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# ENGINEERING PROGRAMME

2024-2025

Year 2 / Year 3

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Specialisation option  
**Industrial Engineering**

OD GI

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PROGRAMME SUPERVISOR  
Raphaël CHENOARD



ENGINEERING - OD GI

# Autumn Semester

Course unit	ECTS Credits	Track	Course code	Title
UE 73	12	Core course	ACTOR MADEC PROD RISK	Roles and Organization Decision-making tools and methods Sustainable production Risk management
UE 74	13	Core course	CHANE MAPIN MODEP P1GI SIGEC	Product Modelling Processes, quality and standards Enterprise Modelling and Performance Project 1 Information Systems and Knowledge Management

# Spring Semester

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Course unit	ECTS Credits	Track	Course code	Title
UE 83	2	Core course	CHANGE HACOPG_GI P2GI RVAL SIROP	Change Management Costing, purchasing and pricing Project 2 Value Networks Simulation and Operations Research

## ENGINEERING - OD GI

Year 2 / Year 3 - Autumn Semester - Course Unit 73 / 93

# Roles and Organization [ACTOR]

LEAD PROFESSOR(S): Raphaël CHENOUEAU

### Requirements

### Objectives

Provide students with an overview of key players and different organizations within enterprises and value networks.

### Course contents

- Enterprise and organization theory
- Circular economy
- Product lifecycle and design
- Industrial testimony

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	10 hrs	10 hrs	10 hrs	0 hrs	2 hrs

## ENGINEERING - OD GI

Year 2 / Year 3 - Autumn Semester - Course Unit 73 / 93

# Decision-making tools and methods [MADEC]

*LEAD PROFESSOR(S): Raphaël CHENOARD*

### Requirements

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### Objectives

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Provide students the tools and methods to support decision making with regard to product design as well as for driving a value chain.

### Course contents

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Formulation and resolution of multi-objective optimisation problems  
 Evaluation of risks and the implications of decisions  
 Implementation of methods for multi-criteria decision making  
 Design of experiments

### Course material

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### Assessment

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Collective assessment: EVC 1 (coefficient 0.2)

Individual assessment: EVI 1 (coefficient 0.8)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	12 hrs	8 hrs	10 hrs	0 hrs	2 hrs

## ENGINEERING - OD GI

Year 2 / Year 3 - Autumn Semester - Course Unit 73 / 93

# Sustainable production [PROD]

LEAD PROFESSOR(S): Yasamin ESLAMI

### Requirements

### Objectives

Combine the constraints of productivity with those of sustainability

### Course contents

Review of production management

- Sustainable production:
  - Sustainable KPI
  - Sustainable Manufacturing
  - Lean and Green Manufacturing
  - Life Cycle Assessment (LCA) methodology and example
  - Recyclability and waste management
  - Remanufacturing
  - Maintenance

Part of the sessions of this course are given in English.

### Course material

### Assessment

Collective assessment: EVC 1 (coefficient 0.75)

Individual assessment: EVI 1 (coefficient 0.25)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	8 hrs	16 hrs	6 hrs	0 hrs	2 hrs

## ENGINEERING - OD GI

Year 2 / Year 3 - Autumn Semester - Course Unit 73 / 93

# Risk management [RISK]

*LEAD PROFESSOR(S): Hervé THOMAS*

### Requirements

### Objectives

Make students aware of the impact of their decisions on health and safety at work  
 Understand the risks and know how to make a decision when designing a product or service.

### Course contents

Lectures:

- Risks and dependability
- Ergonomics
- Regulatory
- Product risk
- Risk management

Tutorials:

- Re-design of ergonomic workstations
- Fault tree

### Course material

### Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	12 hrs	12 hrs	8 hrs	0 hrs	0 hrs

## ENGINEERING - OD GI

Year 2 / Year 3 - Autumn Semester - Course Unit 74 / 94

# Product Modelling [CHANE]

*LEAD PROFESSOR(S): Matthieu RAUCH*

### Requirements

### Objectives

Within the framework of concurrent engineering, this course gives students the opportunity to acquire a broad body of knowledge from product design to production via virtual prototyping.

### Course contents

1. Product modeling: Digital mock-ups - Object representation - Graphic techniques - Topological modeling - Reverse engineering in the CAD/CAM approach - Elements of industrial design and VR.
2. Rapid product development: Rapid Prototyping - Direct Manufacturing
3. Know-How Engineering: Capitalizing on know-how - Advanced CAD/CAM systems Integration of Production constraints in Design (DFM, DFA) - "Trade" CAD/CAM applications: Data Integration
4. Data Management: Technical Data Management - Product Configuration Management - PDM, PLM elements - Databases, DBMS - Technical Data Exchange - BIM - Cloud Computing
5. Applications

### Course material

Machine à commande numérique, B. MERY, Hermès - CADAM Theory and Practice, I. Zeid, Mc Graw-Hill - Surface Modeling for CadCam, BK. Choi, Elsevier - Fundamentals of Computer Integrated Manufacturing, A.L. Foston, CL Smith, T. Au, Prentice Hall - La CFAO Concevoir et produire autrement, F. Piquet, JP Poitou, JC Tass, Nathan - NC Machine Programming and Software Design, CH Chang, MA Melkanoff, Prentice Hall.  
Lecture notes and laboratory sessions.

### Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	10 hrs	0 hrs	20 hrs	0 hrs	2 hrs



## ENGINEERING - OD GI

Year 2 / Year 3 - Autumn Semester - Course Unit 74 / 94

# Processes, quality and standards [MAPIN]

*LEAD PROFESSOR(S): Hervé THOMAS*

### Requirements

### Objectives

OPTIMIZE THE PRODUCTION OF A PART :

- Know how to define a manufacturing study project.
- Generate machining trajectories in CAM.
- Define operating strategies and parameters to optimize machining time and the quality of machined surfaces.

### Course contents

Design a moldable object in epoxy resin: goodies, jewelry, key rings, etc.

Model the counter-mold of the product.

Define the counter-mold manufacturing process.

Generate machining paths in CAM to machine the counter-mold.

Machine the counter-mold.

Make the mold of the product in silicone.

Make the product in epoxy resin.

Optimize costs for producing 200 parts.

### Course material

### Assessment

Collective assessment: EVC 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	4 hrs	12 hrs	16 hrs	0 hrs	0 hrs

## ENGINEERING - OD GI

Year 2 / Year 3 - Autumn Semester - Course Unit 74 / 94

# Enterprise Modelling and Performance [MODEP]

LEAD PROFESSOR(S): Raphaël CHENOUIARD

### Requirements

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### Objectives

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### Course contents

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### Course material

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Entreprise modelling - F. Vernadat  
 Spring University course 'Entreprise modelling', Mines d'Albi Carmaux, 2002  
 Modélisation UML  
 Modélisation BPMN

### Assessment

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Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	14 hrs	16 hrs	0 hrs	0 hrs	2 hrs

## ENGINEERING - OD GI

Year 2 / Year 3 - Autumn Semester - Course Unit 74 / 94

### Project 1 [P1GI]

*LEAD PROFESSOR(S): Raphaël CHENOUEARD*

#### Requirements

#### Objectives

Apply theoretical knowledge to real industrial issues.

#### Course contents

Project conducted in collaboration with an industrial partner.

#### Course material

#### Assessment

Collective assessment: EVC 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	1	0 hrs	0 hrs	0 hrs	32 hrs	0 hrs

## ENGINEERING - OD GI

Year 2 / Year 3 - Autumn Semester - Course Unit 74 / 94

# Information Systems and Knowledge Management [SIGEC]

LEAD PROFESSOR(S): Raphaël CHENOUIARD

### Requirements

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### Objectives

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### Course contents

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### Course material

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### Assessment

Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	12 hrs	6 hrs	12 hrs	0 hrs	2 hrs

## ENGINEERING - OD GI

Year 2 / Year 3 - Spring Semester - Course Unit 103 / 83

# Change Management [CHANGE]

*LEAD PROFESSOR(S): Thomas LECHEVALLIER*

### Requirements

### Objectives

A project is a collective and individual adventure. All the actors participating will be confronted with changes, and the acceptance or not of these will strongly influence the success of the project.

The objective of the course is to give simple and reliable methods allowing to lead the change with respect when one is in the position of project leader.

The learning will begin by questioning the certainties on the expected benefits of the change, then give step-by-step analysis tools to lead and carry the change.

### Course contents

- 6h CM presentation of change management methods
- 3x2h TD in writing a change management deliverable on a chosen project (per group of students)
- 2x2h TP of presentation of the deliverable (by group of students) to all the students of the course with a shared analysis time

### Course material

Administration industrielle et générale (1916) Henri Fayol

Kanter R, M Stein B.A, jick T.D., The challenge of organizational Change : How companies experience it and guide it, Free Press New york, 1992

Kanter R, M., Evolve! : succeeding in the digital culture of tomorrow, Harvard Business school Press, cambridge, 2001

Kanter R, M., Change Pastors : Innovation an entrepreneurship in American corporation, Simon & schuster, New York city, 1983

Kotter J., Leading Change, Harvard Business school Press, 1996

Morgan G., Riding the waves of Change, Imaginization Inc, 1988

S. Covey, the 7 habits of highly efficient people

Michel crozier, Pouvoir et organisation, Archives européennes de sociologie, vol. 5, no 1, pages 52–64

### Assessment

Collective assessment: EVC 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	12 hrs	20 hrs	0 hrs	0 hrs	0 hrs

## ENGINEERING - OD GI

Year 2 / Year 3 - Spring Semester - Course Unit 103 / 83

# Costing, purchasing and pricing [HACOPG\_GI]

*LEAD PROFESSOR(S): Catherine DA CUNHA*

### Requirements

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### Objectives

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Understand the economic dimension of value chains.

### Course contents

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- Purchasing
- Costing
- Pricing
- Negotiation

### Course material

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### Assessment

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Individual assessment: EVI 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	8 hrs	18 hrs	4 hrs	0 hrs	2 hrs

## ENGINEERING - OD GI

Year 2 / Year 3 - Spring Semester - Course Unit 103 / 83

### Project 2 [P2GI]

*LEAD PROFESSOR(S): Raphaël CHENOUIARD*

#### Requirements

#### Objectives

Apply theoretical knowledge to real industrial issues.

#### Course contents

Project undertaken in collaboration with an industrial partner.

#### Course material

#### Assessment

Collective assessment: EVC 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	2	0 hrs	0 hrs	0 hrs	48 hrs	0 hrs

## ENGINEERING - OD GI

Year 2 / Year 3 - