Projet :	0h
Evaluation :	4h
Face à face pédagogique :	46h
Travail personnel :	33h
Total :	79h

ASSESMENT METHOD

- Intermediate Exam on computer (30%)
- Final Exam on computer (30%)
- Lab class (20%)
- Project report (20%)

TEACHING AIDS

- Detailled slides of lectures + Associated notebooks illustrating the lectures
- Corrected notebooks of tutorials (progressively available during the semester)
- Self-training documents related to pre-requisites of the semester (Python language and NumPy and Matplotlib librairies)
- Autonomous quizzs on the progressive aquisition of skills (self-training, does not count in final grade)
- Corrected past exams

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

"The main aim of EC DATA is to introduce students to the handling of scientific and technical data. The data concerned may be of various kinds (quantitative or categorical, localized or not, one-dimensional or multidimensional, images, signals, etc.), of various types (experimental, digital, from the field) and of various origins (other CEs in the curriculum, research labs, industrial partners). The aim is to put the student in the position of an engineer who is confronted with a data set and has to extract useful information and knowledge from it. The aim is to provide students with the theoretical (probability and statistics, signal processing methods, learning methods) and practical (text editor, spreadsheet, programming language) tools they need to deal with a wide variety of such situations, with increasing levels of autonomy. On completion of this course, students will be able to:

1. Store and organize data for retrieval, retention, easy access and management on a computer.
2. Read any type of file containing binary or ASCII data (.txt, .data, .csv, .h5, .toto, etc.).
3. Identify the type of data (quantitative/categorical, localized or not, mono/multi-dimensional), their quality (abundant/limited) from the description of their origin and means of obtaining them (experimental/numerical/field).
4. Visualize and graph a series of data by selecting the right representation and visualization tool.
5. Process one-dimensional data to analyze a problem, applying theoretical tools in probability, statistics and signal processing.
6. Perform basic operations on higher-dimensional data, such as segmentation and filtering.
7. Fit a model on data by linear regression using the least-squares method, using different tools (spreadsheet, code).
8. Apply supervised or unsupervised learning methods (Principal Component Analysis, classification) in guided cases on high-dimensional data to extract information."

CONTENT

1. General information on data. (Why and how to process data? Data types, loading and saving data, graphical representations, common tools). 2. Basics of probability and statistics (random variables, CDF and PDF, descriptive statistics, common laws, statistical moments). 3. One-dimensional data (time, space or other: basic operations, interpolation, regression, differential operations, signal processing, spectral analysis, Fourier series and Discrete Fourier Transform). ¿4. Higher-dimensional data (2D, 3D, 1D+time, 2D+time, etc.). basic operations, segmentation, filtering, etc.). 5. Basics of supervised and unsupervised machine learning techniques.

BIBLIOGRAPHY

PRE-REQUISITES

Programming basics, Scientific undergraduate mathematics.

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

technical objects: imagination and observation

IDENTIFICATION

CODE : HU-3-S1-EC-S-GM-OTIO
ECTS : 2

HOURS

Cours :	4h
TD :	22h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	26h
Travail personnel :	22h
Total :	48h

ASSESMENT METHOD

1. Oral and visual presentation (group mark)
2. Production of a prospective narrative (group mark)

TEACHING AIDS

Documents and digital resources on Moodle platform

TEACHING LANGUAGE

French

CONTACT

Mme CHOUTEAU Marianne : marianne.chouteau@insa-lyon.fr
Mme NGUYEN Céline : celine.nguyen@insa-lyon.fr

AIMS

OBJECTIVE OF THIS COURSE
By the end of the OTIO module, 3GM students will be able to construct the trajectory and the sociotechnical profile of a technical object.
LEARNING OBJECTIVES
Creating a Graphic Representation/Model Depicting Key Aspects of a Technical Object's History, Imaginary, Sensory Interactions, and Uses by:

Collecting academic and journalistic documents (both primary and secondary sources) on the history and imaginary surrounding a technical object.
Analyzing historical documents.
Analyzing representations of a technical object.
Conducting a sociological observation of the uses and users of a technical object.
Describing sensory interactions with a technical object.
Selecting the most significant elements to incorporate into the representation.
Constructing an oral presentation that supports and complements the graphic representation.
Imagining a Prospective Narrative of a Happy World Including the Studied Technical Object by:

Identifying the values of a happy world.
Translating these values into a fictional narrative.
Developing a coherent story.

CONTENT

Composing a graphic representation [sessions 1 to 7] and presenting it [Session 8]
- Foresight for a happy world [session 9]
- Write a coherent story [sessions 10 to 12], read it in session and make the link with technical culture [session 13]

BIBLIOGRAPHY

Jacques Billard (2018), « Une technogénèse », Médium, n°54, p.47-55
Deforge Y., (1993), De l'éducation technologique à la culture technique, Paris, ESF
Deforge Y., (1985), Technologie et génétique de l'objet industriel, Paris, Maloine
Rebekka Endler (2022), Le patriarcat des objets, Paris, Dalva, n°54
Garçon A-F., (2017), « Une brève histoire de la culture technique européenne et de sa relation à l'innovation », Technologie et innovation, p.17-2, http://www.openscience.fr/Une-breve-histoire-de-la-culture-technique-europeenne-et-de-sa-relation-a-l
Jeanne Guien (2021), Le consumérisme à travers ses objets, Paris, Divergences
Marie-Pierre Julien, Céline Rosselin (2005), La culture matérielle, Paris, La Découverte
Jacomy B., (1993), « Culture technique de l'ingénieur », Techniques de l'ingénieur, n°10
Noblet (de) Jocelyn (1981), Manifeste pour le développement de la culture technique, Paris
Perriault J. (1998), « « Culture technique ». Éléments pour l'histoire d'une décennie singulière 1975-1985 », Les cahiers de médiologie, 2 (N° 6), p. 197-214. DOI : 10.3917/cdm.006.0197. URL : https://www.cairn.info/revue-les-cahiers-de-mediologie-1998-2-page-197.htm
Roqueplo P (1983), Penser la technique : pour une démocratie concrète, Paris, Seuil

PRE-REQUISITES

Written and spoken French

Scientific and technical project

IDENTIFICATION

CODE : GM-3-S1-EC-PST
ECTS : 6

HOURS

Cours :	10h
TD :	10h
TP :	4h
Projet :	30h
Evaluation :	1h
Face à face pédagogique :	25h
Travail personnel :	35h
Total :	90h

ASSESMENT METHOD

Final Report (1/3) - Oral presentation and poster (1/3) - Work and involvment (1/3)

TEACHING AIDS

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

One trans-disciplinary subject (theoretical / digital) + simple experimental validation (measurement, design-fabrication, prototyping). MOD-EX / SIM-EX. Tools for bibliographic research, technical report writing, oral presentation of work, data formatting, interaction with others. Allowing students to work and be assessed on the following skills: - Posing and solving a problem - Choosing a methodology adapted to the problem at hand - Manipulating a set of data to extract relevant information - Managing a semester's work - Summarizing scientific and technical work in writing and orally.

CONTENT

"Technical project in pairs. The technical level required will be compatible with (first cycle, or equivalent).
Learning how to format technical documents.
During supervised time, consolidation of learning, analysis, reflection, the ability to properly pose and solve a scientific and technical problem, and the ability to manage a semester's work.
Consolidation and validation of written and oral reporting skills. "

BIBLIOGRAPHY

PRE-REQUISITES

Bachelor's degree or equivalent (bac + 2)

Fluid Mechanics

IDENTIFICATION

CODE : GM-3-S2-EC-FLUID
ECTS : 5

HOURS

Cours :	10h
TD :	22h
TP :	8h
Projet :	0h
Evaluation :	4h
Face à face pédagogique :	44h
Travail personnel :	35h
Total :	79h

ASSESMENT METHOD

Intermediate exam (20min) as a multiple choice (20%), 2 lab reports (20%), Final exam (3H).

TEACHING AIDS

Slides of the main course, exercice list with corrections

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

"School skills in engineering :
A1- Analyze a system (real or virtual) or a problem (level 2)
A2- Use a model of a real or virtual system (level 2)
A3- Implement an experimental approach (level 2)
A4- Design a system to meet specifications (level 2)
School skills in humanity, documentation and physical and sports education :
B2- Work, learn and develop independently (level 1)
B3- Interact with others, work as part of a team (level 1)
School skills specific to the specialty :
C2- Analyze expressed or presumed needs and define the design requirements for a mechanical system to meet these needs (level 1)
C3- Design and predimension a mechanical system (level 2)
C8- Model the behavior of a system or multiphysical phenomenon (level 2)
C10- Establish a problem-solving approach (level 2)
By mobilizing the following skills :
A5- Process data
By enabling the student to work on and be assessed on the following knowledge :
- Fluid statics, wall forces, Bernoulli's theorem, momentum
- Kinematics, turbulence, continuity, fluid dynamics, pressure drop, pump.
By enabling the student to work and be assessed on the following skills:
- Apply the fundamental equation of fluid statics
- Apply the QDM theorem
- Define the kinematic properties of a flow
- Predict aerodynamic forces on an object in a flow
- Select a pump and determine the operating point of a hydraulic system"

CONTENT

1. Static and dynamic force and momentum balance.
2. Bernoulli's Bernoulli's theorem (perfect fluid).
3. Local balance equations (continuity and Navier-Stokes) and associated boundary conditions.
4. Fluid kinematics, Eulerian and Lagrangian descriptions, steady and unsteady flows, 1D, 2D, 3D.
5. Head losses, pump characteristics, functioning point, association of pumps is series or parallel

BIBLIOGRAPHY

PRE-REQUISITES

Bachelor Mathematics level

Mechanics of deformable solids

IDENTIFICATION

CODE : GM-3-S2-EC-MDEF
ECTS : 5

HOURS

Cours :	10h
TD :	22h
TP :	8h
Projet :	0h
Evaluation :	3h
Face à face pédagogique :	43h
Travail personnel :	35h
Total :	78h

ASSESMENT METHOD

final exam (2h) + 2 practical work assessments (4hx2)

TEACHING AIDS

textbook (lecture notes + exercises)

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

"1-Master the notions of stresses, strains and displacements, their representations (tensors) and the links between them.
2-Translate a static mechanics problem using the formalism of continuum mechanics.
3-Associate a system of equations, hypotheses and boundary conditions with a static mechanics problem in order to determine stresses, strains and displacements.
4-Physically interpret results obtained by solving a mechanical problem.
5-Relate local quantities (stresses, strains, etc.) to macroscopic quantities (forces, displacements, equilibrium, etc.).
6-Predict whether the elastic limit has been reached for a mechanical part undergoing a given loading.
7-Solve a simple static mechanics problem by solving elementary problems.
8-Formulate an elasto-static problem in energy terms, developments towards a numerical solving (FEM)."

CONTENT

"Tensor algebra
Kinematics; linearized deformations; strain measures;
Stress vector; stress tensor; yield criteria (Tresca, vM)
Equilibrium (Cauchy, D'Alembert, energy form)
Elastic and thermo-elastic behavior
Plane and axisymmetric elasticity"

BIBLIOGRAPHY

Mécanique des milieux continus, Jean Salençon, Tome I concepts généraux, Tome II Thermoélasticité

PRE-REQUISITES

integral calculus, differential operators, matrix algebra, tensile test

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

CENTRE DES SPORTS
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Sports

IDENTIFICATION

CODE : CDS-3-S2-EC-EPS
ECTS :

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	0h
Travail personnel :	0h
Total :	0h

ASSESMENT METHOD

Assessment in Physical Education concerns the teaching of Sports and Artistic Physical Activities (APSA), and will take the form of continuous assessment with half-yearly marking.

The mark depends on the degree of acquisition of the skills expected in each of the activities, and the progress made over all the sessions in the cycle. The mark takes into account :

Individual and/or team performance
mastery of execution
Progress in the sports project
Responsibility and autonomy

TEACHING AIDS

All physical, sporting, artistic and competitive activities

TEACHING LANGUAGE

French

CONTACT

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AIMS

This EC is part of the Teaching Unit: SHS and contributes to the development of the School's transversal competences

1*Auto-evaluating one's own performance
Knowledges :
- Fundamentals, principles of action and terminology of sports activities
- Criteria for observation, achievement and success.
Abilities :
- Assess your level of practice
- Build up a warm-up
- Set goals for progress
- Manage physical and mental potential

2* Work, learn and develop independently
Knowledge :
- PSAA rules
- Observation criteria
- Principles of warm-up and cool-down
Abilities :
- Mobilise resources
- Analyse, observe, question
- Take on different roles (referee, choreographer)

3* Interact with others, work as part of a team
Knowledges :
- Roles and functions in each sports activity
Abilities :
- Communicate appropriately: verbal, non-verbal and postural communication.
- Integrate into a group
- Take part in and develop a group project
- Take the initiative
- Be a good listener

4* Be creative, innovative and enterprising
Knowledge :
- Artistic disciplines
Abilities :
- Draw on knowledge and resources from different artistic fields to produce an original work.
- Mobilise the imagination and sensibility and make them visible through dance movement
- Access the symbolism of the body

5* Act responsibly in a complex world
Knowledge :
- Safety and operating rules
Abilities :
- Identify uncertainties and risks and act to reduce them
- Integrate a responsible dimension into their actions
- Show respect and fair play in a power struggle

6* Working in an international context
Knowledge :
- Socio-cultural differences
Abilities :
- Integrate cultural diversity into group work
- Act with respect for self and others

CONTENT

Physical Education and Sport lessons are organised around traditional Physical Education lessons, or advanced lessons, or appropriate practices (EPSA), or competitive practices within the framework of the Section Sportive Haut Niveau.

1. Physcical Education lessons :
Students choose one or two physical and sporting activities per year from among the activities offered by the sports centre (individual, group, dual).
2. Appropriate Physical Education lessons: For all students who are exempt from physical activity for at least 2 months:
Swimming, Body-building, Nordic Walking, Somatic Exercise, Sophrology, Wheelchair Basketball, Pilates, Table Tennis, etc.
3. Advanced Physical Education courses :
Specialisation in a sporting activity, University training and competitions
4. SSHN (High-Level Athlete section)

University training and competitions

EPS 3 GEN - GENEPI :
PE lessons on Wednesday from 8.00 to 9.30: 2 x 5 sessions: outdoor activities and 2nd 2-day course in Hauteville

BIBLIOGRAPHY

PRE-REQUISITES

- EPS: none
- Appropriate Physical Education: subject to medical advice
- Advanced courses and competitive practice: previous practice required subject to specific selection according to each activity
- SHN: ministerial list

Levels 1 and 2: Physical Education, Appropriate physical education
Level 3: Advanced courses and competitive practice, SHN

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Control of linear systems

IDENTIFICATION

CODE : GM-3-S2-EC-CSL
ECTS : 5

HOURS

Cours :	10h
TD :	22h
TP :	8h
Projet :	0h
Evaluation :	4h
Face à face pédagogique :	44h
Travail personnel :	35h
Total :	79h

ASSESMENT METHOD

Final exam: 2h
Mid-term examination: 2h

TEACHING AIDS

Lecture notes
Exam session documents
Lecture slides
Summary cards

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

Control engineering concerns the representation, analysis and manipulation of the dynamical response of systems. This discipline has become central to the design of any guided system and, in particular, of mechanical systems. Its purpose is to improve the performances of a system with respect to several criteria, such as stability, speed or accuracy, and ensure repeatability in the behaviour of industrial processes even in the presence of uncontrolled disturbances in the work environment. The goal of this course is to introduce, within a linear framework, the basic tools required to represent and analyse these systems then design suitable control laws.

At the end of this course
The student masters the different approaches to modeling linear systems.
The student masters representations using transfer functions, state-space representations, and block diagrams.
The student is able to analyze and interpret the time response and frequency response of linear systems.
The student is able to identify and model elementary linear systems.
The student is able to evaluate the controllability and observability of a system.
The student is able to determine and analyze the stability of linear systems.
The student is able to assess the performance of closed-loop systems.
The student is able to design robust controllers.
The student masters the frequency-domain synthesis of linear controllers.
The student understands the practical aspects of linear system control, including sampling, instrumentation, and software-based sensors.

CONTENT

To achieve the aforementioned objectives, the course aims to cover the following topics:
1) Representations and characterization of linear systems:
- Input/output approach, transfer functions, state approach, state representation, block diagrams
- Time-domainresponse and analysis: harmonic, step, and impulse responses
- Frequency-domain response and analysis: Bode plots
- Elementary linear models (gain, integrator, 1st order, 2nd order, pure delay, differentiator)
- Controllability and observability

2) Performance analysis
- Stability: input/output stability (analysis of transfer function poles), internal stability, Nyquist criterion, stability margins
- Performance criteria of closed-loop systems: settling time, overshoot, accuracy, bandwidth

3)Controller synthesis:
- Robustness
- Frequency synthesis of linear controllers (P, PI, PD, PID, lead-lag controllers)
- State feedback control and pole placement
- Practical aspects of linear system control: sampling, instrumentation, software sensors

The course also includes two practical lab sessions (8h) introducing the problem of closed-loop control (feedback) on a real system.

BIBLIOGRAPHY

[1] Automatique appliquée Tome 1, E. Dieulesaint, D. Royer, Masson 1987.
[2] Théorie et calcul des asservissements linéaires, J.Ch. Gille, P. Decaulne, M. Pelegrin, Dunod 1992.
[3] Commande des systèmes linéaires, Ph. De Larminat, Hermès 1993.
[4] Asservissement, régulation, commande analogique, Tome 2, M. Rivoire, J-L. Ferrier, Eyrolles 1990.
[5] Automatique : systèmes linéaires et continus, S. Le Ballois, P. Codron. Eyrolles, 2006.
[6] Systèmes Automatiques : Commande des processus, J.P. Hautier, J.P. Caron. Ellipses, 1997.
[7] Feedback control of dynamics systems. G. F. Franklin, D. Powell, A. Emami-Naeini. Addison-Wesley, Reading, MA 1994.
[8] Modern control systems. R. C. Dorf, R. H. Bishop, 1998.

Vibration of Mechanical Systems

IDENTIFICATION

CODE : GM-3-S2-EC-MVIB
ECTS : 5

HOURS

Cours :	10h
TD :	22h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	42h
Travail personnel :	35h
Total :	77h

ASSESMENT METHOD

final exam (2h) all documents authorized (66%), 2 self assessments in practical work (33%)

TEACHING AIDS

Course
TD Materials
Numerical programs
Moodle site

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

The objective of this teaching is the study of mechanical vibrations encountered in any structure. This teaching in a theoretical and practical approach allows to acquire the basic notions essential to the understanding and analysis of the dynamic behavior of structures. At the end of this EC (targeted learning outcomes) the student is able to:
- model a mechanical system,
- put the system into an equation,
- extract the dynamic characteristics,
- implement an analytical or numerical approach to calculate the real responses of the system under loading.
- He also knows how to implement a vibration test with different excitation and measurement techniques.
- The student is thus able to have a critical view, to interpret the dynamic responses and to modify the structure with a view to controlled behavior.

CONTENT

1 - Equations for 1, N degrees of freedom.
2 - Transfert and impulsional function, modal schema.
3 - Determination of eigenvalues and eigenvectors
4 - Evaluation of Damping
5 -Free and forced (sinusoidal) response,
Use of the eigenmode base for the calculation of a structural response under modal or proportional viscous damping.
6 - Introduction to continuous system.
Phenomenology in longitudinal motion, torsion and bending of beam and plate systems 7 - Implementation of a measurement chain to characterize the dynamics of structures

BIBLIOGRAPHY

Biblio
• M. Lalanne, P. Berthier, J. Der Hagopian
Mechanical Vibrations for Engineers, J. Wiley, 1983
• G. Venizelos
Vibrations des structures, Analyse modale, Modélisation, Ellipses 2012
• M. Thomas, F. Laville,
Simulation des vibrations mécaniques par Matlab, Simulink et Ansys, PU du Québec 2007
• B. Combes
Vibrations des structures pour l'ingénieur et le technicien, Théorie et applications, Ellipses 2009
• J-L Guyader
Vibration des milieux continus, Hermès –Lavoisier, 2002

PRE-REQUISITES

Matrix calculation , Solid 's mechanism, elasticity, linear algebra, Numerical calculation, Data science, acquisition and post processing

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Numerical methods

IDENTIFICATION

CODE : GM-3-S2-EC-NUM
ECTS : 5

HOURS

Cours :	10h
TD :	22h
TP :	0h
Projet :	15h
Evaluation :	4h
Face à face pédagogique :	36h
Travail personnel :	30h
Total :	81h

ASSESMENT METHOD

Intermediate exam (2H) without documents (30%), Final exam (2H) without documents (35%), report and digital code of the mini-project carried out in pairs (35%).

TEACHING AIDS

Course overheads. Tutorial topics with correction and numerical code. Catalog of mini-projects. Assessment books.

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

This course is an introduction to numerical methods for the approximate resolution of problems commonly encountered in Mechanics, whether stationary or unsteady, boundary and/or initial value problems. This course, based on a multiphysics and numerical modeling approach in the field of Mechanics, enables students to acquire a fundamental knowledge of Numerical Analysis and a global understanding of how to obtain, implement and exploit a numerical model.

At the end of this course (intended learning outcomes):

- Depending on the nature of the problem to be solved, students will be able to choose a numerical method based on quality and/or numerical cost criteria, while justifying their choices.
- Using analytical modeling of a stationary or unsteady problem, students will be able to implement a reasoned approach to numerical modeling and validation of numerical results obtained in the Python environment.
- Students will be able to conduct a critical analysis of the numerical results obtained, validating them with a reasoned approach in relation to numerical convergence and the accuracy obtained.
- Students will be able to develop a numerical method based on simple modeling to take into account non-linear phenomena or phenomena described by data.
- Students will be able to carry out a convergence analysis of an iterative numerical scheme in the linear case, in order to dimension a numerical model.
- The student acquires autonomy in learning the numerical approach, through independent confrontation of a complex problem.

CONTENT

The program of the course is :

1. Introduction to numerical modeling and simulation.
2. Solving systems of algebraic equations: generalities, direct methods, iterative methods, successive approximation methods, implementation.
3. Finite-difference method for partial differential equations: General, principles and obtaining 1D schemes, implementation, elements of analysis (consistency, stability, convergence), 2D extensions of the method.
4. Numerical schemes for initial-value problems: Principles, analysis and implementation, single-step methods, multi-step methods, prediction-correction methods, semi-discretization and space-time discretization.

BIBLIOGRAPHY

J.-P. Demailly, Numerical analysis and differential equations, EDP Sciences, 2016
F. Filbet, Numerical analysis: algorithm and mathematical study, Dunod, 2013
G. Allaire, Numerical analysis and optimization: an introduction to mathematical modeling and numerical simulation, Ed. de l'Ecole Polytechnique, 2005

PRE-REQUISITES

Mathematics (GM-3-S1-EC-MATH), basic elements on analysis and linear algebra (1st cycle)
Basics on Data processing (GM-3-S1-EC-DATA)
Algorithm basics.

Instrumentation, Data Acquisition and Exploitation project

IDENTIFICATION

CODE : GM-3-S2-EC-PIAE
ECTS : 5

HOURS

Cours :	0h
TD :	4h
TP :	8h
Projet :	20h
Evaluation :	1h
Face à face pédagogique :	13h
Travail personnel :	30h
Total :	63h

ASSESMENT METHOD

Collective assessment of the technical reports of the project groups (50%), individual oral assessment during the project (20%), collective assessment of an experimental set-up (10%), individual oral assessment during the practical work session (20%).

TEACHING AIDS

Course materials, practical work materials, technical documentation (acquisition system, sensors)

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

The main objective of this course is to train students to set up experimental protocols in order to achieve a specific objective, such as comparing experimental data with a model or with results from the scientific literature. By the end of this course, thanks to the following targeted learning outcomes (AAV in French), students will be able to:
- AAV1: analyse a system and determine the physical quantities used to characterise the system.
- AAV2: set up an experimental approach with a specific objective.
- AAV3: select suitable sensors and set up an acquisition chain.
- AAV4: post-process and exploit the signals measured for a defined objective.
- AAV5: make relevant comparisons between measured data and models and/or other measurements.

CONTENT

Introduction (2 x 2h sessions) to physical quantities and units, different sensor technologies and general principles of acquisition chains. Introduction to measurement uncertainties and errors.
Project (10 sessions of 2 hrs) in triads on the instrumentation of a mechanical system and the use of data for comparison with a model or other measurement data.
Practical work (2 sessions of 4 hours) on measuring the mechanical characteristics of a beam in tension using different methods and sensors.

BIBLIOGRAPHY

Data acquisition for sensor systems, H. Rosemary Taylor, ISBN: 0-412-78560-9, 1997.
The makerspace librarian's sourcebook, Ellyssa Kroski, ISBN: 978-1-78330-229-1, 2017.
Arduino in Science, Collecting, Displaying, and Manipulating Sensor Data, Richard J. Smythe, ISBN: 978-1-4842-6777-6, 2021.

PRE-REQUISITES

Know how to handle and convert the units of physical quantities used by mechanical engineers.
Know the basics of probability and statistics and be able to calculate measurement uncertainties.
Know the basics of signal processing.

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Immersion internship

IDENTIFICATION

CODE : GM-3-S2-EC-STAGE
ECTS : 2

HOURS

Cours :	0h
TD :	1h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	3h
Travail personnel :	60h
Total :	63h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

IDENTIFICATION

CODE : HU-3-S2-EC-S-GM-INNO
ECTS : 2

HOURS

Cours :	0h
TD :	28h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	28h
Travail personnel :	22h
Total :	50h

ASSESMENT METHOD

Presentation in “Exhibition” Mode (group grade)
Collective Progress Grade, based on various assignments completed throughout the semester

TEACHING AIDS

Documents and digital resources on Moodle

TEACHING LANGUAGE

French

CONTACT

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AIMS

By the end of the INNO module, 3GM students will be able to propose an innovative concept that makes sense in response to a problem.
To be an innovative concept that makes sense, the concept must meet the following criteria:
- The concept is innovative
- The concept creates meaning for the user
- The concept creates meaning for society
The learning objectives are :
1. To develop an innovative concept [create].
- Students are able to identify a problem
- Pupils are able to define the scope of the problem on the basis of monitoring work [recognise].
- Students are able to use creative methods to generate alternative concepts [apply]
- Students are able to choose a concept [evaluate]
- Students are able to design a proto-card to clarify their concept.

2. Test the meaning of the innovative concept for users and society [evaluate]
- The students are able to use the semi-structured interview method to validate that the concept they have devised makes sense.
- Students are able to compare the value potential of the concept they have devised with that of its competitors
- Students are able to estimate the attitude of stakeholders towards the meaning of the concept they have devised.

CONTENT

The first part of the course aims to define a problem that makes sense for society (3 sessions)
The second part aims to bring out innovative concepts (2 sessions)
The third part selects a concept based on its ability to make sense for users and society (3 sessions)
The fourth part aims to test the chosen concept (4 sessions)
Finally, the last part is dedicated to communicating the concept.

BIBLIOGRAPHY

PRE-REQUISITES

Spoken and written French

Mechanical design and sizing

IDENTIFICATION

CODE : GM-3-S2-EC-CODI
ECTS : 5

HOURS

Cours :	10h
TD :	22h
TP :	8h
Projet :	0h
Evaluation :	3h
Face à face pédagogique :	43h
Travail personnel :	35h
Total :	78h

ASSESMENT METHOD

Intermediate exam
Final exam
Case studies

TEACHING AIDS

Course handout
Exercise handouts
Digital resources (moodle)

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

The aim of this course is to set up an approach for dimensioning the parts and links of a mechanical system, based on preliminary design data.

At the end of this course, students should be able to :
- Validate the dimensions of a beam-like part based on an elastic limit criterion applied to the equivalent Von Mises stress.
- Determine the service life of a part such as a drive shaft subjected cyclically to combined torsion/bending loading.
- Select standard guiding components such as angular contact bearings for a given service life.
- Define the stiffness and dimensional characteristics of components making up an elastic connection, such as coil springs or spring washers, to achieve a given technical function, such as a pressing force on friction surfaces.
- Determine the number and dimensions of threaded elements needed to transmit torque or create a seal in a removable flush-mounted connection.
- Propose and validate technical solutions based on data from a top-down functional analysis and a functional expression of need.
- Represent technical solutions in a collaborative mock-up based on a skeleton structure.

CONTENT

- Static sizing: cohesive torsor, equivalent stress, sizing criterion and safety coefficient.
- Fatigue sizing: fatigue limit, endurance diagram and cumulative damage applied to drive shafts subjected to combined torsion and bending.
- Pivot connections using angular-contact bearings: hyperstatism, induced loads, service life and notion of preload.
- Elastic connections: coil springs and spring washers.
- Complete threaded connections: screw and assembly characteristics, tightening torque, dimensioning using simple and optimized methods.

A case study carried out in pairs enables the design and sizing approach to be implemented, based on data from a top-down functional analysis and a functional expression of need. A 3D model and drawings of the technical solution are produced using a collaborative method.

BIBLIOGRAPHY

Simmons, C. H., & Maguire, D. E. (2012). Manual of engineering drawing: Technical product specification and documentation to British and International Standards. Butterworth-Heinemann.

PRE-REQUISITES

Modeling mechanical actions
Determining the mechanical actions of an isostatic model
Strength of straight beams
Reading technical drawings
Basic knowledge of CAD software

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

CENTRE DES SPORTS
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Sports

IDENTIFICATION

CODE : CDS-4-S1-EC-EPS
ECTS :

HOURS

Cours :	0h
TD :	1.5h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	1.5h
Travail personnel :	0h
Total :	1.5h

ASSESMENT METHOD

Assessment in Physical Education concerns the teaching of Sports and Artistic Physical Activities (APSA), and will take the form of continuous assessment with half-yearly marking.

The mark depends on the degree of acquisition of the skills expected in each of the activities, and the progress made over all the sessions in the cycle. The mark takes into account :

Individual and/or team performance
mastery of execution
Progress in the sports project
Responsibility and autonomy

TEACHING AIDS

All physical, sporting, artistic and competitive activities

TEACHING LANGUAGE

French

CONTACT

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AIMS

This EC is part of the Teaching Unit: SHS and contributes to the development of the School's transversal competences

1*Auto-evaluating one's own performance
Knowledges :
- Fundamentals, principles of action and terminology of sports activities
- Criteria for observation, achievement and success.
Abilities :
- Assess your level of practice
- Build up a warm-up
- Set goals for progress
- Manage physical and mental potential

2* Work, learn and develop independently
Knowledge :
- PSAA rules
- Observation criteria
- Principles of warm-up and cool-down
Abilities :
- Mobilise resources
- Analyse, observe, question
- Take on different roles (referee, choreographer)

3* Interact with others, work as part of a team
Knowledges :
- Roles and functions in each sports activity
Abilities :
- Communicate appropriately: verbal, non-verbal and postural communication.
- Integrate into a group
- Take part in and develop a group project
- Take the initiative
- Be a good listener

4* Be creative, innovative and enterprising
Knowledge :
- Artistic disciplines
Abilities :
- Draw on knowledge and resources from different artistic fields to produce an original work.
- Mobilise the imagination and sensibility and make them visible through dance movement
- Access the symbolism of the body

5* Act responsibly in a complex world
Knowledge :
- Safety and operating rules
Abilities :
- Identify uncertainties and risks and act to reduce them
- Integrate a responsible dimension into their actions
- Show respect and fair play in a power struggle

6* Working in an international context
Knowledge :
- Socio-cultural differences
Abilities :
- Integrate cultural diversity into group work
- Act with respect for self and others

CONTENT

Physical Education and Sport lessons are organised around traditional Physical Education lessons, or advanced lessons, or appropriate practices (EPSA), or competitive practices within the framework of the Section Sportive Haut Niveau.

1. Physcical Education lessons :
Students choose one or two physical and sporting activities per year from among the activities offered by the sports centre (individual, group, dual).
2. Appropriate Physical Education lessons: For all students who are exempt from physical activity for at least 2 months:
Swimming, Body-building, Nordic Walking, Somatic Exercise, Sophrology, Wheelchair Basketball, Pilates, Table Tennis, etc.
3. Advanced Physical Education courses :
Specialisation in a sporting activity, University training and competitions
4. SSHN (High-Level Athlete section)

University training and competitions

BIBLIOGRAPHY

PRE-REQUISITES

- EPS: none
- Appropriate Physical Education: subject to medical advice
- Advanced courses and competitive practice: previous practice required subject to specific selection according to each activity
- SHN: ministerial list

Levels 1 and 2: Physical Education, Appropriate physical education
Level 3: Advanced courses and competitive practice, SHN

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INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

IDENTIFICATION

CODE : HU-4-S1-EC-S-GM-COPR
ECTS : undefined

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	25h
Travail personnel :	0h
Total :	25h

ASSESMENT METHOD

Project Management Plan: 1/3

MCQ on the MOOC Project Management: 1/3

Note from the project and team management tutor: 1/3

TEACHING AIDS

On Moodle: Online MOOC for Project Management

TEACHING LANGUAGE

French

CONTACT

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AIMS

Competencies developed:
2. Work, learn, evolve autonomously
2.2 Develop, implement, regulate a relevant strategy of action in a defined goal

3. Interact with others, work in teams
3.4 Integrating into a group, positioning oneself, building a relationship dynamic to the group, integrate new members
3.5 Managing conflicts, the balance between individual and collective interests
3.6 Engage in a collective project: building and running a project, the to evolve; become aware of their role and responsibility

4. Be creative, innovate, undertake
4.3 Innovate / create value in the business based on issues industrial, professional ...

6. Situate, work, evolve in a company, a socioproductive organization
6.4 Design and conduct an industrial or service project

7. Work in an international and intercultural context
7.4 Integrating cultural diversity into group work

CONTENT

On Moodle: Online MOOC for Project Management

BIBLIOGRAPHY

PMBOK: Guide Du Corpus Des Connaissances En Management De Projet, 5ème édition

PRE-REQUISITES

Life cycle analysis

IDENTIFICATION

CODE : GM-4-S1-EC-ACV
ECTS : 4

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	26h
Total :	52h

ASSESMENT METHOD

Intermediate knowledge assessment (30%)
Group life cycle analysis project (presentation + report 70%)

TEACHING AIDS

4 case studies covering a wide range of mechanical design issues :
Two mono or bi-material systems
A consumer industrial system (small household appliances, power tools, general-purpose machinery, etc.)
A renewable energy production system

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

- Analyze a mechanism or machine from a life cycle perspective
- Use a Life Cycle Assessment tool as part of an eco-design, eco-socio-design or sustainable design approach
- Carry out a critical and comparative review of LCAs carried out within the framework of current standards.
- Implement an eco-design approach that integrates the global challenges of strong sustainability
- Integrate planet boundary (physical and social) by means of relevant indicators, particularly concerning biodiversity.
- Act for a profound rethinking of social models and lifestyles.

CONTENT

- Energy and material balances for a process or life-cycle phase
- Lifecycle analysis method (standards, calculation rules, etc.) and its various concepts (functional unit, reference flow, flow inventory, etc.).
- Knowledge of industry-specific software and standards
- Notions of environmental and social impacts
- Critical reading of an LCA, constraints, limits and validity.
- Hierarchy of impacts on living organisms: habitat degradation and loss, overexploitation, climate change, invasive species, pollution.
- Proposals for concrete action in the context of re-design projects.

BIBLIOGRAPHY

Analyse du cycle de vie - Comprendre et réaliser un écobilan (Olivier Jolliet, Myriam Saadé-Sbeih)
AFNOR - Norme NF EN ISO 14040 Management environnemental Analyse du cycle de vie - Principes et cadre.
Norme NF EN ISO 14044 Management environnemental Analyse du cycle de vie. Exigences et lignes directrices
Fascicule de documentation FD ISO/TR 14047 Management environnemental. Analyse du cycle de vie : exemples illustrant l'application de l'ISO 14044 à des situations d'évaluation de l'impact du cycle de vie

PRE-REQUISITES

Design, dimensioning and fabrication of machine and system components, notions of system sustainability and planet boundary.

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Mechanical design group project

IDENTIFICATION

CODE : GM-4-S1-EC-PRCC
ECTS : 8

HOURS

Cours :	0h
TD :	16h
TP :	0h
Projet :	72h
Evaluation :	4h
Face à face pédagogique :	20h
Travail personnel :	35h
Total :	127h

ASSESMENT METHOD

- Evaluation during project sessions in the form of intermediate presentations and project review.
- Evaluation of a response document to the call for tender.
- Evaluation of the writing of a technical report.
- Evaluation of the digital technical file - Customer deliverable with customer satisfaction.
- Final presentation in the form of a multi-group defense and video capsule.
- Mutual evaluations of the teams and Team self-evaluation.

TEACHING AIDS

On the MOODLE platform:
- Project management tools.
- Functional analysis and specification definition tools.
- PLM environment usage tools - 3D CAD Experience.
- Job book to assist with mechanical design and manufacturing.

TEACHING LANGUAGE

French
English

CONTACT

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Mme BOURDON Adeline :
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AIMS

- To reformulate and synthesize a functional specification resulting from a written or oral verbalisation in accordance with NF EN 16271 and based on a customer need.
- Apply a functional analysis to the life cycle of the product to be designed.
- Propose or explain in sketch or diagram form, with comments and captions, a technical constructive solution (mechanical engineering field).
- Evaluate the strategy and help it evolve through constant feedback, without losing sight of the goals.
- Argue, within a project group, the technical and economic solutions proposed, using appropriate tools.
- Collectively define the stakes, goals, means and timeframes of collective action.
- Estimate the value of a solution in accordance with the NF EN 12973 value management standard.
- Select a component using an industrial, mechanical or electrical database.
- Generate the numerical model of the assembly under study, establishing functional parameters to enable the construction of robust geometries.
- Integrate the requirements of a production process, specialist proposals, cost control and associated quality.
- Integrate product life cycle requirements, notably via the eco-design standard for mechanical products NF EN 16524.
- Draw up the final digital model and derived graphic representations (overall drawing, detail drawing, bill of materials) in a collaborative PLM-type environment.
- Choose an appropriate mode of communication.
- Internal and external communication within the workgroup.
- Know how to choose, argue but also propose, create, participate and commit to projects: be both critical and proactive.
- Organize project group work, allocating tasks and responsibilities.
- Manage project reviews with customers.

CONTENT

- Reformulation of a need.
- Draw up all or part of a functional specification.
- Inventory of production logistics.
- Search for solution principles, applying design rules and eco-design principles.
- Research of constructive solutions and elaboration of preliminary design digital mock-up.
- Proof of concept and demonstrator in agile manufacturing design.
- Consideration of financial, human and environmental costs and deadlines.
- Argumentation within a project group to validate the preliminary study.
- Collaborative design and consideration of shared design constraints.
- Production of detailed 3D digital model in a PLM environment.
- Consideration of product life cycle requirements (maintainability, repairability, safety, ergonomics, use, aesthetics, elimination....).
- Development of the final digital model and derived graphic representations.
- Production of a complete technical file for the manufacture of a mechanical product (3D model, overall drawing, detail drawing, bill of materials, justifications and calculation notes).

BIBLIOGRAPHY

- 3DEXPERIENCE CAD tools tutorial
- Mechanical design and dimensioning guide

PRE-REQUISITES

3GM mechanical design, dimensioning and manufacturing training.

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Social responsibilities of engineer

IDENTIFICATION

CODE : HU-4-S1-EC-S-GM-RSI
ECTS : 2

HOURS

Cours :	2h
TD :	26h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	28h
Travail personnel :	0h
Total :	28h

ASSESMENT METHOD

Press Review Presentation (oral group grade)
Personal Essay, based on the reading of a book from the course's extended bibliography (individual written grade)

TEACHING AIDS

Moodle: course materials; bibliography
Teaching activities: case studies; serious game

TEACHING LANGUAGE

French

CONTACT

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AIMS

Explain the types (ethical, moral or legal), natures (political, social, economic and environmental) and scales (micro, meso, macro) of the engineer's responsibilities, taking examples from current events on the scale of a professional engineering situation and societal debates.
Identify the causes and issues of an ethical problem in an engineering context and determine the responsibilities of the various stakeholders.
Justify a position (point of view and/or decision) using ethical reasoning according to its role in the target context.
Propose a personal vision of engineering responsibility based on critical reading.

CONTENT

introduction: RSI: definitions and contexts
Micro analysis of RSI
- Socio-history of the engineering profession
- Fundamentals of ethics
- Ethics of technology
Meso analysis of CSR
- CSR - Origins and legal framework
- CSR - Psychodynamics of work
- CSR - Case studies Harassment and sexism
Macro analysis of CSR
- Risks and vulnerabilities
- Environmental ethics
- Technical democracy
Conclusion

BIBLIOGRAPHY

DIDIER Christelle, Penser l'éthique des ingénieurs, Paris, PUF, 2008
GILLIGAN Carole, Une voix humaine. L'éthique du care revisitée, Paris, Climats, 2024
HESS Gérald, Éthiques de la nature, Paris, PUF, 2013
JONAS Hans, Le principe responsabilité. Une éthique pour la civilisation technologique, Paris, Champs-Flammarion, 1979
RENOUARD Cécile, Éthique et entreprise, Ivry, L'Atelier, 2013
SANDEL Michael, Justice, Paris, Albin Michel, 2016
VINCK Dominique & SAINSAULIEU Ivan, Ingénieur aujourd'hui, Lausanne, PPUR, 2015

PRE-REQUISITES

Written and spoken French

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Manufacturing processes and thermomechanical behaviour of metallic alloys

IDENTIFICATION

CODE : GM-4-S1-EC-PCM
ECTS : 5

HOURS

Cours :	10h
TD :	24h
TP :	12h
Projet :	0h
Evaluation :	4h
Face à face pédagogique :	50h
Travail personnel :	33h
Total :	83h

ASSESMENT METHOD

-3 tests in practical sessions.
-1 multiple-choice test on lecture concepts.
-1 end-of-semester 2-hour mid-term exam.

TEACHING AIDS

-Industrial files: part, material, routing.
-Manufacturing platform
-Heat treatment and mechanical characterization platform
-Course videos
-Summary sheets

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

At the end of the course, based on a given industrial routine, the student will be able to analyze and argue the choice of metal alloy and the choice of manufacturing routines associated with its shaping to meet functional specifications.
-He/she will be able to list, for certain manufacturing processes, an achievable order of magnitude for: a) thermomechanical loadings induced by shaping, b) dimensional quality, c) surface finish, d) representative defects.
-He/she will be able to describe the microstructure of metal alloys using a technical vocabulary.
-Based on the requirements of the specifications, he/she will be able to justify the scheduling of forming processes within a routine.
-Based on a description of the thermomechanical history of a metal alloy, he/she will be able to identify the characteristic elements of the inherited microstructure and specify the evolution of the resulting functional properties.
-Based on inherited microstructure data, he/she will be able to calculate the value of the yield strength using a metallurgical model.
-Using a database, he/she will be able to describe the main environmental impacts and limits to recycling associated with a choice of material and its manufacturing routine.
-He/she will be able to compare metal alloys with regard to the performance indicators provided for the various product life phases, using a GrantaEdupack-type database.

Given the wide range of existing metal alloys and processes, the aim is to acquire an analysis methodology leading to the choice of an alloy and its manufacturing routine.

CONTENT

Metallic alloys & their microstructure: atomic bonding, crystallographic arrangement, grains, dislocations, precipitates.
Main physico-chemical properties and more specifically mechanical properties.
Microstructural evolution under thermomechanical stress: phase diagram, TRC diagram, solidification structure, precipitation, work hardening, restoration, recrystallization.
The link between microstructure and mechanical properties: qualitative approach & metallurgical model.
The concept of manufacturing range: dressing, functional surface, roughing processes, heat treatments, secondary processes, functionalization/surface finishing processes.
Manufacturing processes: physics involved, thermomechanical stresses, dimensional quality, surface finish, defects.
Environmental issues related to extraction, manufacturing, end-of-life, high-tech alloys, recycling limits.

BIBLIOGRAPHY

-Metallurgie : elaboration, structures-proprietes, normalisation / Jean Barralis, Gerard Maeder
-Materials selection in mechanical design / Michael F. Ashby
-Materials and the environment : eco-informed material choice / Michael F. Ashby
-Fabrication par usinage / Jean-Pierre Cordebois
-Techniques de l'ingénieur

PRE-REQUISITES

Notion of stress, strain, strain rate, performance index, extractivism, elastic properties, Von Mises equivalent stress.

Finite element analysis of structures

IDENTIFICATION

CODE : GM-4-S1-EC-CSEF
ECTS : 5

HOURS

Cours :	10h
TD :	24h
TP :	8h
Projet :	0h
Evaluation :	4h
Face à face pédagogique :	46h
Travail personnel :	33h
Total :	79h

ASSESMENT METHOD

2 tests on theoretical topics
1 practical test

TEACHING AIDS

Documents on moodle platform

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

At the end of this course, students will be able to build a finite element model of a real problem, implement it and critically analyse the results.
To do this, they must be able to:
- Translate a linear static structural problem into a PDE using the weak or strong form
- Implement part of a finite element code in a simple one- or two-dimensional case
- Use a commercial finite element code like ABAQUS within its validity framework.
- Establish the modelling assumptions needed to produce a data set that is representative of the problem to be addressed (boundary and symmetry conditions, loading, type of geometric modelling (3D or structural), nature of the type of analysis, etc.), enabling the most economical use of resources.
- Assess the relevance of an approximate solution obtained from a simulation using a finite element calculation code.

CONTENT

CM
Strong form / weak form / variational form / discrete form / notion of mesh and finite element model (geometry, loading, material, boundary conditions)
Finite element method for 1D boundary problems (linear elasticity)
Finite element method for 1D modal analysis
Finite element method for 2D boundary problems (stationary thermal)
Accuracy of finite element methods (discretization error, mesh effects ....)
TD
Theoretical and programming TDs (5)
Linear elasticity (tension bar)
TD MMEF fluid 1D + hole program
Linear elasticity (beam in bending): rise in degree and effect of discretization
2D stationary thermics + hole program with triangles
TD Machine (5)
2D linear elasticity: Tensile test model or drilled plate (symmetries, CLs, stress concentrations, piloting, etc.)
Decoupled thermo-elasticity
Free vibrations / Forced vibrations simple model (see Sébastien)
Axi-symmetry
3D example in linear elasticity or quenching of a bar
TP
COCA can
Hertz contact (axi or plane)

BIBLIOGRAPHY

PRE-REQUISITES

Mathematics
scalar products, Hilbert spaces, Hilbertian basis, least-squares approximation, projection
differential operators, adjoints, eigenvalues.
tensors and geometry.
Physics
Linear elasticity
Free vibrations and forced vibrations
Fluid statics

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Rheology and polymer processing

IDENTIFICATION

CODE : GM-4-S1-EC-RPP
ECTS : 5

HOURS

Cours :	10h
TD :	24h
TP :	12h
Projet :	0h
Evaluation :	3h
Face à face pédagogique :	49h
Travail personnel :	33h
Total :	82h

ASSESMENT METHOD

Exam of 2 hours
Summary lab report

TEACHING AIDS

A booklet and a PowerPoint presentation.
A training practical lab manual.
Course appendices on Moodle for self-study.

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

Students will develop an understanding of the relationships between material properties, rheology, and processing, integrating the specific characteristics of both solid and molten polymer rheology. This includes viscoelasticity, thermal dependence, time-temperature equivalence, and the behavior of complex non-Newtonian fluids.
The course has two main objectives:
• To select the most suitable polymer type for a given process and application.
• To identify rheological behavior laws for numerical simulation, optimizing processing parameters and determining the in-service properties of the manufactured part, including considerations for recycling.
• CO1: Understand the different families of polymers and composites, including their structure, properties, processing methods, and limitations.
• CO2: Gain knowledge of rheological phenomena and viscoelastic properties in complex fluids and viscoelastic solids.
• CO3: Comprehend the relationships between material and rheological parameters and their impact on polymer processing and performance.
• CO4: Analyze the behavior of viscoelastic solids and liquids under both infinitesimal (slow) and large deformations, including nonlinear viscoelasticity.
• CO5: Understand fundamental rheological quantities and characterization tools for polymer rheology in both molten and solid states, and apply them to analyze polymer structures.
• CO6: Recognize the effects of thermal dependence, pressure dependence, and time/frequency-temperature equivalence on polymer behavior.
• CO7: Interpret key quantities required for modeling polymer flow, and understand how to extract the physical data necessary for flow simulation software.
• CO8: Examine the impact of recycling processes on the rheological properties of polymers.

CONTENT

2 CM (4h) (Physics and processes of polymer materials)
3 CM (6h) (Rheology, Viscoelasticity and solid-melt behavior modeling) TDs:
6h: Polymer families, microstructure (crystallinity, PVT), molar masses, mechanical and thermomechanical properties
6h: Viscoelasticity, : Rheology of Solid State Materials, mechanical models and VEL behavior laws, superposition t, frequency, T....
6h: Rheology of polymers in the molten state, Behavior laws of non-Newtonian fluids, Flow modeling in simple geometries,
2h: Rheometry applied to recycled polymer materials - structure-viscosity behavior laws of recycled raw materials (RPM)
4h: Introduction to numerical simulation/numerical rheology applied to RPM: Inputs (PVT, Behavior laws...)
2 x 4-hour practical sessions on PRM deposits (recycled raw materials)
1) Solid materials (Microstructure, Thermodependence of mechanical properties, identification of solid behavior laws in creep....)
2) Molten materials (Identification of behavior laws (grading and/or capillary rheometry...)
// Discovering processing methods (thermoforming, injection molding...)

BIBLIOGRAPHY

[1] I. TANNER "Engineering Rheology", Oxford Science Publications, 1992.
[2]. C. L. ROHN "Analytical Polymer Rheology", Hanser, New York, 1995.
[3]. J. M. PIAU, J. F. AGASSANT "Rheology for Polymer Melt Processing", Elsevier, 1996, 4th edition 2012.
[4]. DEALY, SAUCIER "Rheology in Plastics Quality", SPE – Hanser, 2000.
[5]. R. B. BIRD, R. C. ARMSTRONG, O. HASSAGER "Dynamics of Polymeric Liquids. Vol. 1: Fluid Mechanics", 2nd edition, John Wiley & Sons, 1987.
[6]. J. F. AGASSANT, P. AVENAS, J. P. SERGENT "La mise en forme des matières plastiques", Lavoisier, Paris, 4th edition.
[7]. C. MACOSKO "Rheology: Principles, Measurements, and Applications", VCH Publishers, New York, 1994.
[8]. S. MIDDLEMAN "Fundamentals of Polymer Processing", McGraw-Hill, New York, 1977.
[9]. I. M. WARD "Mechanical Properties of Solid Polymers", John Wiley & Sons, London, 1971.
[10]. J. D. FERRY "Viscoelastic Properties of Polymers", John Wiley Eds., New York, 1980.
[11]. M. DOI, S. F. EDWARDS "The Phenomenological Theory of Linear Viscoelastic Behaviour", Springer-Verlag, Berlin, 1989.
[12]. M. F. EDWARDS, D. I. ELLIS "The Importance of Heat Transfer in Polymer Processing", Physics Technology, Volume 13, Number 3.

[13]. J. DEALY "Rheology and its Role in Plastics Processing", Springer, 2017.
[14]. Z. TADMOR, C. G. GOGOS "Principles of Polymer Processing", John Wiley & Sons, 2nd edition, 2006.
[15]. T. A. OSSWALD, J. M. HERNÁNDEZ-ORTIZ "Polymer Rheology: Fundamentals and Applications", Hanser, 2015.
[16]. C. W. MACOSKO "Rheology: Principles, Measurements, and Applications", Wiley-VCH, 1994.
[17]. M. M. DENN "Polymer Melt Processing: Foundations in Fluid Mechanics and Heat Transfer", Cambridge University Press, 2008.
[18]. N. P. CHEREMISINOFF "Introduction to Polymer Rheology and Processing", CRC Press, 1993.
[19]. Solid Mechanics (EPFL): https://edu.epfl.ch/coursebook/fr/solid-mechanics-ME-331
[20]. Course of solid mechanic/Matteo Ciccotti : http://cours.espci.fr
[21]. Viscoealsticity and structural analysis/Jean Salençon X polyetch: https://www.editions.polytechnique.fr

PRE-REQUISITES

Concepts on performance and material selection,
Basics of material resistance,
Fundamentals of Algebra, Math (differential equations, integrals, Fourier transform, Laplace transform…),
Concepts of stress and strain in solid mechanics (MSOL-3-S2),
Concepts of pressure losses and Newtonian fluids (MFLUI-3-S2)…

Heat transfer

IDENTIFICATION

CODE : GM-4-S1-EC-TRTH
ECTS : 5

HOURS

Cours :	10h
TD :	24h
TP :	8h
Projet :	0h
Evaluation :	4h
Face à face pédagogique :	46h
Travail personnel :	33h
Total :	79h

ASSESMENT METHOD

Intermediate exam (1.5h) with documents (25%), final exam (2h) with documents (60%), practical work report (15%).

TEACHING AIDS

Course handout with exercises. Course presentations. Practical work handout.

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

The objective of this course is to provide students with a basic understanding of heat transfer, enabling them to analyze and solve simple thermal problems. The course covers the three mechanisms of heat transfer: conduction, convection and radiation, emphasizing both an understanding of transfer phenomena and the solution of practical cases.

At the end of this course (targeted learning outcomes) students will be able to :
- explain heat transfer mechanisms and phenomena, physical quantities, heat exchange coefficients and thermal resistances
- analyze a thermal problem and identify the main heat transfer mechanisms
- propose a reasoned approach, fitting the complexity of the thermal problem and the associated transfer mechanisms
- break down a simple thermal problem and implement nodal-type modeling involving several transfer modes
- calculate steady-state and unsteady-state conduction transfers in simple geometries, using analytical solutions and/or thermal resistances
- calculate heat transfer and exchange coefficients by forced or free convection, for simple geometries and for pipe flows
- calculate heat transfer and exchange coefficients by radiation in a few simple situations involving radiative transfer between opaque surfaces

CONTENT

Introduction: review of physical quantities, heat transfer mecanisms
Conduction: phenomenological description, heat balance, Fourier's law, heat diffusion equation, boundary and initial conditions, contact resistances.
Steady-state conduction: 1D analytical solutions in plates and cylinders, analogy with electrical circuits, thermal resistances, heat fins (extended surfaces), fin efficiency.
Unsteady-state conduction: dimensionless numbers (Biot, Fourier), quasi-uniform temperature method (lumped capacity model), analytical solutions in semi-infinite and finite media, product of solutions.
Thermal convection (without phase change): phenomenological description, convection regimes, dimensionless numbers (Re, Pr, Gr, Ra, Nu), use of correlations for forced and natural convection, boundary layers, forced convection in pipes, calculation concepts in heat exchangers.
Thermal radiation: physical phenomena and fundamental laws, black-body radiation, emission and reception of real bodies, heat exchange between two gray diffuse-isotropic opaque surfaces.

BIBLIOGRAPHY

[1] A. Bejan, Heat Transfer, Wiley, N.Y., 1985.
[2] M. N. Ozisik, Basic Heat Transfer, Mc Graw Hill, N.Y., 1985.
[3] F. P. Incropera, D. P. DeWitt, Fundamentals of Heat and Mass Transfer , Wiley, N.Y., 2002.

PRE-REQUISITES

Basic knowledge of physics, mathematics and fluid mechanics.

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Machines and power transmissions

IDENTIFICATION

CODE : GM-4-S1-EC-MTP
ECTS : 5

HOURS

Cours :	10h
TD :	24h
TP :	8h
Projet :	0h
Evaluation :	4h
Face à face pédagogique :	46h
Travail personnel :	33h
Total :	79h

ASSESMENT METHOD

Interimediate evaluation (1h) with documents (30%)
Evaluation of practical works (lab) (20%)
Final exam (2h) with documents (50%)

TEACHING AIDS

Handout of course with examples
List of exercises covered in discution class and additional exercises.

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

This course is a technological and scientific introduction to the main power transmission systems.
The learning outcomes at the end of this course are:
- be able to read and complete a kinematic or hydraulic diagram
- Know the main characteristics of gear transmissions and the technologies used in hydraulic transmissions.
- Pre-dimension a transmission to select a component from a proposed range.
- Estimate the mechanical and/or hydraulic energy dissipated and determine an efficiency ratio

CONTENT

Power transmission by gears :
- schematic diagram
- Standardized spur gear geometry
- Meshing of two spur gears
- Internal toothing
- Epicyclic gears
- Performance calculation

Hydraulic power transmission :
- schematic diagram
- Pumps and motors
- Distributors and control components
- Calculation of steady-state performance

BIBLIOGRAPHY

Cylindrical Gears ; Linke, Börner, Hess ; Hanser ; ISBN 978-1-56990-489-3

The Geometry of Involute Gears, J. R. COLBOURNE, Springer-Verlag, DOI : 10.1007/978-1-4612-4764-7

Hydraulic Machines Fundamentals of Hydraulic Power Systems ; Taylor & Francis ; ISBN 9780415661935

PRE-REQUISITES

Plan reading
Calculating speed vectors
Fluid mechanics

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

IDENTIFICATION

CODE : HU-4-S2-EC-S-GM-MAGIEE

ECTS : undefined

HOURS

Cours :	0h
TD :	20h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	20h
Travail personnel :	0h
Total :	20h

ASSESMENT METHOD

-Individual assessment 40%
-Collective assessment 60%

TEACHING AIDS

Slides and digital resources on Moodle

TEACHING LANGUAGE

French

CONTACT

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AIMS

This course contributes to the development of the competency CT6: CT6: POSITION ONESELF WITHIN A COMPANY OR AN ORGANIZATION

- Place the company in its socio-economic and competitive environment.
- Understand the organization and management of the company.
- To enable students to understand an organization as a complex system made up of interrelated individuals.
- To enable students to get to know themselves better in order to position themselves as employees, managers and/or company directors.

CONTENT

Session 1: Introduction
Session 2: Knowing your motivations and values, leadership & management styles
Session 3: Sociology of Organizations
Session 4: Project
Session 5: The company in its context
Session 6: Corporate Strategy
Session 7: Group Psychodynamics
Session 8: Individual test evaluation
Session 9: Project
Session 10: Project
Session 11: Conclusion

BIBLIOGRAPHY

-Michel Capron, Françoise Quairel-Lanoizelée, L'entreprise dans la société, Paris, La Découverte, 2015.
-Christelle Didier, Penser l'éthique des ingénieurs, Paris, PUF, 2008.
-Frédéric Fréry, Gerry Johnson & al., Stratégique, Paris, Pearson, 2017.
-Christophe Midler, Bernard Jullien, Innover à l'envers. Repenser la stratégie et la conception dans un monde frugal, Paris, Dunod, 2017.
-Ivan Sainsaulieu et Dominique Vinck, Ingénieur aujourd'hui, Lausanne, Presses polytechniques et universitaires romandes, 2015.
- William Schutz, L'élément Humain, Interéditions, 2006.

PRE-REQUISITES

Very good skills in French (TCF)
OTIO 3GM S1 ; INNO 3GM S1 ; COPRO 4GM S1 ; RSI 4GM S1

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE
Humanities and social sciences

IDENTIFICATION

CODE : HU-0-S2-EC-S-SERIE1
ECTS : undefined

HOURS

Cours :	0h
TD :	20h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	20h
Travail personnel :	0h
Total :	20h

ASSESMENT METHOD

Assessment will be conducted through continuous evaluation. The assessment methods will be presented at the beginning of the semester by the teaching team

TEACHING AIDS

Materials are chosen by the instructor based on the module:
• Didactic documents related to the module
• Audiovisual materials
• Recommended readings

TEACHING LANGUAGE

French

CONTACT

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AIMS

A series of elective courses in Humanities and Social Sciences (HSS) offers several options for students to choose from, allowing them to develop and deepen specific skills. This course aims to develop one or more transversal skills among the following:
• CT1: Self-awareness and self-management
• CT2: Working, learning, and evolving independently
• CT3: Interacting with others, working in a team
• CT4: Demonstrating creativity
• CT5: Acting responsibly in a complex world
• CT6: Navigating and evolving within an organization
• CT7: Working in an international and intercultural context
The list of options available in Series 1 and the specific competencies for each option are detailed in the catalog on the IntranetHumas: https://intranethumas.insa-lyon.fr/sciences-humaines-sociales/offre-de-formation/cours-la-carte-0

CONTENT

Each module is designed to encourage interaction and active student participation. The content is structured around the following key aspects:
• Theoretical deepening related to the theme
• Reflection on the topic
• Practical exercises and activities
• Assessments and presentation of work

BIBLIOGRAPHY

The bibliography is selected by the instructor based on the module.

PRE-REQUISITES

French

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

CENTRE DES SPORTS
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Sports

IDENTIFICATION

CODE : CDS-4-S2-EC-EPS
ECTS :

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	0h
Travail personnel :	0h
Total :	0h

ASSESMENT METHOD

Assessment in Physical Education concerns the teaching of Sports and Artistic Physical Activities (APSA), and will take the form of continuous assessment with half-yearly marking.

The mark depends on the degree of acquisition of the skills expected in each of the activities, and the progress made over all the sessions in the cycle. The mark takes into account :

Individual and/or team performance
mastery of execution
Progress in the sports project
Responsibility and autonomy

TEACHING AIDS

All physical, sporting, artistic and competitive activities

TEACHING LANGUAGE

French

CONTACT

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AIMS

This EC is part of the Teaching Unit: SHS and contributes to the development of the School's transversal competences

1*Auto-evaluating one's own performance
Knowledges :
- Fundamentals, principles of action and terminology of sports activities
- Criteria for observation, achievement and success.
Abilities :
- Assess your level of practice
- Build up a warm-up
- Set goals for progress
- Manage physical and mental potential

2* Work, learn and develop independently
Knowledge :
- PSAA rules
- Observation criteria
- Principles of warm-up and cool-down
Abilities :
- Mobilise resources
- Analyse, observe, question
- Take on different roles (referee, choreographer)

3* Interact with others, work as part of a team
Knowledges :
- Roles and functions in each sports activity
Abilities :
- Communicate appropriately: verbal, non-verbal and postural communication.
- Integrate into a group
- Take part in and develop a group project
- Take the initiative
- Be a good listener

4* Be creative, innovative and enterprising
Knowledge :
- Artistic disciplines
Abilities :
- Draw on knowledge and resources from different artistic fields to produce an original work.
- Mobilise the imagination and sensibility and make them visible through dance movement
- Access the symbolism of the body

5* Act responsibly in a complex world
Knowledge :
- Safety and operating rules
Abilities :
- Identify uncertainties and risks and act to reduce them
- Integrate a responsible dimension into their actions
- Show respect and fair play in a power struggle

6* Working in an international context
Knowledge :
- Socio-cultural differences
Abilities :
- Integrate cultural diversity into group work
- Act with respect for self and others

CONTENT

Physical Education and Sport lessons are organised around traditional Physical Education lessons, or advanced lessons, or appropriate practices (EPSA), or competitive practices within the framework of the Section Sportive Haut Niveau.

1. Physcical Education lessons :
Students choose one or two physical and sporting activities per year from among the activities offered by the sports centre (individual, group, dual).
2. Appropriate Physical Education lessons: For all students who are exempt from physical activity for at least 2 months:
Swimming, Body-building, Nordic Walking, Somatic Exercise, Sophrology, Wheelchair Basketball, Pilates, Table Tennis, etc.
3. Advanced Physical Education courses :
Specialisation in a sporting activity, University training and competitions
4. SSHN (High-Level Athlete section)

University training and competitions

BIBLIOGRAPHY

PRE-REQUISITES

- EPS: none
- Appropriate Physical Education: subject to medical advice
- Advanced courses and competitive practice: previous practice required subject to specific selection according to each activity
- SHN: ministerial list

Levels 1 and 2: Physical Education, Appropriate physical education
Level 3: Advanced courses and competitive practice, SHN

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IDENTIFICATION

CODE : GM-4-S2-EC-CCIM
ECTS : 2

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	25h
Travail personnel :	25h
Total :	50h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-CCPT
ECTS : 3

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	62h
Evaluation :	1h
Face à face pédagogique :	1h
Travail personnel :	20h
Total :	83h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-CEMP
ECTS :

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	25h
Total :	51h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-CCCE
ECTS : 5

HOURS

Cours :	0h
TD :	36h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	47h
Travail personnel :	80h
Total :	127h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Tolerancing and geometric control

IDENTIFICATION

CODE : GM-4-S2-EC-CCTG
ECTS : 4

HOURS

Cours :	0h
TD :	36h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	47h
Travail personnel :	50h
Total :	97h

ASSESMENT METHOD

Submission of component rating exercises/ Oral questioning during the case study/ Evaluation of a case study of a geometric simulation model in pairs/ Case study report/ Report and defense of practical work.

TEACHING AIDS

35 / 5 000
Moodle Support/ Slideshow and Tutorial/

TEACHING LANGUAGE

French

CONTACT

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AIMS

The parts from CAD (volume and/or surface) based on nominal parameters have only a virtual existence that must be supplemented by tolerances related to manufacturing and/or use. This EC will therefore provide students with knowledge and skills in the field of tolerancing, 2D/3D GPS dimensions that will not be covered in the common core.
From a CAD point of view, this will be accompanied by the production of a 3D GPS dimension, the associated drawing and the use of a dedicated project review tool. A practical dimension will also be given by the production of Dimensional and Geometric Metrology practical work.
The different toleranced parts are to be assembled with others to form a mechanism or a product-process system currently being designed. The different parts can come from the same design project, be parts already existing in the company (validated and manufactured), parts supplied by a partner, a distributor, reverse-engineered parts. The format of these parts can correspond to native or step CAD. This observation will allow to present the transfer issues between CAD and neutral formats (Step, IGES, Step AP242).
During assembly, it is necessary to check the absence of interferences (interpenetration of parts) both at nominal and real dimensions. This step will allow the control of real products and/or processes from 3D tolerancing tools and simulation of real geometries (3DCS tool in the 3D Experience or CATIA V5 environment). An optimization process will allow to modify the design, geometry, tolerancing of the products as well as the choice of production processes. In the case of parts coming from neutral format, it will then be necessary to partially rebuild the design tree in order to be able to locally modify the geometry.
The second step is to check the correct "kinematic" operation of the product, its adequacy to the specifications and the absence of collision. This step will review the concept of kinematic connection by considering part defects and clearances, isostatism, internal mobility.
These checks will be carried out by geometric simulations of rigid parts, with real geometries and clearances in mechanical connections (3DCS type in 3DExperience).
Carrying out practical work on Dimensional and Geometric Metrology of products or assemblies will allow the simulation results to be correlated with real systems.
At the end of this EC (targeted learning outcomes), the student:
- Is able to understand and decode the ISO GPS dimensioning language.
- Knows how to analyze a definition plan to prepare the industrialization, manufacturing and metrology of mechanical components.
- Use a proven decoding methodology.
- Knows how to develop a geometric control range using CAD, dimensioning and available control methods.
- Is able to perform the ISO GPS 2D functional dimensioning of mechanical components of elementary morphology.
- Knows how to model the connections or positioning, the functional conditions and the ISO GPS 3D dimensioning in a Geometric Simulation tool for Rigid Parts, tools and processes (3D Tolerancing and 3DCS Tools)
- Is able to develop a model and optimize the design and dimensioning of products for the control of manufacturing costs, development, assembly and exemptions during the series life.
- Knows how to implement a control program with the development of a control report by mastering the capability of the control processes.

CONTENT

1- Knowledge contribution on the dimensioning of mechanical products, ISO GPS tolerancing.
2- Methodology for analyzing and decoding geometric and dimensional specifications.
3- Methodology for functional dimensioning ISO GPS of mechanical system components.
4- 3D modeling of ISO GPS dimensions in the CAD environment.
5- Development of enriched 3D models for the manufacture and quality control of products.
6- Modeling of rigid assemblies for the implementation of geometric simulations of real components in a virtual environment.
7- Simulation and 3D dimension chains taking into account manufacturing and quality control data.
8- Knowledge of conventional or computer-assisted 1D, 2D, 3D measuring means.
9- Development of conventional 1D, 2D or 3D assisted control ranges.
10- Implementation of dimensional, geometric and micro geometric control means.
11- Development of control reports with control of uncertainties or capability of the control process.
36h Course - TD:
- 8h Course TD on ISO GPS Tolerancing
- 4h of TD on 2D functional dimensioning of components
- 4h of TD of 3D Tolerancing
- 8h Learning Simulation tools, use and optimization of 3D geometric models
- 8h Case study 3D Tolerancing 3DCS
- 4h Course TD Metrology Dim and Geometric
8h Tp:

- 4h Metrology dim
- 4h Geometric Metrology

BIBLIOGRAPHY

ISO GPS Standards - ISO 14638 Master Plan
Industrial Designer's Guide.
Memotech.
ISO GPS Dimensioning: 1. Fundamentals: For Beginners and the Curious
ISO GPS Dimensioning: 2. Additional Investigations: For Beginners and the Curious
Functional Dimensioning, Chains of Dimensions, Tolerance Optimization: Technical Functional Analysis
Geometric Product Specification Handbook - 2nd Ed.: ISO-GPS Standards

PRE-REQUISITES

- 2D technical drawing and reading of 2D assembly plan
- CAD tools
- Elementary dimensional dimensioning
- 1D dimension chain method
- Conventional dimensional measuring means technology

IDENTIFICATION

CODE : GM-4-S2-EC-CCMF
ECTS : 3

HOURS

Cours :	0h
TD :	24h
TP :	4h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	30h
Travail personnel :	50h
Total :	80h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-CCOT
ECTS : 2

HOURS

Cours :	0h
TD :	16h
TP :	4h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	22h
Travail personnel :	30h
Total :	52h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-CCFP
ECTS : 2

HOURS

Cours :	0h
TD :	16h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	25h
Total :	51h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-CCCS
ECTS : 2

HOURS

Cours :	0h
TD :	16h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	17h
Travail personnel :	30h
Total :	47h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-CEPT
ECTS : 3

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	62h
Evaluation :	1h
Face à face pédagogique :	1h
Travail personnel :	20h
Total :	83h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-CEIM
ECTS : 2

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	25h
Face à face pédagogique :	50h
Travail personnel :	0h
Total :	50h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-CEMP
ECTS :

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	25h
Total :	51h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Thermal machines

IDENTIFICATION

CODE : GM-4-S2-EC-CECT
ECTS : 4

HOURS

Cours :	0h
TD :	32h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	42h
Travail personnel :	60h
Total :	102h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. Lefevre Stéphane :
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Energy in all its forms

IDENTIFICATION

CODE : GM-4-S2-EC-CETD
ECTS : 2

HOURS

Cours :	0h
TD :	16h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	17h
Travail personnel :	30h
Total :	47h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

Mme Martin de Argenta Diana :
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Flow and heat transfer modelling for energy conversion

IDENTIFICATION

CODE : GM-4-S2-EC-CEMS
ECTS : 4

HOURS

Cours :	0h
TD :	32h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	42h
Travail personnel :	60h
Total :	102h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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Electrical machinery and hybridisation

IDENTIFICATION

CODE : GM-4-S2-EC-CEEH
ECTS : 4

HOURS

Cours :	0h
TD :	32h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	42h
Travail personnel :	60h
Total :	102h

ASSESMENT METHOD

IE (1h) + DS (2h)

TEACHING AIDS

Lecture notes
Scientific software

TEACHING LANGUAGE

French

CONTACT

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AIMS

To be able to :
- Read, analyze and determine the main characteristics of the components of an electric power transmission.
- Analyze and understand the architectures of hybrid and electric traction systems.
- Model and make the numerical simulation of an electric energy conversion chain and its energy performance.
- Choose the components of an electric transmission according to specifications, taking into account energy and technological constraints.
- Take into account energy management issues.

CONTENT

- Electrical quantities and circuit modeling.
- Electromagnetism and principles of electromechanical conversion.
- Electrical machines (DC machine, synchronous machines, asynchronous machines)
- Introduction to power electronics for controlling electrical systems.
- Energy storage and autonomy.
- Electric and hybrid vehicles.
- Introduction to optimal control for energy management.

BIBLIOGRAPHY

- Electrical Engineering: Know It All, Clive Maxfield, John Bird, Tim Williams, Walt Kester, Dan Bensky, Elsevier, 2008, eBook ISBN: 9780080949666
- Electromagnetics for Electrical Machines, Saurabh Kumar Mukerji, Ahmad Shahid Khan, Yatendra Pal Singh, March 2015, CRC Press, ISBN: 9781498709156
- Electrical Machines: Fundamentals of Electromechanical Energy Conversion, Jacek F. Gieras, 2016, CRC Press, ISBN: 1498708846
- Electric Motors and Drives Fundamentals, Types and Applications, Austin Hughes, Bill Drury, 2019, Elsevier, eBook ISBN: 9780128189252

PRE-REQUISITES

- Electricity / physics 1st cycle
- Mechanical engineering (common core)
- Mechanical transmission (common core)
- Design (common core)
- Control (common core)

Turbomachinery

IDENTIFICATION

CODE : GM-4-S2-EC-CETA
ECTS : 4

HOURS

Cours :	0h
TD :	32h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	42h
Travail personnel :	60h
Total :	102h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-VAIM
ECTS : 2

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	25h
Travail personnel :	25h
Total :	50h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-VAPT
ECTS : 3

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	62h
Evaluation :	1h
Face à face pédagogique :	1h
Travail personnel :	20h
Total :	83h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-CEMP
ECTS :

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	25h
Total :	51h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Structural vibrations and dynamics of rotating systems

IDENTIFICATION

CODE : GM-4-S2-EC-VAVS
ECTS : 4

HOURS

Cours :	0h
TD :	32h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	43h
Travail personnel :	30h
Total :	73h

ASSESMENT METHOD

final exam (2h)

TEACHING AIDS

Course and tutorial materials

TEACHING LANGUAGE

French

CONTACT

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AIMS

The objective of this course is to model the vibratory phenomena that occur in structures and systems. Based on an understanding of the phenomena that cause vibrations in structures, students will be able to set up an appropriate analytical or numerical model in order to dimension a part or control the amplitudes of vibrations in a system. Thus, thanks to the learning outcomes targeted (AAV in French), the student will be able, at the end of this course, to :
AAV1: solve analytically a problem of vibrations of simple structures (beams, plates, membranes) in the case of free or forced vibrations
AAV2: implement a modelling and numerical resolution strategy using finite elements adapted to the problem under consideration (type of elements, convergence, type of solver) in order to carry out a modal extraction or a frequency response calculation for a single part.
AAV3: numerical modelling of part assemblies (bolted, glued, spot welded).
AAV4: dimension a deformable structure in multi-body dynamics modelling.
AAV5: take into account the speed of rotation of rotating assemblies in an analytical model and interpret its influence on the dynamics of the system.
AAV6: Calculate analytically the unbalance response of a rotating system (synchronous and asynchronous excitations).
AAV7: use the Campbell diagram to identify retrograde and direct precessions and critical frequency

CONTENT

(i) introduction to vibration problems in industrial applications (external lecturer) - 2h
(ii) Analytical modelling of simple structures (beams, plates, membranes): displacement fields, equations of motion, eigenvalue problem, boundary conditions, free and forced response - 12h
(iii) Numerical modelling using finite elements (single parts, coupled parts) - 12h
(iv) Dynamics of rotating assemblies (critical speeds, imbalances) - 12h
(v) Round table on engineering professions in the field of systems vibration modelling - 2h

BIBLIOGRAPHY

Engineering vibration, Daniel J. Inman, ISBN : 978-0-273-76844-9, 2014.
Vibrations in continuous media, J.L Guyader, Hermès Science/Lavoisier, 2002.
Structural Dynamics and Vibration in Practice : An Engineering Handbook, online book on ScholarVox, 2008.
Rotordynamics Prediction in Engineering, M. Lalanne, G. Ferraris, 2nd Ed., John Wiley, 1998

PRE-REQUISITES

General theorem of dynamics or Lagrangian mechanics, vibrations of discrete systems

Acoustical engineering

IDENTIFICATION

CODE : GM-4-S2-EC-VAAI
ECTS : 5

HOURS

Cours :	0h
TD :	32h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	43h
Travail personnel :	30h
Total :	73h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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Vibration and acoustics testing

IDENTIFICATION

CODE : GM-4-S2-EC-VAVA
ECTS : 4

HOURS

Cours :	0h
TD :	32h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	42h
Travail personnel :	30h
Total :	72h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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Passive and active control

IDENTIFICATION

CODE : GM-4-S2-EC-VASC
ECTS : 3

HOURS

Cours :	0h
TD :	24h
TP :	4h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	30h
Travail personnel :	25h
Total :	55h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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Condition monitoring

IDENTIFICATION

CODE : GM-4-S2-EC-VASD
ECTS : 3

HOURS

Cours :	0h
TD :	24h
TP :	4h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	30h
Travail personnel :	25h
Total :	55h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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IDENTIFICATION

CODE : GM-4-S2-EC-CSIM
ECTS : 2

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	25h
Travail personnel :	25h
Total :	50h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-CSPT
ECTS : 3

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	62h
Evaluation :	1h
Face à face pédagogique :	1h
Travail personnel :	20h
Total :	83h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-CEMP
ECTS :

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	25h
Total :	51h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Tools for frugal modelling of structures

IDENTIFICATION

CODE : GM-4-S2-EC-CSCS
ECTS : 5

HOURS

Cours :	0h
TD :	40h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	51h
Travail personnel :	75h
Total :	126h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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Environmental aspect of materials and their processing

IDENTIFICATION

CODE : GM-4-S2-EC-CSMP
ECTS : 4

HOURS

Cours :	0h
TD :	32h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	43h
Travail personnel :	60h
Total :	103h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

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Product end of life

IDENTIFICATION

CODE : GM-4-S2-EC-CSFV
ECTS : 5

HOURS

Cours :	0h
TD :	40h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	51h
Travail personnel :	75h
Total :	126h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-CSTS
ECTS : 4

HOURS

Cours :	0h
TD :	32h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	43h
Travail personnel :	60h
Total :	103h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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IDENTIFICATION

CODE : GM-4-S2-EC-IPIM
ECTS :

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	25h
Travail personnel :	25h
Total :	50h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

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www.insa-lyon.fr

IDENTIFICATION

CODE : GM-4-S2-EC-IPPT
ECTS : 3

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	62h
Evaluation :	1h
Face à face pédagogique :	1h
Travail personnel :	20h
Total :	83h

ASSESMENT METHOD

1 report
1 defense

TEACHING AIDS

Forming processes simulation codes, topological optimisation software, GM production workshop, additive manufacturing platform, a mechanical part on which the project is done

TEACHING LANGUAGE

French

CONTACT

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AIMS

At the end of this course and based on the update of a functional specification of an existing part, the student will be able to :
- choose a manufacturing sequence adapted to the new specifications,
- adapt the design of the part to the processes used,
- choose the manufacturing parameters using process simulation numerical code.
- implement all or some of the forming processes to produce a small or medium series of parts.
- quantify the impact of the optimisation on performance indicators (cost, quality, lead time, sustainable development)
- simulate the product quality in relation to manufacturing processes

CONTENT

The aim of the project is going from the redesign of a part to the optimisation of its manufacturing process and industrialisation.

BIBLIOGRAPHY

PRE-REQUISITES

Courses from the thematic option

IDENTIFICATION

CODE : GM-4-S2-EC-CEMP
ECTS :

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	25h
Total :	51h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Machining

IDENTIFICATION

CODE : GM-4-S2-EC-IPPU
ECTS : 3

HOURS

Cours :	0h
TD :	24h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	34h
Travail personnel :	40h
Total :	74h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. Tardif Nicolas :
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Additive manufacturing processes

IDENTIFICATION

CODE : GM-4-S2-EC-IPFA
ECTS : 3

HOURS

Cours :	0h
TD :	24h
TP :	4h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	29h
Travail personnel :	45h
Total :	74h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. Elguedj Thomas :
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Blank Manufacturing Process

IDENTIFICATION

CODE : GM-4-S2-EC-IPPO
ECTS : 3

HOURS

Cours :	0h
TD :	24h
TP :	4h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	30h
Travail personnel :	45h
Total :	75h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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measurement and control of parts

IDENTIFICATION

CODE : GM-4-S2-EC-IPMC
ECTS : 3

HOURS

Cours :	0h
TD :	24h
TP :	16h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	42h
Travail personnel :	30h
Total :	72h

ASSESMENT METHOD

2 reports
1 oral presentation

TEACHING AIDS

labs handouts
online textbooks

TEACHING LANGUAGE

French

CONTACT

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AIMS

- be able to identify the NDT technique best suited to the problem
- identify the strengths and weaknesses of the two major NDT techniques: X-rays and ultrasound
- understand the challenges of 3D tomography
- be able to read and analyse a simple dimensional drawing
- be able to effectively measure the dimensional, geometric and surface specifications of a part
- be able to visualise internal structural defects
- be able to draw up an inspection range using a toleranced drawing and industrial metrology equipment
- be able to validate the conformity of the part, taking into account the capabilities or uncertainties of the measurement process
- be able to carry out an off-line inspection programme in a dematerialised measurement process environment

CONTENT

16h measurement & NDT labs, including:
- 8h dimensional et geometrical (MMT, polyarticulated arm or Tracker laser with Polyworks, Metrolog X4, SILMA)
- 8h NDT labs

BIBLIOGRAPHY

PRE-REQUISITES

Reading 2D geometric media and using the CAD environment to analyse and visualise mechanical products

IDENTIFICATION

CODE : GM-4-S2-EC-IPMQ
ECTS : 3

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	50h
Total :	76h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. Cheutet Vincent :
vincent.cheutet@insa-lyon.fr

IDENTIFICATION

CODE : GM-4-S2-EC-IPGP
ECTS : 3

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	50h
Total :	76h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

State-space methods for dynamical systems

IDENTIFICATION

CODE : GM-4-S2-EC-MSRE
ECTS : 3

HOURS

Cours :	0h
TD :	24h
TP :	8h
Projet :	15h
Evaluation :	2h
Face à face pédagogique :	35h
Travail personnel :	40h
Total :	90h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. Di Loreto Michael :
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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Optimisation and identification

IDENTIFICATION

CODE : GM-4-S2-EC-MSIO
ECTS : 3

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	25h
Total :	51h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Vibration control for dynamical systems

IDENTIFICATION

CODE : GM-4-S2-EC-MSCV
ECTS : 3

HOURS

Cours :	0h
TD :	24h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	35h
Travail personnel :	25h
Total :	60h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Multiphysical modeling

IDENTIFICATION

CODE : GM-4-S2-EC-MSMP
ECTS : 4

HOURS

Cours :	0h
TD :	28h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	31h
Travail personnel :	70h
Total :	101h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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Embedded systems

IDENTIFICATION

CODE : GM-4-S2-EC-MSSE
ECTS : 2

HOURS

Cours :	0h
TD :	20h
TP :	8h
Projet :	15h
Evaluation :	1h
Face à face pédagogique :	30h
Travail personnel :	15h
Total :	60h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. Smaoui Mohamed :
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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Electrical machines and control

IDENTIFICATION

CODE : GM-4-S2-EC-MSME
ECTS : 3

HOURS

Cours :	0h
TD :	24h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	35h
Travail personnel :	25h
Total :	60h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Mechatronics design workshop

IDENTIFICATION

CODE : GM-4-S2-EC-MSPT
ECTS : 3

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	62h
Evaluation :	1h
Face à face pédagogique :	1h
Travail personnel :	20h
Total :	83h

ASSESMENT METHOD

Oral and written presentation. Evaluation of the work from academic and industrial supervisors

TEACHING AIDS

- Moodle
- Technical docs

TEACHING LANGUAGE

French

CONTACT

M. Massioni Paolo :
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AIMS

This design workshop focuses on an industrial case study of an innovative system or the development of new functionalities on an existing system. This case study covers the themes of design, sizing, actuation and measurement chains, modeling, simulation and possibly experimentation. This transdisciplinary thematic workshop aims to mobilize and unify on the same system all the ECs of the ETE Mechatronics.

At the end of this EC, the student
- is able to define and analyze a functional specification of a mechatronic system;
- is able to propose solutions, in a reasoned manner, to the required functions and specifications;
- is able to work within an organized and interdependent team;
- is able to reproduce scientific work, while knowing how to adapt it with the requirements and specifications.

CONTENT

The program of this EC is built around a preliminary interaction with experts from the socio-economic environment to define the need (in TD format), then project sessions.

BIBLIOGRAPHY

-

PRE-REQUISITES

EC of ETE Mechatronics (GM-4-S2-EC-MSRE, GM-4-S2-EC-MSCV, GM-4-S2-EC-MSIO, GM-4-S2-EC-MSME, GM-4-S2-EC-MSMP and GM-4-S2-EC-MSSE)
Control of linear systems (GM-3-S2-EC-CSL)
Notions on data processing (GM-3-S1-EC-DATA) and instrumentation (GM-3-S2-EC-PIAE)

IDENTIFICATION

CODE : GM-4-S2-EC-CEMP
ECTS :

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	25h
Total :	51h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-MSIM
ECTS : 2

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	25h
Travail personnel :	25h
Total :	50h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-NEPT
ECTS : 3

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	62h
Evaluation :	1h
Face à face pédagogique :	1h
Travail personnel :	20h
Total :	83h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-NEIM
ECTS : 2

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	25h
Travail personnel :	25h
Total :	50h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-CEMP
ECTS :

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	25h
Total :	51h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Fluid and structure experimentation

IDENTIFICATION

CODE : GM-4-S2-EC-NEEX
ECTS : 4

HOURS

Cours :	0h
TD :	28h
TP :	16h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	46h
Travail personnel :	55h
Total :	101h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

Mme Miralles Sophie :
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Structures optimization

IDENTIFICATION

CODE : GM-4-S2-EC-NEOS
ECTS : 5

HOURS

Cours :	0h
TD :	36h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	47h
Travail personnel :	80h
Total :	127h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. Blal Nawfal :
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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Advanced computational mechanics

IDENTIFICATION

CODE : GM-4-S2-EC-NECA
ECTS : 5

HOURS

Cours :	0h
TD :	36h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	46h
Travail personnel :	75h
Total :	121h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. Nelias Daniel :
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Computational fluid dynamics

IDENTIFICATION

CODE : GM-4-S2-EC-NEMF
ECTS : 4

HOURS

Cours :	0h
TD :	42h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	44h
Travail personnel :	60h
Total :	104h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. Mignot Emmanuel :
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IDENTIFICATION

CODE : GM-4-S2-EC-CEMP
ECTS :

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	25h
Total :	51h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-PCPT
ECTS : 3

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	62h
Evaluation :	1h
Face à face pédagogique :	1h
Travail personnel :	20h
Total :	83h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. Dumont Pierre :
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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-PCIM
ECTS : 2

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	25h
Travail personnel :	25h
Total :	50h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Plastic and composite part design

IDENTIFICATION

CODE : GM-4-S2-EC-PCCP
ECTS : 4

HOURS

Cours :	0h
TD :	32h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	42h
Travail personnel :	60h
Total :	102h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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Structures and properties

IDENTIFICATION

CODE : GM-4-S2-EC-PCSP
ECTS : 5

HOURS

Cours :	0h
TD :	40h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	51h
Travail personnel :	75h
Total :	126h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Polymer and composite processing : experimental and numerical approaches

IDENTIFICATION

CODE : GM-4-S2-EC-PCPR
ECTS : 5

HOURS

Cours :	0h
TD :	40h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	51h
Travail personnel :	75h
Total :	126h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Recycling and end-of-life

IDENTIFICATION

CODE : GM-4-S2-EC-PCFV
ECTS : 4

HOURS

Cours :	0h
TD :	32h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	42h
Travail personnel :	60h
Total :	102h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-SMPT
ECTS : 3

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	62h
Evaluation :	1h
Face à face pédagogique :	1h
Travail personnel :	20h
Total :	83h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-SMIM
ECTS : 2

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	25h
Total :	51h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-CEMP
ECTS :

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	25h
Total :	51h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Solid mechanics for living materials

IDENTIFICATION

CODE : GM-4-S2-EC-SMMV
ECTS : 5

HOURS

Cours :	0h
TD :	36h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	47h
Travail personnel :	60h
Total :	107h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

Mme Platzer Auriane :
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Medical device and medical imaging

IDENTIFICATION

CODE : GM-4-S2-EC-SMDM
ECTS : 3

HOURS

Cours :	0h
TD :	18h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	21h
Travail personnel :	50h
Total :	71h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

Mme Bel-Brunon Aline :
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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-4-S2-EC-SMMH
ECTS : 4

HOURS

Cours :	0h
TD :	36h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	47h
Travail personnel :	35h
Total :	82h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. Sandel Arnaud :
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IDENTIFICATION

CODE : GM-4-S2-EC-SMCA
ECTS : 2

HOURS

Cours :	0h
TD :	18h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	28h
Travail personnel :	24h
Total :	52h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. Philippon David :
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IDENTIFICATION

CODE : GM-4-S2-EC-SMFS
ECTS : 4

HOURS

Cours :	0h
TD :	36h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	47h
Travail personnel :	35h
Total :	82h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. El Hajem Mahmoud :
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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Immersion in mechanical engineering professions and challenges

IDENTIFICATION

CODE : GM-4-S2-EC-TSIM
ECTS : 2

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	25h
Travail personnel :	25h
Total :	50h

ASSESMENT METHOD

oral defense

TEACHING AIDS

TEACHING LANGUAGE

English

CONTACT

M. Ville Fabrice :
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AIMS

Students work with engineers to explore technical challenges and design strategies informed by life cycle analysis, industry standards, and regulatory frameworks. A the end of this course, students are able to:
- Engage in technical discussions with practicing engineers to deepen understanding of real-world applications.
- Apply life cycle analysis methods to assess system performance and sustainability.
- Interpret and integrate relevant industry standards and regulations into design projects.
- Develop preliminary proposals for innovative systems or enhancements to existing ones.
- Collaborate within multidisciplinary teams to synthesize technical insights into practical design solutions.

CONTENT

- meetings with engineers for technical issues in solving innovation problems
- opening lessons on LCA, regulations, standards, …
- design a preliminary innovative project or develop an existing mechanism

BIBLIOGRAPHY

PRE-REQUISITES

- GM-3-S1-EC-CONAN
- GM-3-S2-EC-FLUID
- GM-3-S2-EC-MDEF
- GM-3-S2-EC-CODI
- GM-3-S2-EC-NUM
- GM-4-S1-EC-MTP
- HU-4-S1-EC-S-GM-COPR
- HU-3-S2-EC-S-GM-INNO

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Thematic project in power transmissions

IDENTIFICATION

CODE : GM-4-S2-EC-TSPT
ECTS : 3

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	62h
Evaluation :	1h
Face à face pédagogique :	1h
Travail personnel :	20h
Total :	83h

ASSESMENT METHOD

Written report and oral defense

TEACHING AIDS

- Lab facilities
- FabLab & FabElec
- Scientific softwares

TEACHING LANGUAGE

English

CONTACT

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AIMS

This project involves analyzing a power transmission system to validate design choices:
- Analyse a mechanical system (hydraulic, electric or Gear power transmission)
- Evaluating its durability through fatigue analysis, wear prediction, and long-term degradation assessments.
- Assess in-service behavior with a focus on vibration analysis and dynamic response.
- Quantify energy efficiency by identifying power losses and optimizing energy use.
- Integrate simulation and diagnostic tools to compare theoretical models with practical performance.
- Formulate recommendations for design improvements based on comprehensive system analysis.

CONTENT

Case-study on a mechanical system to validate the design choices in terms of performance (durability, behavior in service) and energy efficiency.

BIBLIOGRAPHY

- Lecture notes
- Dedicated seminars

PRE-REQUISITES

- Mechanics (core curriculum)
- Fluid Mechanics (core curriculum)
- Mechanical Transmission (core curriculum)
- Mechanics of deformable structures (core curriculum)
- Design (core curriculum)
- Hydraulic and Electric Power Transmissions
- Gear Power Transmissions

IDENTIFICATION

CODE : GM-4-S2-EC-CEMP
ECTS :

HOURS

Cours :	0h
TD :	24h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	26h
Travail personnel :	25h
Total :	51h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

CONTACT

AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Efficient Hydraulic Power Transmissions

IDENTIFICATION

CODE : GM-4-S2-EC-TSHT
ECTS : 5

HOURS

Cours :	0h
TD :	36h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	47h
Travail personnel :	70h
Total :	117h

ASSESMENT METHOD

Written test (1h) + Final exam (2h)

TEACHING AIDS

Lecture notes
Scientific software (AMESim, Fluent)

TEACHING LANGUAGE

English

CONTACT

M. Bideaux Eric :
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AIMS

Efficient Hydraulic Power Transmission introduces fundamental hydraulic system principles, emphasizing diagram interpretation, component analysis, and circuit design. This course also develops skills in modeling, simulation, and energy evaluation to optimize hydraulic performance:
- be able to read a complex hydraulic diagram and analyse its function
- be able to analyse the behaviour of a component from its drawing
- be able to read or determine the characteristics of hydraulic components and use them in the design phase
- be able to define a hydraulic circuit and choose its components according to specifications
- be able to model, control and simulate a hydraulic transmission chain
- be able to carry out an energy analysis on a hydraulic system

CONTENT

- Fluid characteristics and their consequences
- Modelling and analysis of actuator behaviour (pump, motor, cylinder)
- Modelling and analysis of valve behaviour: pressure regulation, flow regulation, servovalve
- Accumulators: principles, sizing
- Energy optimisation of hydraulic circuits
- Modelling flows of weakly compressible fluids (Reynolds and Navier-Stokes equations)
- Introduction to compressible fluids (cavitation, subsonic/sonic flow)
- Introduction to numerical flow modelling (meshing, boundary layer, turbulence models, etc.)
- Macroscopic modelling of unsteady behaviour
- Analysis of component stability and transients in circuits
- Digital hydraulics

BIBLIOGRAPHY

Fundamentals of Fluid Power Control, John Watton, March 2014, Cambridge University Press, ISBN: 9781107670181

PRE-REQUISITES

- Mechanics (core curriculum)
- Fluid mechanics (core curriculum)
- Mechanical transmission (core curriculum)
- Mechanics of deformable structures (core curriculum)
- Design (core curriculum)
- Control of linear systems (core curriculum)

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Electric power transmission and control

IDENTIFICATION

CODE : GM-4-S2-EC-TSET
ECTS : 4

HOURS

Cours :	0h
TD :	36h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	47h
Travail personnel :	50h
Total :	97h

ASSESMENT METHOD

Written test (1h) + final exam (2h)

TEACHING AIDS

Lecture notes
Scientific software

TEACHING LANGUAGE

English

CONTACT

M. Bideaux Eric :
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AIMS

Electric Power Transmission & Control introduces core principles of electrical machines and system design. It empowers students to select components, model and simulate transmission systems, and perform energy analyses for optimal performance:
- understand the principles of electrical machines and their controls
- be able to read or determine the main characteristics of electrical systems in order to use them in the design phase
- be able to choose the components of an electrical drive train according to specifications
- be able to model, control and simulate the main components of an electrical transmission chain
- be able to carry out an energy analysis of an electrical system

CONTENT

- Electricity
- Electromagnetism
- Electromagnetic actuators
- Electric motor technologies
- Introduction to power electronics
- Control of electrical machines
- Electrical energy storage technologies

BIBLIOGRAPHY

- Electrical Engineering: Know It All, Clive Maxfield, John Bird, Tim Williams, Walt Kester, Dan Bensky, Elsevier, 2008, eBook ISBN: 9780080949666
- Electromagnetics for Electrical Machines, Saurabh Kumar Mukerji, Ahmad Shahid Khan, Yatendra Pal Singh, March 2015, CRC Press, ISBN: 9781498709156
- Electrical Machines: Fundamentals of Electromechanical Energy Conversion, Jacek F. Gieras, 2016, CRC Press, ISBN: 1498708846
- Electric Motors and Drives Fundamentals, Types and Applications, Austin Hughes, Bill Drury, 2019, Elsevier, eBook ISBN: 9780128189252

PRE-REQUISITES

- Electricity / Physics 1st cycle
- Mechanics (core curriculum)
- Mechanical transmission (core curriculum)
- Design (ccore curriculum)
- Control of linear systems (core curriculum)

Tribology of gears and bearings

IDENTIFICATION

CODE : GM-4-S2-EC-TSGB
ECTS : 4

HOURS

Cours :	0h
TD :	36h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	47h
Travail personnel :	50h
Total :	97h

ASSESMENT METHOD

test (1h), final exam (2h)

TEACHING AIDS

Handbook

TEACHING LANGUAGE

English

CONTACT

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AIMS

Tribology of Gears and Bearings focuses on the calculation and analysis of key contact parameters in gear and bearing systems. The course enables students to assess design considerations, evaluate power losses, and identify common contact damage phenomena.
A the end of this course, students are able to:
- Calculate typical contact parameters
(lubricant film thickness, max. pressure, Friction, oil flow, contact stresses…)
- Take into account contact influence in design
- Evaluate power losses
- Identify contact damages (µpitting-pitting-scuffing…)

CONTENT

a - Introduction to Tribology
b - Hertz theory; Reynolds Equation
c - HydroStatic; HydroDynamics; ElastoHydroDynamics Lubrication
d - Surface roughness
e - Stribek Curve
f - Friction; power losses
g - Contact Damages (µpitting-pitting-scuffing…)
h - Advanced tribology (impact of lubricants, hydrogen charging…)

BIBLIOGRAPHY

* Johnson, K. L. (1987). Contact mechanics. Cambridge university press.

* Harris, T. A., & Kotzalas, M. N. (2006). Advanced concepts of bearing technology: rolling bearing analysis. CRC press.

* Tallian, T. E. (1992). The failure atlas for hertz contact machine elements. Mechanical Engineering, 114(3), 66.

PRE-REQUISITES

- GM-3-S1-EC-CONAN
- GM-3-S2-EC-FLUID
- GM-3-S2-EC-MDEF
- GM-3-S2-EC-CODI
- GM-3-S2-EC-NUM
- GM-4-S1-EC-MTP

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Advanced gear power transmissions

IDENTIFICATION

CODE : GM-4-S2-EC-TSAG
ECTS : 5

HOURS

Cours :	0h
TD :	36h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	47h
Travail personnel :	70h
Total :	117h

ASSESMENT METHOD

written test (1h), final exam (2h)

TEACHING AIDS

TEACHING LANGUAGE

English

CONTACT

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AIMS

Advanced Gear Power Transmissions offers a comprehensive overview of cylindrical gear design—including spur and helical gears—using ISO standards. Students master advanced techniques such as FEA for gear sizing and develop the skills needed to analyze and enhance the static and dynamic performance of gear systems:
- Design of cylindrical gears (spur, helical gears) using ISO standard,
- Advanced calculations (FEA) for gear sizing and comparison to ISO standard,
- Analyses and enhancement of the static and dynamic behaviour of gears (dynamics)

CONTENT

Spur gear reminders
Helical gears (Geometry, operating parameters)
Sizing using ISO (ISO presentation, Gear design with ISO geometry, using dedicated softwares)
Dynamics (Base plane and torsional model; Tooth modification to enhance dynamic behaviour, Dynamic behaviour appreciation parameters : Dynamic ratio; Transmission error etc...)
Static FE analysis of spur and helical gear, comparison to ISO

BIBLIOGRAPHY

PRE-REQUISITES

- GM-3-S1-EC-MLAG - Lagrangian Mechanics
- GM-4-S1-EC-MTP - Mechanical transmissions
- GM-3-S2-EC-MDEF - Mechanics of deformable structures
- GM-3-S1-EC-CONAN - Design 1
- GM-3-S2-EC-CODI - Design 2
- GM-4-S1-EC-CSEF - Finite elements

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Internship

IDENTIFICATION

CODE : GM-5-S1-EC-STAGEL
ECTS : 30

HOURS

Cours :	0h
TD :	1h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	2h
Travail personnel :	400h
Total :	402h

ASSESMENT METHOD

50% by the industry through a grid given by GM /
25% by an oral presentation evaluted by GM's teachers /
25% by a written report evaluated by GM's teachers

TEACHING AIDS

None

TEACHING LANGUAGE

French

CONTACT

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Mme Paredes Astudillo Yenny :
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AIMS

M1- To integrate an organization, to lead and help it to evolve
M2- To take account for constraints such as professionnal, economical and industrials ones.
M3- To take account for societal values (ethical, and ethics) and help them being respected
M4- To dialogue with specialists as with not specialists
M5- To work in international context: speak one or several langages, cultural openings,
M6- To work with autonomy, critical faculty, and curiosity

CONTENT

26 weeks of industrial intership

BIBLIOGRAPHY

Documents with details informations about progress of the intership and associated regulations are avalaible on Moodle website

PRE-REQUISITES

All teachings of GM for 3rd and 4th years

Introduction to innovative forming processes

IDENTIFICATION

CODE : GM-5-S1-EC-PCPHY
ECTS : 5

HOURS

Cours :	12h
TD :	24h
TP :	8h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	44h
Travail personnel :	25h
Total :	69h

ASSESMENT METHOD

Practical work reports.

TEACHING AIDS

Manuscripts of lessons, exercice lessons and practical works

TEACHING LANGUAGE

French

CONTACT

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AIMS

A. Additive manufacturing (AM) of polymer parts, Processes of shaping of innovative and functional multi-layer materials, Plastronics

B. Processing routes for long and discontinuous fibre composites

CONTENT

A. Additive manufacturing (AM) of polymer parts, Processes of shaping of innovative and functional multi-layer materials, Plastronics

B. Processing routes for long and discontinuous fibre composites

BIBLIOGRAPHY

[1] Manufacturing Techniques for Polymer Matrix Composites (PMCs), 1st Edition, Editors: Suresh Advani Kuang-Ting Hsiao, Woodhead Publishing, Cambridge, Royaume Uni, 2012.
Polymer Extrusion, 4¿me ed. C. Rauwendaal ; Hanser Publishers (2001)
[2] Screw Extrusion, Science and Technology. J.L. White, H. Potente ; Hanser Publishers (2001)
[3] Extrusion Dies for Plastics and Rubber, Design and Engineering Computations, 3¿me ed. W. Michaeli ; Hanser Publishers (2003)
[4] FRANKE, J¿rg (ed.). Three-Dimensional Molded Interconnect Devices (3D-MID): Materials, Manufacturing, Assembly and Applications for Injection Molded Circuit Carriers. Carl Hanser Verlag GmbH Co KG, 2014.

PRE-REQUISITES

GM-4-PCPRA-S1, GM-4-PCPMF-S1, GM-4-PCPMF-S2

Advanced mechanics for the prediction of material properties

IDENTIFICATION

CODE : GM-5-S1-EC-PCMAV
ECTS : 5

HOURS

Cours :	0h
TD :	37h
TP :	4h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	41h
Travail personnel :	15h
Total :	56h

ASSESMENT METHOD

Reports on the studies that are done.

TEACHING AIDS

Manuscripts of lessons, exercice lessons and practical works

TEACHING LANGUAGE

French

CONTACT

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AIMS

To understand the links between the microstructural characteristics of polymer and composite parts and their physical and mechanical properties as well as their damage and fracture properties

CONTENT

Part A - From the microstructure to the effective propertie of parts
- Basis of upscaling (homogenisation) theories (micro-macro uspcaling techniques)
- Applications : use of Digimat code or Geodict or Abaqus or Ansys for the calculation of effective properties

Part B -Damage et fracture of polymer and composite parts
- Basis of the damage and fracture mechanics
- Application and extension to polymer materials
- Application and extension to composite materials (cases of laminates and short-fibre composites)

Part C - Finishing processes and assembly processes
- General introduction to the finishing and assmebly processes of polymer (thermoset and
thermoplastic) and composite parts
- Principle of decoration processes and painting: related physico-chemical, physical and mechanical properties

BIBLIOGRAPHY

[1] Damage Mechanics of Composite Materials, Volume 9, 1st Edition, Editor: R. Talreja, Elsevier, Amsterdam, Pays-Bas, 1994.
[2] Application of Fracture Mechanics to Composite Materials, Volume 6, 1st Edition, Editor: K. Friedrich, Elsevier, Amsterdam, Pays-Bas, 1989.

PRE-REQUISITES

GM-4-PCPRA-S1, GM-4-PCPMF-S1, GM-4-PCPMF-S2, GM-4-PCSIM-S2, GM-4-PRM-S2

Numerical engineering of forming processes

IDENTIFICATION

CODE : GM-5-S1-EC-PCNUM
ECTS : 5

HOURS

Cours :	0h
TD :	32h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	32h
Travail personnel :	25h
Total :	57h

ASSESMENT METHOD

Practical work reports.

TEACHING AIDS

Manuscripts of lessons, exercice lessons

TEACHING LANGUAGE

French

CONTACT

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AIMS

Chaining the numerical tools for the desing of parts, starting from the choice of a forming process to the end-use properties of part.

CONTENT

Advanced simulation of forming processes for polymers and composites
- Advanced use of codes for polymer and composites processing (Polyflow, Moldflow...)
- Advanced use of structural mechanics codes (ex. Abaqus)

BIBLIOGRAPHY

[1] Flow and Rheology in Polymer Composites Manufacturing, Volume 10, 1st Edition, Editors: S.G. Advani, Elsevier, Amsterdam, Pays-Bas, 1994.
[2] Manufacturing Techniques for Polymer Matrix Composites (PMCs), 1st Edition, Editors: Suresh Advani Kuang-Ting Hsiao, Woodhead Publishing, Cambridge, Royaume Uni, 2012.
[3] Polymer Extrusion, 4ème ed. C. Rauwendaal ; Hanser Publishers (2001)

PRE-REQUISITES

GM-4-PCPRA-S1, GM-4-PCPMF-S1, GM-4-PCPMF-S2, GM-4-PCSIM-S2, GM-4-PRM-S2

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

IDENTIFICATION

CODE : HU-0-S1-EC-S-PPH
ECTS : undefined

HOURS

Cours :	0h
TD :	20h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	20h
Travail personnel :	0h
Total :	20h

ASSESMENT METHOD

Written report (10 pages minimum) and oral defence (in presence of tutor and guest).

TEACHING AIDS

Présentation du PPH sur Moodle : http://moodle.insa-lyon.fr

TEACHING LANGUAGE

French

CONTACT

AIMS

The PPH is an individual exercise where the student carries out an investigation or some research into a subjet of particular interest to them in the aim of developing some form of critical analysis of the subject. The PPH is a means by which the student can show their ability to build an analysis based on a rigorously developed thesis. The analysis is based on a personal approach to the subject (openness to the wider world), the way the subject is dealt with (for example the use of a personal experience as a way of seeing the world or the chosen subject), or in certain cases the creative approach used (for example, for an artistic experience).
The PPH requires the ability to work autonomously.

The PPH contributes primarily to the development of competencies CT2.1-4 and CT3.1 ; other competencies can be developed depending on the choice of project.

CONTENT

Work on a particular theme with a tutor chosen by the student.
Filling in of a project sheet (elaboration of the question, definition of the personal approach, bibliography, etc),
Step by step meetings with the tutor (plan, analysis, etc),
Report writing and oral presentation.

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-5-S1-EC-PPP
ECTS : 1

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	0h
Travail personnel :	20h
Total :	20h

ASSESMENT METHOD

- one French written page in which the student explains the vision he has of the differentiated path that he will follow in 4th and 5th year.
- one English written page in which the student explains his choice of mobility abroad and an analysis of the developed skills.
- a French written page to justify the choice of the training periods and an analysis of the developed skills.
- an inventory of skills at the end of each year with an assessment at the end of the 5th year.

TEACHING AIDS

Personal tests
Presentation slides when allowed by the speaker
Online self-assessment materials

TEACHING LANGUAGE

French

CONTACT

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AIMS

The overall objective is to build his/her own professional project. If the assessment takes place in the 5th year, the work must start during the 3rd year.
The aim is :
- Allow the student to choose his/her 4th and 5th year differentiated path
- Understand and know the trades and sectors associated with the different aspects of training
- Self-assessment and identification of competencies acquired or to be acquired
- Choose the aspects of its training to be strengthened
- Establish his/her professional project based on personal skills and self-knowledge.

CONTENT

1. Evaluation of the spontaneous representations on the differentiated paths
2. Interventions of partner companies and other engineers
3. Active participation in at least one collective activity (promotion of the department, management of the FabLab of the department, Professional day, company coffees, contacts with alumni, sponsorship of the promotion, presentation of the department, organization of the integration week , Inter-Semester Week, End-of-Studies Travel, GM Awards, Graduation Ceremony)
4. Self-Assessment Techniques and Building a personal skills Portfolio

If needed,a methodological aid can be provided for the writing of their CV and their cover letters during their search for internship.

BIBLIOGRAPHY

PRE-REQUISITES

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE
Humanities and social sciences

IDENTIFICATION

CODE : HU-0-S1-EC-S-SERIE3
ECTS : undefined

HOURS

Cours :	0h
TD :	20h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	20h
Travail personnel :	0h
Total :	20h

ASSESMENT METHOD

Assessment will be conducted through continuous evaluation. The assessment methods will be presented at the beginning of the semester by the teaching team.

TEACHING AIDS

Materials are chosen by the instructor based on the module:
•Didactic documents related to the module
•Audiovisual materials
•Recommended readings

TEACHING LANGUAGE

French

CONTACT

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Mme GOUTALAND Carine :
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AIMS

A series of elective courses in Humanities and Social Sciences (HSS) offers several options for students to choose from, allowing them to develop and deepen specific skills. This course aims to develop one or more transversal skills among the following:
• CT1: Self-awareness and self-management
• CT2: Working, learning, and evolving independently
• CT3: Interacting with others, working in a team
• CT4: Demonstrating creativity
• CT5: Acting responsibly in a complex world
• CT6: Navigating and evolving within an organization
• CT7: Working in an international and intercultural context
The list of options available in Series 1 and the specific competencies for each option are detailed in the catalog on the IntranetHumas:
https://intranethumas.insa-lyon.fr/sciences-humaines-sociales/offre-de-formation/cours-la-carte-0

CONTENT

Each module is designed to encourage interaction and active student participation. The content is structured around the following key aspects:
• Theoretical deepening related to the theme
• Reflection on the topic
• Practical exercises and activities
• Assessments and presentation of work

BIBLIOGRAPHY

The bibliography is selected by the instructor based on the module.

PRE-REQUISITES

French

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

CENTRE DES SPORTS
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Sports

IDENTIFICATION

CODE : CDS-5-S1-EC-EPS
ECTS :

HOURS

Cours :	0h
TD :	1.5h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	1.5h
Travail personnel :	0h
Total :	1.5h

ASSESMENT METHOD

Assessment in Physical Education concerns the teaching of Sports and Artistic Physical Activities (APSA), and will take the form of continuous assessment with half-yearly marking.

The mark depends on the degree of acquisition of the skills expected in each of the activities, and the progress made over all the sessions in the cycle. The mark takes into account :

Individual and/or team performance
mastery of execution
Progress in the sports project
Responsibility and autonomy

TEACHING AIDS

All physical, sporting, artistic and competitive activities

TEACHING LANGUAGE

French

CONTACT

MME JAUSSAUD Marie :
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AIMS

This EC is part of the Teaching Unit: SHS and contributes to the development of the School's transversal competences

1*Auto-evaluating one's own performance
Knowledges :
- Fundamentals, principles of action and terminology of sports activities
- Criteria for observation, achievement and success.
Abilities :
- Assess your level of practice
- Build up a warm-up
- Set goals for progress
- Manage physical and mental potential

2* Work, learn and develop independently
Knowledge :
- PSAA rules
- Observation criteria
- Principles of warm-up and cool-down
Abilities :
- Mobilise resources
- Analyse, observe, question
- Take on different roles (referee, choreographer)

3* Interact with others, work as part of a team
Knowledges :
- Roles and functions in each sports activity
Abilities :
- Communicate appropriately: verbal, non-verbal and postural communication.
- Integrate into a group
- Take part in and develop a group project
- Take the initiative
- Be a good listener

4* Be creative, innovative and enterprising
Knowledge :
- Artistic disciplines
Abilities :
- Draw on knowledge and resources from different artistic fields to produce an original work.
- Mobilise the imagination and sensibility and make them visible through dance movement
- Access the symbolism of the body

5* Act responsibly in a complex world
Knowledge :
- Safety and operating rules
Abilities :
- Identify uncertainties and risks and act to reduce them
- Integrate a responsible dimension into their actions
- Show respect and fair play in a power struggle

6* Working in an international context
Knowledge :
- Socio-cultural differences
Abilities :
- Integrate cultural diversity into group work
- Act with respect for self and others

CONTENT

Physical Education and Sport lessons are organised around traditional Physical Education lessons, or advanced lessons, or appropriate practices (EPSA), or competitive practices within the framework of the Section Sportive Haut Niveau.

1. Physcical Education lessons :
Students choose one or two physical and sporting activities per year from among the activities offered by the sports centre (individual, group, dual).
2. Appropriate Physical Education lessons: For all students who are exempt from physical activity for at least 2 months:
Swimming, Body-building, Nordic Walking, Somatic Exercise, Sophrology, Wheelchair Basketball, Pilates, Table Tennis, etc.
3. Advanced Physical Education courses :
Specialisation in a sporting activity, University training and competitions
4. SSHN (High-Level Athlete section)

University training and competitions

EPS5 GMPP OYONNAX :Group cohesion project
Autonomy Lessons at S1 on Wednesday afternoons
Hiking outing

BIBLIOGRAPHY

OTTAWA Charter (1986): ‘health is seen as a resource for everyday life; it is a positive concept that highlights social and individual resources, as well as physical abilities’.

PRE-REQUISITES

- EPS: none
- Appropriate Physical Education: subject to medical advice
- Advanced courses and competitive practice: previous practice required subject to specific selection according to each activity
- SHN: ministerial list

Levels 1 and 2: Physical Education, Appropriate physical education
Level 3: Advanced courses and competitive practice, SHN

INSA LYON
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INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Final project master thesis

IDENTIFICATION

CODE : GM-5-S1-EC-COPRI
ECTS : 16

HOURS

Cours :	0h
TD :	1h
TP :	0h
Projet :	200h
Evaluation :	1h
Face à face pédagogique :	2h
Travail personnel :	200h
Total :	402h

ASSESMENT METHOD

Ongoing evaluation, final report and defense

TEACHING AIDS

Depending on the topic

TEACHING LANGUAGE

French
English

CONTACT

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AIMS

To train students in the performance of industrial analysis and design or research, possibly funded by industrial partners.

CONTENT

Practice of knowledges and knowhow studied during the whole cursus

BIBLIOGRAPHY

PRE-REQUISITES

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Internship

IDENTIFICATION

CODE : GM-5-S1-EC-STAGEL
ECTS : 30

HOURS

Cours :	0h
TD :	1h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	2h
Travail personnel :	400h
Total :	402h

ASSESMENT METHOD

50% by the industry through a grid given by GM /
25% by an oral presentation evaluted by GM's teachers /
25% by a written report evaluated by GM's teachers

TEACHING AIDS

None

TEACHING LANGUAGE

French

CONTACT

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M. Morterolle Sebastien :
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Mme Paredes Astudillo Yenny :
yenny.paredes-astudillo@insa-lyon.fr

AIMS

M1- To integrate an organization, to lead and help it to evolve
M2- To take account for constraints such as professionnal, economical and industrials ones.
M3- To take account for societal values (ethical, and ethics) and help them being respected
M4- To dialogue with specialists as with not specialists
M5- To work in international context: speak one or several langages, cultural openings,
M6- To work with autonomy, critical faculty, and curiosity

CONTENT

26 weeks of industrial intership

BIBLIOGRAPHY

Documents with details informations about progress of the intership and associated regulations are avalaible on Moodle website

PRE-REQUISITES

All teachings of GM for 3rd and 4th years

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Vehicule dynamics

IDENTIFICATION

CODE : GM-5-S1-EC-MSDV
ECTS : 5

HOURS

Cours :	0h
TD :	20h
TP :	12h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	33h
Travail personnel :	40h
Total :	73h

ASSESMENT METHOD

1 evaluation of 1h

TEACHING AIDS

Lecture notes and slides.
Exercises notes.
Softwares : Maplesim, Amesim, Oktal Scaner,

TEACHING LANGUAGE

French

CONTACT

M. MORTEROLLE Sebastien :
sebastien.morterolle@insa-lyon.fr

AIMS

This course is oriented towards the design of innovative vehicles, with a vehicle approach as a complex system: study of vehicle dynamics, new means of operation, design of a hybrid system, simulation of the vehicle in its environment. It is through this course to give students the skills to:
- Understand the behavior of a vehicle as a whole.
- Design and dimensioning of vehicles for industrial applications.
- Implement systems of management of the motorization and the direction.

CONTENT

BIBLIOGRAPHY

Brossard J.-P., Dynamique du véhicule, PPUR, 2006.
Brossard J.-P., Dynamique du freinage, PPUR, 2009.
Matschinky W., Road Vehicule Suspensions,PEP, 2000.
Pacejka H., Tire and vehicule Dynamics, Third Edition, Elsevier, 2012.

PRE-REQUISITES

Multibody dynamics

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Optimisation for systems design

IDENTIFICATION

CODE : GM-5-S1-EC-MSOPT
ECTS : 5

HOURS

Cours :	0h
TD :	32h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	34h
Travail personnel :	33h
Total :	67h

ASSESMENT METHOD

1x1h30

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. BRIBIESCA ARGOMEDO :
federico.bribiesca-argomedo@insa-lyon.fr

AIMS

Optimization are a recurring theme encountered by engineers all along their careers. The objective of this module is to introduce future engineers to the fomulation, analyisis and solution of optimization problems. The guiding principle will be to give students "good practices" when using toolboxes included in different software packages (such as Matlab)

CONTENT

The first half of this module will deal with the principles of optimization and the introduction of some basic solution methods applied to examples issued from mechatronic design problems. This introduction aims to define the notions of constrained and unconstrained optimization, single or multi-objective optimization, local or global optimization and optimality conditions. Numerical methods such as gradient descent, Hooke and Jeeves method, the Simplex algorithm, some convex optimization methods or simulated reannealing will support this introduction to parametric optimization.
The second part of this module will deal with dynamic optimization problems. This topic will be presented first in its general form based on the Euler-Lagrange formulation, and then, particular methods such as Pontryagin's maximum principle or Bellman's optimality principle will be applied to concrete examples such as path finding or optimal control.
A sensibilization to meta-heuristic models (genetic algorithms, particle filters, etc.) will be provided at the end of this module.

BIBLIOGRAPHY

[1] Rao, S. S. ""Engineering Optimization Theory and Practice"", Wiley, 2009.
[2] Boyd, S. and L. Vandenberghe, ""Convex Optimization"", Cambride University Press, 2004.

PRE-REQUISITES

Robotics

IDENTIFICATION

CODE : GM-5-S1-EC-MSROB
ECTS : 5

HOURS

Cours :	0h
TD :	24h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	34h
Travail personnel :	40h
Total :	74h

ASSESMENT METHOD

1 evaluation of 2h

TEACHING AIDS

Lecture notes and slides.
Exercises notes.
Softwares : Maple/Maplesim, Matlab, Adams.

TEACHING LANGUAGE

French

CONTACT

M. PHAM Minh :
minh-tu.pham@insa-lyon.fr

AIMS

This course offers an introduction to robotics and is based on tools that are widely used in industrial environments. It is through this course to give students the skills to:
- Understand the creation of a robotic system
- Design and dimensioning of robotic systems for industrial applications, mobile robotics, biomechanics
- Implement robotic system control laws

CONTENT

Technology of the components of a robotic system (terminology, mechanical system, terminal organ, proprioceptive and external sensors, actuators, human-machine interface).
Bases in identification and dynamic control of robots.
Basis of the generation of movements and the synthesis of trajectory.
Control of robots in position or effort for open and closed kinematic chains.
Geometric modeling, kinematics, dynamics: direct and inverse models.
Parameterization by a systematic method of description (Denavit-Hartenberg, Euler parameters, quaternions).
Analysis of the operation of a robot and singular points.
Use of software to solve a system of algebra-differential equations.

BIBLIOGRAPHY

Dombre E. et Khalil Wisama, Modélisation et commande des robots, Hermes, 1988.
Khalil W., Dombre E., Modelisation, identification and control of robots, Hermes, 2002.
Liégeois A., Les Robots Tome 7 : Analyse des performances et CAO, Hermès, 1984.

PRE-REQUISITES

Multibody dynamics

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Energy conversions

IDENTIFICATION

CODE : GM-5-S1-EC-MSCEN
ECTS : 5

HOURS

Cours :	0h
TD :	20h
TP :	16h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	38h
Travail personnel :	12h
Total :	50h

ASSESMENT METHOD

2 Final Exam (2x2h) + oral speech

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. LEFEVRE Stephane :
stephane.lefevre@insa-lyon.fr

AIMS

- Describe and analyze thermodynamically the operating principles of energy conversion systems in sectors such as transport, industry or energy production.
- Identify the different components of a turbomachine and explain the role of each element.
- Modeling and analyzing, from the point of view of fluid mechanics, the performance of a turbomachine.
- Identify the different components of an internal combustion engines, know the different way to control and to optimise an internal combustion engine

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Thermodynamics, Fluid mechanics

Ecodesign

IDENTIFICATION

CODE : GM-5-S1-EC-MSECO
ECTS : 5

HOURS

Cours :	0h
TD :	32h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	32h
Travail personnel :	22h
Total :	54h

ASSESMENT METHOD

Project

TEACHING AIDS

Lecture + Tutorials - Software : Gabi

TEACHING LANGUAGE

French

CONTACT

M. MAHFOUD Jarir :
jarir.mahfoud@insa-lyon.fr

AIMS

1. Taking into account environmental impacts in the process of integrated design of an industrial product.
2. Be aware of eco-design practices in the industry, and have a first application approach.
3. Be aware of different industrial organization approaches (small, medium or large enterprises).
4. Be aware of standards,
5. Practice tools used in the industry.
6. Be aware of the limitations of current tools and approaches (what can be considered valid today, may not be in 5 years).
7. Sustainable development during the design or during the development of an industrial product

CONTENT

- Studying and aanalyzing the life cycle of a mechanism, a machine, (application to structures control, different types of actuators, different control algorithm)
- Considering the constraints induced by the standards,
- Establish a simple environmental assessment of one phase of the life cycle,
- Establish an environmental assessment of a process or system
- Life cycle analysis of a simple system: Approach with simplified Eco-design-pilot tools, OKALA / Ecolyser, Bilan Produit ADEME, BEE, ECO FAIRE,
- Eco-Design (Economy, functionality, branding)
- Life Cycle Analysis of a Simple System: Approach with Industrial Tools (GABI)
- Studying and aanalyzing the design of an industrial product. Establishing its LCA, proposing perspective for improving the design and, when possible, the realization of prototypes

BIBLIOGRAPHY

PRE-REQUISITES

No

Smart structures

IDENTIFICATION

CODE : GM-5-S1-EC-MSSS
ECTS : 5

HOURS

Cours :	0h
TD :	22h
TP :	8h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	32h
Travail personnel :	30h
Total :	62h

ASSESMENT METHOD

Final exam 2h

TEACHING AIDS

lecture handout

TEACHING LANGUAGE

French

CONTACT

M. CHESNE Simon :
simon.chesne@insa-lyon.fr

AIMS

The aim of this course, which involves the physics and models of smart transducers and their integration, is to acquire a methodology for designing and testing multiphysic systems. By the use of smart transducers coupled with mechanical structures, we develop the design of integrated active / semi-passive or semi-active control or energy harvesting devices .

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

IDENTIFICATION

CODE : HU-0-S1-EC-S-PPH
ECTS : undefined

HOURS

Cours :	0h
TD :	20h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	20h
Travail personnel :	0h
Total :	20h

ASSESMENT METHOD

Written report (10 pages minimum) and oral defence (in presence of tutor and guest).

TEACHING AIDS

Présentation du PPH sur Moodle : http://moodle.insa-lyon.fr

TEACHING LANGUAGE

French

CONTACT

AIMS

The PPH is an individual exercise where the student carries out an investigation or some research into a subjet of particular interest to them in the aim of developing some form of critical analysis of the subject. The PPH is a means by which the student can show their ability to build an analysis based on a rigorously developed thesis. The analysis is based on a personal approach to the subject (openness to the wider world), the way the subject is dealt with (for example the use of a personal experience as a way of seeing the world or the chosen subject), or in certain cases the creative approach used (for example, for an artistic experience).
The PPH requires the ability to work autonomously.

The PPH contributes primarily to the development of competencies CT2.1-4 and CT3.1 ; other competencies can be developed depending on the choice of project.

CONTENT

Work on a particular theme with a tutor chosen by the student.
Filling in of a project sheet (elaboration of the question, definition of the personal approach, bibliography, etc),
Step by step meetings with the tutor (plan, analysis, etc),
Report writing and oral presentation.

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-5-S1-EC-PPP
ECTS : 1

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	0h
Travail personnel :	20h
Total :	20h

ASSESMENT METHOD

- one French written page in which the student explains the vision he has of the differentiated path that he will follow in 4th and 5th year.
- one English written page in which the student explains his choice of mobility abroad and an analysis of the developed skills.
- a French written page to justify the choice of the training periods and an analysis of the developed skills.
- an inventory of skills at the end of each year with an assessment at the end of the 5th year.

TEACHING AIDS

Personal tests
Presentation slides when allowed by the speaker
Online self-assessment materials

TEACHING LANGUAGE

French

CONTACT

MME SALLE Emmanuelle :
emmanuelle.vidal-salle@insa-lyon.fr

AIMS

The overall objective is to build his/her own professional project. If the assessment takes place in the 5th year, the work must start during the 3rd year.
The aim is :
- Allow the student to choose his/her 4th and 5th year differentiated path
- Understand and know the trades and sectors associated with the different aspects of training
- Self-assessment and identification of competencies acquired or to be acquired
- Choose the aspects of its training to be strengthened
- Establish his/her professional project based on personal skills and self-knowledge.

CONTENT

1. Evaluation of the spontaneous representations on the differentiated paths
2. Interventions of partner companies and other engineers
3. Active participation in at least one collective activity (promotion of the department, management of the FabLab of the department, Professional day, company coffees, contacts with alumni, sponsorship of the promotion, presentation of the department, organization of the integration week , Inter-Semester Week, End-of-Studies Travel, GM Awards, Graduation Ceremony)
4. Self-Assessment Techniques and Building a personal skills Portfolio

If needed,a methodological aid can be provided for the writing of their CV and their cover letters during their search for internship.

BIBLIOGRAPHY

PRE-REQUISITES

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE
Humanities and social sciences

IDENTIFICATION

CODE : HU-0-S1-EC-S-SERIE3
ECTS : undefined

HOURS

Cours :	0h
TD :	20h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	20h
Travail personnel :	0h
Total :	20h

ASSESMENT METHOD

Assessment will be conducted through continuous evaluation. The assessment methods will be presented at the beginning of the semester by the teaching team.

TEACHING AIDS

Materials are chosen by the instructor based on the module:
•Didactic documents related to the module
•Audiovisual materials
•Recommended readings

TEACHING LANGUAGE

French

CONTACT

Mme JOUISHOMME Delphine :
delphine.jouishomme@insa-lyon.fr
Mme GOUTALAND Carine :
carine.goutaland@insa-lyon.fr

AIMS

A series of elective courses in Humanities and Social Sciences (HSS) offers several options for students to choose from, allowing them to develop and deepen specific skills. This course aims to develop one or more transversal skills among the following:
• CT1: Self-awareness and self-management
• CT2: Working, learning, and evolving independently
• CT3: Interacting with others, working in a team
• CT4: Demonstrating creativity
• CT5: Acting responsibly in a complex world
• CT6: Navigating and evolving within an organization
• CT7: Working in an international and intercultural context
The list of options available in Series 1 and the specific competencies for each option are detailed in the catalog on the IntranetHumas:
https://intranethumas.insa-lyon.fr/sciences-humaines-sociales/offre-de-formation/cours-la-carte-0

CONTENT

Each module is designed to encourage interaction and active student participation. The content is structured around the following key aspects:
• Theoretical deepening related to the theme
• Reflection on the topic
• Practical exercises and activities
• Assessments and presentation of work

BIBLIOGRAPHY

The bibliography is selected by the instructor based on the module.

PRE-REQUISITES

French

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

CENTRE DES SPORTS
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Sports

IDENTIFICATION

CODE : CDS-5-S1-EC-EPS
ECTS :

HOURS

Cours :	0h
TD :	1.5h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	1.5h
Travail personnel :	0h
Total :	1.5h

ASSESMENT METHOD

Assessment in Physical Education concerns the teaching of Sports and Artistic Physical Activities (APSA), and will take the form of continuous assessment with half-yearly marking.

The mark depends on the degree of acquisition of the skills expected in each of the activities, and the progress made over all the sessions in the cycle. The mark takes into account :

Individual and/or team performance
mastery of execution
Progress in the sports project
Responsibility and autonomy

TEACHING AIDS

All physical, sporting, artistic and competitive activities

TEACHING LANGUAGE

French

CONTACT

MME JAUSSAUD Marie :
marie.jaussaud@insa-lyon.fr

AIMS

This EC is part of the Teaching Unit: SHS and contributes to the development of the School's transversal competences

1*Auto-evaluating one's own performance
Knowledges :
- Fundamentals, principles of action and terminology of sports activities
- Criteria for observation, achievement and success.
Abilities :
- Assess your level of practice
- Build up a warm-up
- Set goals for progress
- Manage physical and mental potential

2* Work, learn and develop independently
Knowledge :
- PSAA rules
- Observation criteria
- Principles of warm-up and cool-down
Abilities :
- Mobilise resources
- Analyse, observe, question
- Take on different roles (referee, choreographer)

3* Interact with others, work as part of a team
Knowledges :
- Roles and functions in each sports activity
Abilities :
- Communicate appropriately: verbal, non-verbal and postural communication.
- Integrate into a group
- Take part in and develop a group project
- Take the initiative
- Be a good listener

4* Be creative, innovative and enterprising
Knowledge :
- Artistic disciplines
Abilities :
- Draw on knowledge and resources from different artistic fields to produce an original work.
- Mobilise the imagination and sensibility and make them visible through dance movement
- Access the symbolism of the body

5* Act responsibly in a complex world
Knowledge :
- Safety and operating rules
Abilities :
- Identify uncertainties and risks and act to reduce them
- Integrate a responsible dimension into their actions
- Show respect and fair play in a power struggle

6* Working in an international context
Knowledge :
- Socio-cultural differences
Abilities :
- Integrate cultural diversity into group work
- Act with respect for self and others

CONTENT

Physical Education and Sport lessons are organised around traditional Physical Education lessons, or advanced lessons, or appropriate practices (EPSA), or competitive practices within the framework of the Section Sportive Haut Niveau.

1. Physcical Education lessons :
Students choose one or two physical and sporting activities per year from among the activities offered by the sports centre (individual, group, dual).
2. Appropriate Physical Education lessons: For all students who are exempt from physical activity for at least 2 months:
Swimming, Body-building, Nordic Walking, Somatic Exercise, Sophrology, Wheelchair Basketball, Pilates, Table Tennis, etc.
3. Advanced Physical Education courses :
Specialisation in a sporting activity, University training and competitions
4. SSHN (High-Level Athlete section)

University training and competitions

EPS5 GMPP OYONNAX :Group cohesion project
Autonomy Lessons at S1 on Wednesday afternoons
Hiking outing

BIBLIOGRAPHY

OTTAWA Charter (1986): ‘health is seen as a resource for everyday life; it is a positive concept that highlights social and individual resources, as well as physical abilities’.

PRE-REQUISITES

- EPS: none
- Appropriate Physical Education: subject to medical advice
- Advanced courses and competitive practice: previous practice required subject to specific selection according to each activity
- SHN: ministerial list

Levels 1 and 2: Physical Education, Appropriate physical education
Level 3: Advanced courses and competitive practice, SHN

INSA LYON
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www.insa-lyon.fr

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Final project master thesis

IDENTIFICATION

CODE : GM-5-S1-EC-COPRI
ECTS : 16

HOURS

Cours :	0h
TD :	1h
TP :	0h
Projet :	200h
Evaluation :	1h
Face à face pédagogique :	2h
Travail personnel :	200h
Total :	402h

ASSESMENT METHOD

Ongoing evaluation, final report and defense

TEACHING AIDS

Depending on the topic

TEACHING LANGUAGE

French
English

CONTACT

M. BUFFIERE Jean-Yves :
jean-yves.buffiere@insa-lyon.fr

AIMS

To train students in the performance of industrial analysis and design or research, possibly funded by industrial partners.

CONTENT

Practice of knowledges and knowhow studied during the whole cursus

BIBLIOGRAPHY

PRE-REQUISITES

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

IDENTIFICATION

CODE : HU-0-S1-EC-S-PPH
ECTS : undefined

HOURS

Cours :	0h
TD :	20h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	20h
Travail personnel :	0h
Total :	20h

ASSESMENT METHOD

Written report (10 pages minimum) and oral defence (in presence of tutor and guest).

TEACHING AIDS

Présentation du PPH sur Moodle : http://moodle.insa-lyon.fr

TEACHING LANGUAGE

French

CONTACT

AIMS

The PPH is an individual exercise where the student carries out an investigation or some research into a subjet of particular interest to them in the aim of developing some form of critical analysis of the subject. The PPH is a means by which the student can show their ability to build an analysis based on a rigorously developed thesis. The analysis is based on a personal approach to the subject (openness to the wider world), the way the subject is dealt with (for example the use of a personal experience as a way of seeing the world or the chosen subject), or in certain cases the creative approach used (for example, for an artistic experience).
The PPH requires the ability to work autonomously.

The PPH contributes primarily to the development of competencies CT2.1-4 and CT3.1 ; other competencies can be developed depending on the choice of project.

CONTENT

Work on a particular theme with a tutor chosen by the student.
Filling in of a project sheet (elaboration of the question, definition of the personal approach, bibliography, etc),
Step by step meetings with the tutor (plan, analysis, etc),
Report writing and oral presentation.

BIBLIOGRAPHY

PRE-REQUISITES

IDENTIFICATION

CODE : GM-5-S1-EC-PPP
ECTS : 1

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	0h
Travail personnel :	20h
Total :	20h

ASSESMENT METHOD

- one French written page in which the student explains the vision he has of the differentiated path that he will follow in 4th and 5th year.
- one English written page in which the student explains his choice of mobility abroad and an analysis of the developed skills.
- a French written page to justify the choice of the training periods and an analysis of the developed skills.
- an inventory of skills at the end of each year with an assessment at the end of the 5th year.

TEACHING AIDS

Personal tests
Presentation slides when allowed by the speaker
Online self-assessment materials

TEACHING LANGUAGE

French

CONTACT

MME SALLE Emmanuelle :
emmanuelle.vidal-salle@insa-lyon.fr

AIMS

The overall objective is to build his/her own professional project. If the assessment takes place in the 5th year, the work must start during the 3rd year.
The aim is :
- Allow the student to choose his/her 4th and 5th year differentiated path
- Understand and know the trades and sectors associated with the different aspects of training
- Self-assessment and identification of competencies acquired or to be acquired
- Choose the aspects of its training to be strengthened
- Establish his/her professional project based on personal skills and self-knowledge.

CONTENT

1. Evaluation of the spontaneous representations on the differentiated paths
2. Interventions of partner companies and other engineers
3. Active participation in at least one collective activity (promotion of the department, management of the FabLab of the department, Professional day, company coffees, contacts with alumni, sponsorship of the promotion, presentation of the department, organization of the integration week , Inter-Semester Week, End-of-Studies Travel, GM Awards, Graduation Ceremony)
4. Self-Assessment Techniques and Building a personal skills Portfolio

If needed,a methodological aid can be provided for the writing of their CV and their cover letters during their search for internship.

BIBLIOGRAPHY

PRE-REQUISITES

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE
Humanities and social sciences

IDENTIFICATION

CODE : HU-0-S1-EC-S-SERIE3
ECTS : undefined

HOURS

Cours :	0h
TD :	20h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	20h
Travail personnel :	0h
Total :	20h

ASSESMENT METHOD

Assessment will be conducted through continuous evaluation. The assessment methods will be presented at the beginning of the semester by the teaching team.

TEACHING AIDS

Materials are chosen by the instructor based on the module:
•Didactic documents related to the module
•Audiovisual materials
•Recommended readings

TEACHING LANGUAGE

French

CONTACT

Mme JOUISHOMME Delphine :
delphine.jouishomme@insa-lyon.fr
Mme GOUTALAND Carine :
carine.goutaland@insa-lyon.fr

AIMS

A series of elective courses in Humanities and Social Sciences (HSS) offers several options for students to choose from, allowing them to develop and deepen specific skills. This course aims to develop one or more transversal skills among the following:
• CT1: Self-awareness and self-management
• CT2: Working, learning, and evolving independently
• CT3: Interacting with others, working in a team
• CT4: Demonstrating creativity
• CT5: Acting responsibly in a complex world
• CT6: Navigating and evolving within an organization
• CT7: Working in an international and intercultural context
The list of options available in Series 1 and the specific competencies for each option are detailed in the catalog on the IntranetHumas:
https://intranethumas.insa-lyon.fr/sciences-humaines-sociales/offre-de-formation/cours-la-carte-0

CONTENT

Each module is designed to encourage interaction and active student participation. The content is structured around the following key aspects:
• Theoretical deepening related to the theme
• Reflection on the topic
• Practical exercises and activities
• Assessments and presentation of work

BIBLIOGRAPHY

The bibliography is selected by the instructor based on the module.

PRE-REQUISITES

French

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

CENTRE DES SPORTS
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Sports

IDENTIFICATION

CODE : CDS-5-S1-EC-EPS
ECTS :

HOURS

Cours :	0h
TD :	1.5h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	1.5h
Travail personnel :	0h
Total :	1.5h

ASSESMENT METHOD

Assessment in Physical Education concerns the teaching of Sports and Artistic Physical Activities (APSA), and will take the form of continuous assessment with half-yearly marking.

The mark depends on the degree of acquisition of the skills expected in each of the activities, and the progress made over all the sessions in the cycle. The mark takes into account :

Individual and/or team performance
mastery of execution
Progress in the sports project
Responsibility and autonomy

TEACHING AIDS

All physical, sporting, artistic and competitive activities

TEACHING LANGUAGE

French

CONTACT

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AIMS

This EC is part of the Teaching Unit: SHS and contributes to the development of the School's transversal competences

1*Auto-evaluating one's own performance
Knowledges :
- Fundamentals, principles of action and terminology of sports activities
- Criteria for observation, achievement and success.
Abilities :
- Assess your level of practice
- Build up a warm-up
- Set goals for progress
- Manage physical and mental potential

2* Work, learn and develop independently
Knowledge :
- PSAA rules
- Observation criteria
- Principles of warm-up and cool-down
Abilities :
- Mobilise resources
- Analyse, observe, question
- Take on different roles (referee, choreographer)

3* Interact with others, work as part of a team
Knowledges :
- Roles and functions in each sports activity
Abilities :
- Communicate appropriately: verbal, non-verbal and postural communication.
- Integrate into a group
- Take part in and develop a group project
- Take the initiative
- Be a good listener

4* Be creative, innovative and enterprising
Knowledge :
- Artistic disciplines
Abilities :
- Draw on knowledge and resources from different artistic fields to produce an original work.
- Mobilise the imagination and sensibility and make them visible through dance movement
- Access the symbolism of the body

5* Act responsibly in a complex world
Knowledge :
- Safety and operating rules
Abilities :
- Identify uncertainties and risks and act to reduce them
- Integrate a responsible dimension into their actions
- Show respect and fair play in a power struggle

6* Working in an international context
Knowledge :
- Socio-cultural differences
Abilities :
- Integrate cultural diversity into group work
- Act with respect for self and others

CONTENT

Physical Education and Sport lessons are organised around traditional Physical Education lessons, or advanced lessons, or appropriate practices (EPSA), or competitive practices within the framework of the Section Sportive Haut Niveau.

1. Physcical Education lessons :
Students choose one or two physical and sporting activities per year from among the activities offered by the sports centre (individual, group, dual).
2. Appropriate Physical Education lessons: For all students who are exempt from physical activity for at least 2 months:
Swimming, Body-building, Nordic Walking, Somatic Exercise, Sophrology, Wheelchair Basketball, Pilates, Table Tennis, etc.
3. Advanced Physical Education courses :
Specialisation in a sporting activity, University training and competitions
4. SSHN (High-Level Athlete section)

University training and competitions

EPS5 GMPP OYONNAX :Group cohesion project
Autonomy Lessons at S1 on Wednesday afternoons
Hiking outing

BIBLIOGRAPHY

OTTAWA Charter (1986): ‘health is seen as a resource for everyday life; it is a positive concept that highlights social and individual resources, as well as physical abilities’.

PRE-REQUISITES

- EPS: none
- Appropriate Physical Education: subject to medical advice
- Advanced courses and competitive practice: previous practice required subject to specific selection according to each activity
- SHN: ministerial list

Levels 1 and 2: Physical Education, Appropriate physical education
Level 3: Advanced courses and competitive practice, SHN

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INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Production systems engineering

IDENTIFICATION

CODE : GM-5-S1-EC-IPISP
ECTS : 5

HOURS

Cours :	2h
TD :	30h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	34h
Travail personnel :	10h
Total :	44h

ASSESMENT METHOD

3 IM (3x 30min)

TEACHING AIDS

- 1 handout (lecture notes + exercices)
- moodle platform with autocorrected online exercices for self-training

TEACHING LANGUAGE

French

CONTACT

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AIMS

- Get general knowledge on the variety of production systems
- Know the basic principles of production planning
- Be able to plan the layout and size of a workshop
- Know the basic methods in inventory management
- Be able to handle a business information system

CONTENT

- Typology of production systems
- Introduction to technical data management
- Production planning: S&OP, MPS, MRP, capacity planning, scheduling
- CAPE (computer-aided production engineering)
- Production system layout and sizing
- Inventory management: ABC method, classic replenishment methods, focus on EOQ (economic order quantity) model
- Information systems for business: ERP, PLM

BIBLIOGRAPHY

PRE-REQUISITES

N/A

Industrial maintenance

IDENTIFICATION

CODE : GM-5-S1-EC-IPMAI
ECTS : 5

HOURS

Cours :	0h
TD :	32h
TP :	4h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	36h
Travail personnel :	10h
Total :	46h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Composite manufacturing

IDENTIFICATION

CODE : GM-5-S1-EC-IPMIC
ECTS : 5

HOURS

Cours :	0h
TD :	32h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	32h
Travail personnel :	10h
Total :	42h

ASSESMENT METHOD

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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M. NAOUAR Naim :
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AIMS

At the end of this module, students will be able to:
- to know the different types of composite materials and their fields of application;
- know the main processes of shaping composites
- know the models of behavior in shaping of composites
- choose and implement a simulation model of composite material shaping

CONTENT

I- Technology
A) Presentation of the main types of composites: matrix, fibers, field of application ...
(B) Various types of processes, including draping of thermo-hardenable prepregs, thermoforming of thermoplastic prepregs, Liquid composite molding, RTM and infusion processes, filament winding, pultrusion, sheet molding compound (SMC).

II- Modeling and simulation of processes:
(A) Geometrical approach to the ""net""
B) Mechanical behavior of fibrous reinforcements,
C) Finite element simulation of shaping,
D) injection on reinforcement, permeability, approach of Darcy

BIBLIOGRAPHY

PRE-REQUISITES

Structural integrity under extreme loadings

IDENTIFICATION

CODE : GM-5-S1-EC-IPDSX
ECTS : 5

HOURS

Cours :	0h
TD :	28h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	28h
Travail personnel :	10h
Total :	38h

ASSESMENT METHOD

TEACHING AIDS

Moodle e-learning

TEACHING LANGUAGE

French

CONTACT

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AIMS

At the end of this module the student will be able to design mechanical parts with a good level of reliability and mechanical durability in response to intense stresses: resistance to impacts, buckling, damage by fatigue ... This module will be based on TD-courses, and a design project using numerical codes (ABAQUS) applied to typical parts encountered in production systems.

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Solid Mechanics, Non-Linear Mechanics, Mechanical Design

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Advanced modeling of manufacturing processes

IDENTIFICATION

CODE : GM-5-S1-EC-IPPAS
ECTS : 5

HOURS

Cours :	0h
TD :	32h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	33h
Travail personnel :	10h
Total :	43h

ASSESMENT METHOD

1 one hour test, 1 technical report and 1 project presentation

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

The general purpose of this course is to present the theoretical basis and the methodology of the modelling of additive and soustractive manufacturing processes. Numerical and analytical approaches, based on the thermal, microstructural and mechanical behaviour of the materials are studied. The students will be capable of designing a modelling approach for processes accounting for thermo-metallurgical couplings.

CONTENT

Machining - Welding - Additive manufacturing

BIBLIOGRAPHY

PRE-REQUISITES

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Final project master thesis

IDENTIFICATION

CODE : GM-5-S1-EC-COPRI
ECTS : 16

HOURS

Cours :	0h
TD :	1h
TP :	0h
Projet :	200h
Evaluation :	1h
Face à face pédagogique :	2h
Travail personnel :	200h
Total :	402h

ASSESMENT METHOD

Ongoing evaluation, final report and defense

TEACHING AIDS

Depending on the topic

TEACHING LANGUAGE

French
English

CONTACT

M. BUFFIERE Jean-Yves :
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AIMS

To train students in the performance of industrial analysis and design or research, possibly funded by industrial partners.

CONTENT

Practice of knowledges and knowhow studied during the whole cursus

BIBLIOGRAPHY

PRE-REQUISITES

Rotor dynamics

IDENTIFICATION

CODE : GM-5-S2-EC-MEDYR
ECTS : 5

HOURS

Cours :	0h
TD :	30h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	30h
Travail personnel :	20h
Total :	50h

ASSESMENT METHOD

Project

TEACHING AIDS

Handouts

TEACHING LANGUAGE

French

CONTACT

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AIMS

The course has the objective to understand the dynamic behavior of rotating machines, to design them, to implement modifications in accordance with standards, to optimize their operation, to control their vibratory levels, and to detect potential failures as soon as possible.
To this end, it is necessary to know how to establish a mechanical model, to understand the basic phenomena with quasi-analytical and Finite Element methods. With an engineer objective, the program addresses the assumptions formulation and the relevance of the solutions obtained. The chapter devoted to the dynamic behavior monitoring uses powerful signal processing tools to identify and locate faults.
The students must have autonomy, ability to synthesize and to interpret linear or nonlinear basic phenomena during these course-TD-TP sessions, using numerical and experimental demonstrators.

CONTENT

1- Rotor
Modeling of components ; Basic Phenomena ; Finite element modeling. API Standards ; Parametric instabilities and excitation ;Balancing methods. Experimental Demonstrator ; Industrial Illustrations and Applications

2- Aubages
Modeling of blades, axisymmetric assemblies ; Calculation of the Campbell diagram and responses

3- Nonlinear dynamics
Phenomena and basic techniques ;Application to rotating machines.

4- Follow-up of the behavior of the rotors
Troubleshooting and understanding of defects ;Interests of signal processing tools ; Experimental approach of bearing defects.

Tools used: FE codes ROTORINSA, ANSYS and Matlab software: behavior monitoring, nonlinear oscillator, balancing, etc.

BIBLIOGRAPHY

M. LALANNE, G. FERRARIS, Rotordynamics Prediction in Engineering, J. Wiley & Sons, 2nd Ed. 1998
H. DRESIG, F. HOLZWEISSIG, Dynamics of Machinery - Theory and applications. Springer, 2010
N. BACHSCHMID, P. PENNACHI E. TANZI, Cracked Rotors, A survey on static and dynamic behavior including modelling and diagnostic. Springer, 2010
G. GENTA, Dynamics of Rotating Systems. Springer, 2005
M.L. ADAMS, Jr, Rotating Machinery Vibration. From Analysis to Troushooting. CRC Press, 2010.
A.H. NAYFEH, B. BALACHANDRAN, Applied Nonlinear Dynamics, 686p, J. Wiley, 1995

PRE-REQUISITES

Vibration, computational methods, FEM, data processing

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Engin and power train analysis

IDENTIFICATION

CODE : GM-5-S2-EC-MEEPT
ECTS : 5

HOURS

Cours :	0h
TD :	30h
TP :	0h
Projet :	0h
Evaluation :	3h
Face à face pédagogique :	33h
Travail personnel :	15h
Total :	48h

ASSESMENT METHOD

written exam and project

TEACHING AIDS

hand-outs of slides

TEACHING LANGUAGE

English

CONTACT

M. LUBRECHT Antonius :
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AIMS

Main objectives are
a) to master the basic concepts and reduce the power loss in IC engines and gear transmissions
b) transient and dynamic models applied to cams, spur and helical gears,
c) case studies by industrials.

CONTENT

Vue d'ensemble sur les moteurs à combustion interne, études des pertes de puissance dans le vilbrequin, les arbres à cames et segments. Introduction des modèles de base pour les engrenages: raideurs d'engrènement variables, erreurs de transmission, sauts d'amplitude et chocs, régimes à vitesses variables, optimisation des dentures.

BIBLIOGRAPHY

Internal combustion engine fundamentals, J.R.Heywood
Elastohydrodynamic lubrication, course notes 4GMD, A.A. Lubrecht
D. W. Dudley, `Handbook of Practical Gear Design¿, CRC, 1994
J. D. Smith, ` Gear Noise and Vibration¿, CRC, 2003, 320 p.
Selected articles in the ASME Journal of Mechanical Design, the Journal of Sound and Vibration, Mechanism and Machine Theory

PRE-REQUISITES

Contact Mechanics, Lubrication, Rigid-solid kinematics and dynamics.

Experimental fluid mechanics

IDENTIFICATION

CODE : GM-5-S2-EC-MEMFE
ECTS : 5

HOURS

Cours :	0h
TD :	18h
TP :	12h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	32h
Travail personnel :	10h
Total :	42h

ASSESMENT METHOD

Written exam & reports

TEACHING AIDS

Course outline

TEACHING LANGUAGE

French

CONTACT

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M. EL HAJEM :
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AIMS

- Have an overview of the advanced experimental methods used in the fields of fluid mechanics and heat transfer.
- To allow R & D engineers interested in the preparation and implementation of experiments for the determination of physical quantities (such as velocity, pressure, concentration and temperature) to choose the appropriate instrumentation.
- Also master the processing of the results, their interpretation as well as the dimensional analysis.

CONTENT

Emphasis will be placed on measuring instruments specific to:
- Scalar quantities: flowrate, pressure, temperature; concentration...
- Vector quantities: velocity; turbulence, Shearing ...
Presentation of non-intrusive optical measuring techniques:
- Doppler laser anemometry,
- Particle Imaging Velocimetry (PIV),
- Planar Laser-induced fluorescence (PLIF),
- Visualization by Digital Holography
Data acquisition systems;flow visualization.
Hot Wire Anemometry.

BIBLIOGRAPHY

- Springer Handbook of Experimental Fluid Mechanics, Cameron Tropea , Alexander Yarin , John F. Foss
- Fluid Mechanics Measurements, R. Goldstein

PRE-REQUISITES

Thermodynamics, Fluid mechanics

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Noise and vibration control in industry

IDENTIFICATION

CODE : GM-5-S2-EC-MESAV
ECTS : 5

HOURS

Cours :	0h
TD :	18h
TP :	12h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	30h
Travail personnel :	20h
Total :	50h

ASSESMENT METHOD

Reports

TEACHING AIDS

lecture handout

TEACHING LANGUAGE

French

CONTACT

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M. LECLERE Quentin :
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AIMS

Introduction of vibration and acoustic challenges usually faced by engineers working in transportation industry. Presentation of some trouble shooting solutions.

CONTENT

Automotive noise: description of noise sources. Generation of engine noise, transmission of forces from the powertrain to the body, propagation in the passenger compartment. Improvement solutions (balancing shafts, shock absorbers, dynamic absorbers ...)
Evaluation of the acoustic and vibratory comfort and identification of the ways of perceptual improvement.
Aeronautical noise: acoustic transparency of complex walls.
Railway noise: wheel-rail contact and wheel radiation, braking noise.
Insulation of machines in industry.
Passive systems for vibration control in aeronautics:
-Insulation,
- Absorbers and resonators.
Active / semi-active systems for vibration control in aeronautics / aerospace:
- Introduction to active vibration control
- Piezoelectric transducers
- Electromagnetic Transducers

BIBLIOGRAPHY

Bernard Swoboda : Mécanique des moteurs alternatifs, Technip (1984).
Helmut Fuchs : Applied Acoustics. Concepts, absorbers and silencers for acoustical comfort and noise control, Springer (2013).
Thomasz Krysinski "Origine et contrôle des vibrations mécaniques" (2003),
André Preumont " Vibration Control of active Structures" (2011).

PRE-REQUISITES

GM-3-VIBAC-S2; GM-4-MEMDS-S1;GM-4-MEAVS-S2

Tribology

IDENTIFICATION

CODE : GM-5-S2-EC-METRI
ECTS : 5

HOURS

Cours :	0h
TD :	30h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	32h
Travail personnel :	20h
Total :	52h

ASSESMENT METHOD

oral and written exam

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

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AIMS

The aim is to give both experimental and numerical skills in tribology for mechanical engineers and thus through industrial applications and future research challenges in tribology.

CONTENT

- Part #1: History, definitions and fundamentals
o History and definitions for tribology
o Friction and Wear: basics, classical laws and limits
o Lubrication: solid or fluid, a question of strategy
o Tribological concept: tribological triplet and tribological circuit
o Failures analyses
o From contact conditions to their consequences

- Part #2: Interface rheology, a central key of tribology
o Definition of rheology
o Measurement of rheological parameters and their limits
o Rheological models and their limits
o Link between rheology and 3rd body structure

- Part #3: Numerical tribology
o Finite Element Modelling, experimental validation and applications
o Discrete Element Modelling, experimental validation and applications
o Molecular Dynamics Modelling, experimental validation and applications
o Coupled Multi-scales Models, experimental validation and application

- Part #4: Applications
o 5 industrial and R&D cases

- Part #5: Synthesis

BIBLIOGRAPHY

- History of Tribology D. Dowson, Longman, London and New York, ISBN 0-582-44766-4

PRE-REQUISITES

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE

Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Advanced numerical methods for modeling in mechanics

IDENTIFICATION

CODE : GM-5-S2-EC-MEMN2
ECTS : 5

HOURS

Cours :	0h
TD :	30h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	32h
Travail personnel :	10h
Total :	42h

ASSESMENT METHOD

2 written tests and Report

TEACHING AIDS

TEACHING LANGUAGE

English

CONTACT

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AIMS

The aim of this class is to give future engineers some detailed insight in the numerical methods applied for mechanical problems.

CONTENT

1. MultiGrid Methods: system of equations obtained from discretising a differential equation on a (regular) grid. Fast solution using MG, implementation.
2. Molecular Dynamics: approximation order in time , choice of interaction laws, conservation of discrete quantities, boundary conditions.
3. Approximation of the contact prolem under small and large strains using finite element methods: lagrangian and augmented lagrangiian, numerical approximation. Application through the COMSOL software.
4. Coupled models: principal difficulties, applied to fluid-structure interaction, ALE method. Application through the COMSOL software.

BIBLIOGRAPHY

- Numerical Recipes in C: Press, Teukolsky, Vetterling, Flannery
- The Art of Computer Programming: Knuth
- Multilevel Methods in Lubrication: Venner, Lubrecht
- The finite element method for solid an structural mechanics, Zienkiewicz, Taylor
- Nonlinear finite elements for continua and structures, Belytschko, Liu, Moran
- Contact problems in elasticity: a study of variational inequalities and finite element methods. Kikuchi, Oden
- Computational contact and impact mechanics. Laursen

PRE-REQUISITES

Advanced heat transfer

IDENTIFICATION

CODE : GM-5-S2-EC-METTA
ECTS : 5

HOURS

Cours :	0h
TD :	30h
TP :	0h
Projet :	0h
Evaluation :	4h
Face à face pédagogique :	34h
Travail personnel :	12h
Total :	46h

ASSESMENT METHOD

Final Exam (4h) + oral speech (30min)

TEACHING AIDS

Written notes, collection of exercices, use of numerical softwares

TEACHING LANGUAGE

French

CONTACT

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AIMS

- To acquire advanced skills on coupled heat transfers introducing the phase changes undergone by the materials, their kinetics and their modeling.
- To address thermal radiations methods, radiation in semi-transparent materials and extreme cases: optically thin and optically tick materials.
- To quantify thermal contact resistances, thermal stresses.
- To know the definition and to identify of thermophysical parameters as a function of temperature (inverse methodes)
- To estimate and quantify of the heat fluxes and temperature fields
- To realize thermal design of systems by multiphysics modeling

CONTENT

- Recall of basics of heat transfer modes
- Radiation in semi-transparent and participating media
- Energy balance, heat equation
- Estimation of interfacial heat transfer rates, thermal resistances¿
- Expression of viscous dissipation,
- Phase change (evaporation, condensation, crystallization, ...)
- Coupling with flow
- Identification of thermophysical parameters versus temperature (inverse methods)
- Presentation of the various exchanger architectures
- Different heating and cooling technologies.
- Nodal modeling, numerical schemes, models reduction (system)
- Conventional courses and practical projects using matlab, comsol ...

BIBLIOGRAPHY

- M.N. Ozisik, Heat Conduction, 2d Edition, John Wiley & Sons, NY (1993)
- M F.MODEST; Radiative Heat Transfer; McGRAW-HILL Inter. Editions, 1993
- Bejan A., Convection Heat Transfer, 2nd Ed., 1995, John Wiley & Sons, NY
- J.-F. Sacadura, Transferts thermiques. Initiation et approfondissement, Tec & Doc Lavoisier, Paris, 2015.
- Techniques de l'ingénieur
- F. P. Incropera, D. P. DeWitt, Fundamentals of Heat and Mass Transfer , Wiley, N.Y., 2002.

PRE-REQUISITES

Initiation to Heat transfers, thermodynamics, fluid mechanics

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Sciences et Technologie Industrielles mention GENIE MECANIQUE
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Computational fluid dynamics

IDENTIFICATION

CODE : GM-5-S2-EC-MECFD
ECTS : 5

HOURS

Cours :	0h
TD :	30h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	32h
Travail personnel :	12h
Total :	44h

ASSESMENT METHOD

Final exam (2h)

TEACHING AIDS

Digital pdf class notes; Exercice paper folders

TEACHING LANGUAGE

French

CONTACT

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AIMS

* Being able to simulate flows using CFD methods (Newtonian flows with simple boundary conditions): 2D or 3D approaches, finite-volume methods, turbulence models for engineers, wall functions, time schemes, validation and convergence strategies.
* Introduction to CFD in modre complex configurations: compressible flows, with heat/mass trasnfers, free surfaces.

CONTENT

* Introduction to basic equations, physical interpretation of the flows - closure models
* Identifying laminar/turbulent, 2D/3D, visquous/inviscid, steady/unsteady flows; introduction to compressibility.
* Numerical schemes and discretisations specific to CFD, including compressible flows.
* Turbulence models for engineers. Wall treatments and detachment.
* Introduction to more comple real flows: 2-phase, with heat/mass transfer, free surface

Application: Simulations of +/- complex configurations using commercial code ANSYS-FLUENT or Star CCM+

BIBLIOGRAPHY

Versteeg & Malalasekera, an introduction to computational Fluid Dynamics, Pearson Prentice hall, 1995.
Ferziger & Peric, Computational Methods for Fluid Dynamics, 2002.

PRE-REQUISITES

Basics Fluid mechanics & numerical methods

Structural acoustics

IDENTIFICATION

CODE : GM-5-S2-EC-MERAY
ECTS : 5

HOURS

Cours :	0h
TD :	30h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	30h
Travail personnel :	20h
Total :	50h

ASSESMENT METHOD

Reports

TEACHING AIDS

Course materials; Tutorials

TEACHING LANGUAGE

French

CONTACT

M. LAULAGNET Bernard :
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AIMS

Mastering the formalisms involved in the acoustic radiation of vibrating structures: the integral formulation and the acoustic finite element methods and the ray tracing method.

CONTENT

Radiation of elementary sources, monopoles and dipoles, Radiation of an electrodynamic loudspeaker, Radiation of the plates in bending, notion of radiating modes, radiated power and radiation efficiency, Integral formulation of an external and internal problem, Finite Boundary element method, singular frequencies for the external problem, example of cavity plate problem, Acoustic finite elements and application for the description of the "PML" method, Perfect match layer. Ray tracing method, useful in the context of environmental acoustics to plot noise maps. Numerical simulation work with the commercial software ACTRAN. Use of Code Tympan, open source software of ray tracing.

BIBLIOGRAPHY

Rayonnement acoustique des structures. C. Lesueur ; Acoustics, A.D. Pierce; Phénomènes fondamentaux de l'acoustique linéaire, J.L Migeot, éditions Lavoisier

PRE-REQUISITES

GM-4-MEAVS-S2; GM-3-VIBAC-S2

Final project master thesis

IDENTIFICATION

CODE : GM-5-S2-EC-COPRI
ECTS : 16

HOURS

Cours :	1h
TD :	1h
TP :	0h
Projet :	200h
Evaluation :	1h
Face à face pédagogique :	3h
Travail personnel :	200h
Total :	403h

ASSESMENT METHOD

Ongoing evaluation, final report and defense

TEACHING AIDS

Depending on the topic

TEACHING LANGUAGE

French
English

CONTACT

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jean-yves.buffiere@insa-lyon.fr

AIMS

To train students in the performance of industrial analysis and design or research, possibly funded by industrial partners.

CONTENT

Practice of knowledges and knowhow studied during the whole cursus

BIBLIOGRAPHY

PRE-REQUISITES

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

IDENTIFICATION

CODE : HU-0-S2-EC-S-PPH
ECTS : undefined

HOURS

Cours :	0h
TD :	20h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	20h
Travail personnel :	0h
Total :	20h

ASSESMENT METHOD

Written report (10 pages minimum) and oral defence (in presence of tutor and guest).

TEACHING AIDS

Présentation du PPH sur Moodle : http://moodle.insa-lyon.fr

TEACHING LANGUAGE

French

CONTACT

AIMS

The PPH is an individual exercise where the student carries out an investigation or some research into a subjet of particular interest to them in the aim of developing some form of critical analysis of the subject. The PPH is a means by which the student can show their ability to build an analysis based on a rigorously developed thesis. The analysis is based on a personal approach to the subject (openness to the wider world), the way the subject is dealt with (for example the use of a personal experience as a way of seeing the world or the chosen subject), or in certain cases the creative approach used (for example, for an artistic experience).
The PPH requires the ability to work autonomously.
The PPH contributes primarily to the development of competencies CT2.1-4 and CT3.1 ; other competencies can be developed depending on the choice of project.

CONTENT

Work on a particular theme with a tutor chosen by the student.
Filling in of a project sheet (elaboration of the question, definition of the personal approach, bibliography, etc),
Step by step meetings with the tutor (plan, analysis, etc),
Report writing and oral presentation.

BIBLIOGRAPHY

PRE-REQUISITES

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE
Humanities and social sciences

IDENTIFICATION

CODE : HU-0-S2-EC-S-SERIE2
ECTS : undefined

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	0h
Travail personnel :	0h
Total :	0h

ASSESMENT METHOD

Assessment will be conducted through continuous evaluation. The assessment methods will be presented at the beginning of the semester by the teaching team.

TEACHING AIDS

Materials are chosen by the instructor based on the module:
• Didactic documents related to the module
• Audiovisual materials
• Recommended readings

TEACHING LANGUAGE

French

CONTACT

Mme JOUISHOMME Delphine :
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Mme GOUTALAND Carine :
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AIMS

A series of elective courses in Humanities and Social Sciences (HSS) offers several options for students to choose from, allowing them to develop and deepen specific skills. This course aims to develop one or more transversal skills among the following:
• CT1: Self-awareness and self-management
• CT2: Working, learning, and evolving independently
• CT3: Interacting with others, working in a team
• CT4: Demonstrating creativity
• CT5: Acting responsibly in a complex world
• CT6: Navigating and evolving within an organization
• CT7: Working in an international and intercultural context
The list of options available in Series 1 and the specific competencies for each option are detailed in the catalog on the IntranetHumas:
https://intranethumas.insa-lyon.fr/sciences-humaines-sociales/offre-de-formation/cours-la-carte-0

CONTENT

Each module is designed to encourage interaction and active student participation. The content is structured around the following key aspects:
• Theoretical deepening related to the theme
• Reflection on the topic
• Practical exercises and activities
• Assessments and presentation of work

BIBLIOGRAPHY

The bibliography is selected by the instructor based on the module.

PRE-REQUISITES

French

IDENTIFICATION

CODE : GM-5-S2-EC-PPP
ECTS :

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	0h
Travail personnel :	20h
Total :	20h

ASSESMENT METHOD

- one French written page in which the student explains the vision he has of the differentiated path that he will follow in 4th and 5th year.
- one English written page in which the student explains his choice of mobility abroad and an analysis of the developed skills.
- a French written page to justify the choice of the training periods and an analysis of the developed skills.
- an inventory of skills at the end of each year with an assessment at the end of the 5th year.

TEACHING AIDS

Personal tests
Presentation slides when allowed by the speaker
Online self-assessment materials

TEACHING LANGUAGE

French

CONTACT

MME SALLE Emmanuelle :
emmanuelle.vidal-salle@insa-lyon.fr

AIMS

The overall objective is to build his/her own professional project. If the assessment takes place in the 5th year, the work must start during the 3rd year.
The aim is :
- Allow the student to choose his/her 4th and 5th year differentiated path
- Understand and know the trades and sectors associated with the different aspects of training
- Self-assessment and identification of competencies acquired or to be acquired
- Choose the aspects of its training to be strengthened
- Establish his/her professional project based on personal skills and self-knowledge.

CONTENT

1. Evaluation of the spontaneous representations on the differentiated paths
2. Interventions of partner companies and other engineers
3. Active participation in at least one collective activity (promotion of the department, management of the FabLab of the department, Professional day, company coffees, contacts with alumni, sponsorship of the promotion, presentation of the department, organization of the integration week , Inter-Semester Week, End-of-Studies Travel, GM Awards, Graduation Ceremony)
4. Self-Assessment Techniques and Building a personal skills Portfolio

If needed,a methodological aid can be provided for the writing of their CV and their cover letters during their search for internship.

BIBLIOGRAPHY

PRE-REQUISITES

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

CENTRE DES SPORTS
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Sports

IDENTIFICATION

CODE : CDS-5-S2-EC-EPS
ECTS :

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	0h
Travail personnel :	0h
Total :	0h

ASSESMENT METHOD

Assessment in Physical Education concerns the teaching of Sports and Artistic Physical Activities (APSA), and will take the form of continuous assessment with half-yearly marking.

The mark depends on the degree of acquisition of the skills expected in each of the activities, and the progress made over all the sessions in the cycle. The mark takes into account :

Individual and/or team performance
mastery of execution
Progress in the sports project
Responsibility and autonomy

TEACHING AIDS

All physical, sporting, artistic and competitive activities

TEACHING LANGUAGE

French

CONTACT

MME JAUSSAUD Marie :
marie.jaussaud@insa-lyon.fr

AIMS

This EC is part of the Teaching Unit: SHS and contributes to the development of the School's transversal competences

1*Auto-evaluating one's own performance
Knowledges :
- Fundamentals, principles of action and terminology of sports activities
- Criteria for observation, achievement and success.
Abilities :
- Assess your level of practice
- Build up a warm-up
- Set goals for progress
- Manage physical and mental potential

2* Work, learn and develop independently
Knowledge :
- PSAA rules
- Observation criteria
- Principles of warm-up and cool-down
Abilities :
- Mobilise resources
- Analyse, observe, question
- Take on different roles (referee, choreographer)

3* Interact with others, work as part of a team
Knowledges :
- Roles and functions in each sports activity
Abilities :
- Communicate appropriately: verbal, non-verbal and postural communication.
- Integrate into a group
- Take part in and develop a group project
- Take the initiative
- Be a good listener

4* Be creative, innovative and enterprising
Knowledge :
- Artistic disciplines
Abilities :
- Draw on knowledge and resources from different artistic fields to produce an original work.
- Mobilise the imagination and sensibility and make them visible through dance movement
- Access the symbolism of the body

5* Act responsibly in a complex world
Knowledge :
- Safety and operating rules
Abilities :
- Identify uncertainties and risks and act to reduce them
- Integrate a responsible dimension into their actions
- Show respect and fair play in a power struggle

6* Working in an international context
Knowledge :
- Socio-cultural differences
Abilities :
- Integrate cultural diversity into group work
- Act with respect for self and others

CONTENT

Physical Education and Sport lessons are organised around traditional Physical Education lessons, or advanced lessons, or appropriate practices (EPSA), or competitive practices within the framework of the Section Sportive Haut Niveau.

1. Physcical Education lessons :
Students choose one or two physical and sporting activities per year from among the activities offered by the sports centre (individual, group, dual).
2. Appropriate Physical Education lessons: For all students who are exempt from physical activity for at least 2 months:
Swimming, Body-building, Nordic Walking, Somatic Exercise, Sophrology, Wheelchair Basketball, Pilates, Table Tennis, etc.
3. Advanced Physical Education courses :
Specialisation in a sporting activity, University training and competitions
4. SSHN (High-Level Athlete section)

University training and competitions

BIBLIOGRAPHY

OTTAWA Charter (1986): 'health is seen as a resource for everyday life; it is a positive concept that highlights social and individual resources, as well as physical abilities'.

PRE-REQUISITES

EPS: none
- Appropriate Physical Education: subject to medical advice
- Advanced courses and competitive practice: previous practice required subject to specific selection according to each activity
- SHN: ministerial list

Levels 1 and 2: Physical Education, Appropriate physical education
Level 3: Advanced courses and competitive practice, SHN

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www.insa-lyon.fr

IDENTIFICATION

CODE : GM-5-S2-EC-STAGEL
ECTS : 30

HOURS

Cours :	0h
TD :	1h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	2h
Travail personnel :	400h
Total :	402h

ASSESMENT METHOD

50% by the industry through a grid given by GM /
25% by an oral presentation evaluted by GM's teachers /
25% by a written report evaluated by GM's teachers

TEACHING AIDS

None

TEACHING LANGUAGE

French

CONTACT

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M. Morterolle Sebastien :
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Mme Paredes Astudillo Yenny :
yenny.paredes-astudillo@insa-lyon.fr

AIMS

M1- To integrate an organization, to lead and help it to evolve
M2- To take account for constraints such as professionnal, economical and industrials ones.
M3- To take account for societal values (ethical, and ethics) and help them being respected
M4- To dialogue with specialists as with not specialists
M5- To work in international context: speak one or several langages, cultural openings,
M6- To work with autonomy, critical faculty, and curiosity

CONTENT

26 weeks of industrial intership

BIBLIOGRAPHY

Documents with details informations about progress of the intership and associated regulations are avalaible on Moodle website

PRE-REQUISITES

All teachings of GM for 3rd and 4th years

IDENTIFICATION

CODE : GM-5-S2-EC-STAGEL
ECTS : 30

HOURS

Cours :	0h
TD :	1h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	2h
Travail personnel :	400h
Total :	402h

ASSESMENT METHOD

50% by the industry through a grid given by GM /
25% by an oral presentation evaluted by GM's teachers /
25% by a written report evaluated by GM's teachers

TEACHING AIDS

None

TEACHING LANGUAGE

French

CONTACT

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M. Morterolle Sebastien :
sebastien.morterolle@insa-lyon.fr

Mme Paredes Astudillo Yenny :
yenny.paredes-astudillo@insa-lyon.fr

AIMS

M1- To integrate an organization, to lead and help it to evolve
M2- To take account for constraints such as professionnal, economical and industrials ones.
M3- To take account for societal values (ethical, and ethics) and help them being respected
M4- To dialogue with specialists as with not specialists
M5- To work in international context: speak one or several langages, cultural openings,
M6- To work with autonomy, critical faculty, and curiosity

CONTENT

26 weeks of industrial intership

BIBLIOGRAPHY

Documents with details informations about progress of the intership and associated regulations are avalaible on Moodle website

PRE-REQUISITES

All teachings of GM for 3rd and 4th years

Mechanical design and optimisation

IDENTIFICATION

CODE : GM-5-S2-EC-CECOP
ECTS : 5

HOURS

Cours :	0h
TD :	26h
TP :	4h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	30h
Travail personnel :	10h
Total :	40h

ASSESMENT METHOD

Report and case studie

TEACHING AIDS

Slides (pdf)

TEACHING LANGUAGE

French

CONTACT

MME MICHEL Chantal :
chantal.michel@insa-lyon.fr

M. RAYNAUD Stephane :
stephane.raynaud@insa-lyon.fr

AIMS

In the design phase, the BE engineer must master the prismatic or surface geometric definition of the products. He must ascertain at the earliest possible feasibility of manufacture, geometric quality and material.
This module makes it possible to master the various links of the geometric digital chain of the mechanical products of the BE to the service quality. The mastery of the surface design tools from a specification or an existing product in surface retro-design. Proficiency in 3D scanning and imaging tools for product design assistance and proficiency topologic optimisation softs.

CONTENT

- DESIGN AND TOPOLOGIc optimization (2h cours + 4h of TD + 4h Projet) - Nadine NOEL
- Optimized geometry definition from stress conditions
- INSPIRE optimization tools, case study for mass optimization, stiffness, natural frequency.
- Optimization from the point of view of the process - additive manufacture or foundry - SURFACIC CAD (2h of course + 4h TD + 4h Project) - Michele GUINGAND
- Generative Shape Design workshop
- Imagine and Shape/Free style workshops
- 3D SCANNING AND SURFACIC RETROCONCEPTION (2h of course + 4h TD + 4hTP)
- St¿phane RAYNAUD and Adrien CHOUVIER
- Acquisition of laser scanner on measuring arm, MMT, large dimension scanner
- Processing, Filtering, Resetting Clouds, AC (As constructed)

- STL mesh
- Retro surface design with DSE (Digitalized Shape Editor) and QSR (Quick Surface Reconstruction) workshops

BIBLIOGRAPHY

PRE-REQUISITES

Bachelor in Mechanical Engineering

Biomechanics, art, luxury, architecture

IDENTIFICATION

CODE : GM-5-S2-EC-CEBAL
ECTS : 5

HOURS

Cours :	0h
TD :	30h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	30h
Travail personnel :	45h
Total :	75h

ASSESMENT METHOD

Report + Oral defence

TEACHING AIDS

handout

TEACHING LANGUAGE

French

CONTACT

MME TANGUY Anne :
anne.tanguy@insa-lyon.fr
M. VILLE Fabrice :
fabrice.ville@insa-lyon.fr
MME BEL Aline :
aline.bel-brunon@insa-lyon.fr

AIMS

The goal of this teaching is for the students to investigate and solve a problem arising from a professional in one of the domains listed in the title (Biomechanics, Arts, Luxury, Architecture)

CONTENT

This teaching is organized in 3 domains (Biomechanics and Sports, Arts, Luxury, Civil Engineering, Architecture). Each student has to choose a domainn. He will profit of an additional teaching of 4hFaF, and then 28h of project (in order to meets the expectation of a professionnal)

BIBLIOGRAPHY

PRE-REQUISITES

Power transmission

IDENTIFICATION

CODE : GM-5-S2-EC-CESTP
ECTS : 5

HOURS

Cours :	0h
TD :	30h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	31h
Travail personnel :	30h
Total :	61h

ASSESMENT METHOD

- 1h: exam,

TEACHING AIDS

Course and exercice handouts, synthesis slides, Moodle course

TEACHING LANGUAGE

French

CONTACT

M. BIDEAUX Eric :
eric.bideaux@insa-lyon.fr

AIMS

To be able to :
- Technology of electrical actuators and components.
- Basic modeling of electrical components and their performances (efficiency...).
- design an electrictal actuated transmission.
- address multi-physics system modelling, formulate the objectives, the hypotheses and the validity limits of modelling.
- use the model in order to answer the given engineering study objectives (the analysis of behavior and performances, and the design/control of multi-technological and multi-physics systems).
- use analogies in electrical, mechanical and hydraulic power transmission systems and compare their performances.

CONTENT

Part I:
1. Introduction to power transmission problematic in mechanical systems.
2. Electrical actuation : basis of electromagnetism (Maxwell, field, energy, ...) and technology of electrical power transmission chains and their control

Part II:
1. Introduction of the multi-physics modelling context: modelling objectives, multi-technology and multi-physics approach, notions of circuits and networks, system functions and hypotheses.
2. Elements of multi-physics modelling: energy and coupling approach, physical laws and behavioral laws, analogy and bond graph elements, construction of the bond graph representation.
3. Analysis of multi-physics models: bond graph causality, systems of equations, model properties.

Part III:
1. Analogies: Electrical, mechanical and hydraulic domain.
2. Modeling and studying new power transmission architectures (multi-energy).

BIBLIOGRAPHY

- Dauphin-Tanguy, G. Les bond graphs. IC2 : Série Systèmes automatisés. Hermès Science Publications, 2000.
- Borutzky, W. Bond graph modelling of engineering systems. Springer, 2011.
- Karnopp, D. C., Margolis, D. L., Rosenberg, R. C. System dynamics: Modeling, Simulation, and Control of Mechatronic Systems. 5th Ed., John Wiley & Sons, 2012.

PRE-REQUISITES

Physics of preparatory classes and of the common core courses of GM department.
Mathematics of preparatory classes and of the common core courses of GM department (differential equations, partial derivative equations, integration numerical methods,...).

Geometry and 3D imaging

IDENTIFICATION

CODE : GM-5-S2-EC-CEGEO
ECTS : 5

HOURS

Cours :	0h
TD :	8h
TP :	20h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	28h
Travail personnel :	10h
Total :	38h

ASSESMENT METHOD

Report and case studie

TEACHING AIDS

Slides (pdf)

TEACHING LANGUAGE

French

CONTACT

M. RAYNAUD Stephane :
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AIMS

In the design phase, the engineer must master the prismatic or surface geometric definition of the products. He must ascertain at the earliest possible feasibility of manufacture, geometric quality and material.
This course allows us to master the various "links of the geometric digital chain" of the mechanical products of the design to the service quality.
- To analyze manufacturing returns and to take into account the geometric quality of the real products,
- Proficiency in 3D scanning and imaging tools for product design,
- Understand the role of non-destructive testing (NDT) methods in the life cycle of a product,
- Knowledge of advanced NDT methods such as radiography or X-ray tomography,
- Know how to analyze reconstructed images in 3D.

CONTENT

TOMOGRAPHY / NDT (16H Labsession/Project)¿ Jean Michel LETANG and Jean-Yves BUFFIERE
-Basic copncepts of physics, of technologies and of instrumentation in x-ray imaging
-Study and parametrisation of digital X-ray imaging
-Use of simulation modeling toolboxes and experimental benches of radiography and tomography
-Processing of 2D and 3D reconstructed images

GEOMETRIC AND SURFACE CONTROL (2H Tutotrials + 12H Labsession/Project)- Stéphane RAYNAUD and Adrien CHOUVIER
-Digital metrology chain
-Technology of contact or laser
-Analysis of specifications
-Capabilities of the means of acquisition and treatment
-Implementation of inspection with 3D means to contact or with laser scanner (MMT contact and laser, ARM laser scanner, large laser scanner)
-Point cloud processing
-Control report and mapping of defects
-Geometric expertise, decision making
-Implementation of large-scale scanning for TQC, implantation, augmented reality applications, meter surveyor.

BIBLIOGRAPHY

Advanced Tomographic Methods in Materials Research and Engineering, J. Banhart, OUP Oxford, 2008
- Industrial Tomography: Systems and Applications, M. Wang, Woodhead Publishing, 2015
- Nondestructive Testing of Materials and Structures, O. Büyüköztürk, Springer, 2013

PRE-REQUISITES

Bachelor in Mechanical Engineering

Innovative tools for design

IDENTIFICATION

CODE : GM-5-S2-EC-CEOAC
ECTS : 5

HOURS

Cours :	0h
TD :	30h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	32h
Travail personnel :	45h
Total :	77h

ASSESMENT METHOD

Written Exam + report on one of the 3 themes

TEACHING AIDS

handout

TEACHING LANGUAGE

French

CONTACT

MME TANGUY Anne :
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AIMS

The students will learn how to use innovative tools for design assistance: sensory perception, imaging, non-conventional materials (foams, glasses, biological tissues..)

CONTENT

Contribution of sensory perception to conception; Use of imagery for mechanical analysis; Adapted choice of non-conventional materials (wood, glasses, mousses, biological tissues ..)

BIBLIOGRAPHY

PRE-REQUISITES

Manufacturing and innovative processes

IDENTIFICATION

CODE : GM-5-S2-EC-CEFPI
ECTS : 5

HOURS

Cours :	0h
TD :	22h
TP :	8h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	30h
Travail personnel :	12h
Total :	42h

ASSESMENT METHOD

TEACHING AIDS

TUTORIELS - MOODLE - LOGICIEL CATIA FTA 3DCS - FAO ESPRIT OU NX CAM

TEACHING LANGUAGE

French

CONTACT

M. RAYNAUD Stephane :
stephane.raynaud@insa-lyon.fr

AIMS

In the design phase, the BE engineer must master the prismatic or surface geometric definition of the products. He must ascertain at the earliest possible feasibility of manufacture, geometric quality.
This course allows us to master the various -links of the geometric digital chain- of the mechanical products of the BE to the service quality. The mastery of the geometric definition for the manufacture and in order to guarantee the functionalities required,
- Know the modern means of production and their possibilities of realization by mastering the cost and the quality,
- To analyze manufacturing returns and to take into account the geometric quality of the real products,

CONTENT

1) TOLERANCING ISO GPS and 3D GEOMETRIC SIMULATION (4h of course + 4h of TD + 8h Project) - Stéphane RAYNAUD and Valerie WOLFF
- Definition of the TOLERANCE of the products from a functional analysis
- Placement of tolerances on the 3D model using the FTA tool
- Modeling of MIPs or links on the 3D model with the 3DCS tool,
- Definition of functional conditions (play, flush, alignment, ..., between geometric elements of 3D components)
- Simulation of manufacturing and assembly of product systems
- Development of tolerance values, specification capabilities, link games, design or query semantics.
- Consideration of component deformation in 3DCS ""compliant modler"" and using Abaqus for CATIA
- Optimization of tolerance and control and semi-rigid or very flexible parts.
2) FAO 3AXES / 5 AXES / NX CAM or ESPRIT (4h class 6h TD / TP) - Thibaut CHAISE and Nicolas TARDIF
-The digital chain, from CAD to the actual part
- Technology
- Functional bases of a Digital Drive/NC and CAD/CAM software
- Manufacturing range and manufacturing preparation using CAM tools
- Simulation of manufacturing from 3 to 5 axes
- Manufacturing tuning and adjustments
- Product realizations
3) INDUSTRIAL QUALITY SURVEY (4h TP) - Stéphane RAYNAUD
- Implementation of conventional metrology resources for dimensional, geometric control.
- Realization of 3D control for the optimization of manufacturing
- Roughness Control
Different quality surveys will be carried out for the development of manufacturing and the control of dispersions or capabilities of manufacturing processes

BIBLIOGRAPHY

PRE-REQUISITES

COMMON AREA 3GM

Multiphysics systems modeling

IDENTIFICATION

CODE : GM-5-S2-EC-CEASM
ECTS : 5

HOURS

Cours :	0h
TD :	30h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	30h
Travail personnel :	30h
Total :	60h

ASSESMENT METHOD

4h:
- 1h: mid-term exam,
- 3h: final-term exam.

TEACHING AIDS

Course and exercice handouts, synthesis slides, Moodle course

TEACHING LANGUAGE

French

CONTACT

M. BOULANGER Thomas :
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AIMS

To be able to :
- design new power transmission architectures (multi-energy).

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Energy conversions

IDENTIFICATION

CODE : GM-5-S2-EC-CECEN
ECTS : 5

HOURS

Cours :	0h
TD :	30h
TP :	0h
Projet :	0h
Evaluation :	2h
Face à face pédagogique :	32h
Travail personnel :	12h
Total :	44h

ASSESMENT METHOD

Final Exam (2h)+ rapport

TEACHING AIDS

TEACHING LANGUAGE

French

CONTACT

M. LEFEVRE Stephane :
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AIMS

- Describe and analyze thermodynamically the operating principles of energy conversion systems in sectors such as transport, industry or energy production.
- Identify the different components of a turbomachine and explain the role of each element.
- Modeling and analyzing, from the point of view of fluid mechanics, the performance of a turbomachine.
- Identify the different components of an internal combustion engines, know the different way to control and to optimise an internal combustion engine

CONTENT

BIBLIOGRAPHY

PRE-REQUISITES

Thermodynamics, Fluid mechanics

Bioinspiration and ecodesign

IDENTIFICATION

CODE : GM-5-S2-EC-CEBED
ECTS : 5

HOURS

Cours :	0h
TD :	30h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	30h
Travail personnel :	45h
Total :	75h

ASSESMENT METHOD

MCQ + report on one of the 4 themes

TEACHING AIDS

handout

TEACHING LANGUAGE

French

CONTACT

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M. VILLE Fabrice :
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MME BEL Aline :
aline.bel-brunon@insa-lyon.fr

AIMS

By changing paradigm, studying bio-inspiration, eco-design, design or nanoscale design, students develop new methods of creativity and / or innovation in the design of products or systems.

CONTENT

- introduction to bio-inspiration
- Eco-design methodology
- exchange on design
- design at the nanometric scale

BIBLIOGRAPHY

PRE-REQUISITES

Final project master thesis

IDENTIFICATION

CODE : GM-5-S2-EC-COPRI
ECTS : 16

HOURS

Cours :	1h
TD :	1h
TP :	0h
Projet :	200h
Evaluation :	1h
Face à face pédagogique :	3h
Travail personnel :	200h
Total :	403h

ASSESMENT METHOD

Ongoing evaluation, final report and defense

TEACHING AIDS

Depending on the topic

TEACHING LANGUAGE

French
English

CONTACT

M. BUFFIERE Jean-Yves :
jean-yves.buffiere@insa-lyon.fr

AIMS

To train students in the performance of industrial analysis and design or research, possibly funded by industrial partners.

CONTENT

Practice of knowledges and knowhow studied during the whole cursus

BIBLIOGRAPHY

PRE-REQUISITES

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

IDENTIFICATION

CODE : HU-0-S2-EC-S-PPH
ECTS : undefined

HOURS

Cours :	0h
TD :	20h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	20h
Travail personnel :	0h
Total :	20h

ASSESMENT METHOD

Written report (10 pages minimum) and oral defence (in presence of tutor and guest).

TEACHING AIDS

Présentation du PPH sur Moodle : http://moodle.insa-lyon.fr

TEACHING LANGUAGE

French

CONTACT

AIMS

The PPH is an individual exercise where the student carries out an investigation or some research into a subjet of particular interest to them in the aim of developing some form of critical analysis of the subject. The PPH is a means by which the student can show their ability to build an analysis based on a rigorously developed thesis. The analysis is based on a personal approach to the subject (openness to the wider world), the way the subject is dealt with (for example the use of a personal experience as a way of seeing the world or the chosen subject), or in certain cases the creative approach used (for example, for an artistic experience).
The PPH requires the ability to work autonomously.
The PPH contributes primarily to the development of competencies CT2.1-4 and CT3.1 ; other competencies can be developed depending on the choice of project.

CONTENT

Work on a particular theme with a tutor chosen by the student.
Filling in of a project sheet (elaboration of the question, definition of the personal approach, bibliography, etc),
Step by step meetings with the tutor (plan, analysis, etc),
Report writing and oral presentation.

BIBLIOGRAPHY

PRE-REQUISITES

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

Centre des Humanités
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE
Humanities and social sciences

IDENTIFICATION

CODE : HU-0-S2-EC-S-SERIE2
ECTS : undefined

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	0h
Travail personnel :	0h
Total :	0h

ASSESMENT METHOD

Assessment will be conducted through continuous evaluation. The assessment methods will be presented at the beginning of the semester by the teaching team.

TEACHING AIDS

Materials are chosen by the instructor based on the module:
• Didactic documents related to the module
• Audiovisual materials
• Recommended readings

TEACHING LANGUAGE

French

CONTACT

Mme JOUISHOMME Delphine :
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Mme GOUTALAND Carine :
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AIMS

A series of elective courses in Humanities and Social Sciences (HSS) offers several options for students to choose from, allowing them to develop and deepen specific skills. This course aims to develop one or more transversal skills among the following:
• CT1: Self-awareness and self-management
• CT2: Working, learning, and evolving independently
• CT3: Interacting with others, working in a team
• CT4: Demonstrating creativity
• CT5: Acting responsibly in a complex world
• CT6: Navigating and evolving within an organization
• CT7: Working in an international and intercultural context
The list of options available in Series 1 and the specific competencies for each option are detailed in the catalog on the IntranetHumas:
https://intranethumas.insa-lyon.fr/sciences-humaines-sociales/offre-de-formation/cours-la-carte-0

CONTENT

Each module is designed to encourage interaction and active student participation. The content is structured around the following key aspects:
• Theoretical deepening related to the theme
• Reflection on the topic
• Practical exercises and activities
• Assessments and presentation of work

BIBLIOGRAPHY

The bibliography is selected by the instructor based on the module.

PRE-REQUISITES

French

IDENTIFICATION

CODE : GM-5-S2-EC-PPP
ECTS :

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	0h
Travail personnel :	20h
Total :	20h

ASSESMENT METHOD

- one French written page in which the student explains the vision he has of the differentiated path that he will follow in 4th and 5th year.
- one English written page in which the student explains his choice of mobility abroad and an analysis of the developed skills.
- a French written page to justify the choice of the training periods and an analysis of the developed skills.
- an inventory of skills at the end of each year with an assessment at the end of the 5th year.

TEACHING AIDS

Personal tests
Presentation slides when allowed by the speaker
Online self-assessment materials

TEACHING LANGUAGE

French

CONTACT

MME SALLE Emmanuelle :
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AIMS

The overall objective is to build his/her own professional project. If the assessment takes place in the 5th year, the work must start during the 3rd year.
The aim is :
- Allow the student to choose his/her 4th and 5th year differentiated path
- Understand and know the trades and sectors associated with the different aspects of training
- Self-assessment and identification of competencies acquired or to be acquired
- Choose the aspects of its training to be strengthened
- Establish his/her professional project based on personal skills and self-knowledge.

CONTENT

1. Evaluation of the spontaneous representations on the differentiated paths
2. Interventions of partner companies and other engineers
3. Active participation in at least one collective activity (promotion of the department, management of the FabLab of the department, Professional day, company coffees, contacts with alumni, sponsorship of the promotion, presentation of the department, organization of the integration week , Inter-Semester Week, End-of-Studies Travel, GM Awards, Graduation Ceremony)
4. Self-Assessment Techniques and Building a personal skills Portfolio

If needed,a methodological aid can be provided for the writing of their CV and their cover letters during their search for internship.

BIBLIOGRAPHY

PRE-REQUISITES

INSA INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

CENTRE DES SPORTS
Domaine Scientifique de la DOUA
20 Avenue Albert Einstein - 69100 VILLEURBANNE

Sports

IDENTIFICATION

CODE : CDS-5-S2-EC-EPS
ECTS :

HOURS

Cours :	0h
TD :	0h
TP :	0h
Projet :	0h
Evaluation :	0h
Face à face pédagogique :	0h
Travail personnel :	0h
Total :	0h

ASSESMENT METHOD

Assessment in Physical Education concerns the teaching of Sports and Artistic Physical Activities (APSA), and will take the form of continuous assessment with half-yearly marking.

The mark depends on the degree of acquisition of the skills expected in each of the activities, and the progress made over all the sessions in the cycle. The mark takes into account :

Individual and/or team performance
mastery of execution
Progress in the sports project
Responsibility and autonomy

TEACHING AIDS

All physical, sporting, artistic and competitive activities

TEACHING LANGUAGE

French

CONTACT

MME JAUSSAUD Marie :
marie.jaussaud@insa-lyon.fr

AIMS

This EC is part of the Teaching Unit: SHS and contributes to the development of the School's transversal competences

1*Auto-evaluating one's own performance
Knowledges :
- Fundamentals, principles of action and terminology of sports activities
- Criteria for observation, achievement and success.
Abilities :
- Assess your level of practice
- Build up a warm-up
- Set goals for progress
- Manage physical and mental potential

2* Work, learn and develop independently
Knowledge :
- PSAA rules
- Observation criteria
- Principles of warm-up and cool-down
Abilities :
- Mobilise resources
- Analyse, observe, question
- Take on different roles (referee, choreographer)

3* Interact with others, work as part of a team
Knowledges :
- Roles and functions in each sports activity
Abilities :
- Communicate appropriately: verbal, non-verbal and postural communication.
- Integrate into a group
- Take part in and develop a group project
- Take the initiative
- Be a good listener

4* Be creative, innovative and enterprising
Knowledge :
- Artistic disciplines
Abilities :
- Draw on knowledge and resources from different artistic fields to produce an original work.
- Mobilise the imagination and sensibility and make them visible through dance movement
- Access the symbolism of the body

5* Act responsibly in a complex world
Knowledge :
- Safety and operating rules
Abilities :
- Identify uncertainties and risks and act to reduce them
- Integrate a responsible dimension into their actions
- Show respect and fair play in a power struggle

6* Working in an international context
Knowledge :
- Socio-cultural differences
Abilities :
- Integrate cultural diversity into group work
- Act with respect for self and others

CONTENT

Physical Education and Sport lessons are organised around traditional Physical Education lessons, or advanced lessons, or appropriate practices (EPSA), or competitive practices within the framework of the Section Sportive Haut Niveau.

1. Physcical Education lessons :
Students choose one or two physical and sporting activities per year from among the activities offered by the sports centre (individual, group, dual).
2. Appropriate Physical Education lessons: For all students who are exempt from physical activity for at least 2 months:
Swimming, Body-building, Nordic Walking, Somatic Exercise, Sophrology, Wheelchair Basketball, Pilates, Table Tennis, etc.
3. Advanced Physical Education courses :
Specialisation in a sporting activity, University training and competitions
4. SSHN (High-Level Athlete section)

University training and competitions

BIBLIOGRAPHY

OTTAWA Charter (1986): 'health is seen as a resource for everyday life; it is a positive concept that highlights social and individual resources, as well as physical abilities'.

PRE-REQUISITES

EPS: none
- Appropriate Physical Education: subject to medical advice
- Advanced courses and competitive practice: previous practice required subject to specific selection according to each activity
- SHN: ministerial list

Levels 1 and 2: Physical Education, Appropriate physical education
Level 3: Advanced courses and competitive practice, SHN

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IDENTIFICATION

CODE : GM-5-S2-EC-STAGEL
ECTS : 30

HOURS

Cours :	0h
TD :	1h
TP :	0h
Projet :	0h
Evaluation :	1h
Face à face pédagogique :	2h
Travail personnel :	400h
Total :	402h

ASSESMENT METHOD

50% by the industry through a grid given by GM /
25% by an oral presentation evaluted by GM's teachers /
25% by a written report evaluated by GM's teachers

TEACHING AIDS

None

TEACHING LANGUAGE

French

CONTACT

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M. Morterolle Sebastien :
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Mme Paredes Astudillo Yenny :
yenny.paredes-astudillo@insa-lyon.fr

AIMS

M1- To integrate an organization, to lead and help it to evolve
M2- To take account for constraints such as professionnal, economical and industrials ones.
M3- To take account for societal values (ethical, and ethics) and help them being respected
M4- To dialogue with specialists as with not specialists
M5- To work in international context: speak one or several langages, cultural openings,
M6- To work with autonomy, critical faculty, and curiosity

CONTENT

26 weeks of industrial intership

BIBLIOGRAPHY

Documents with details informations about progress of the intership and associated regulations are avalaible on Moodle website

PRE-REQUISITES

All teachings of GM for 3rd and 4th years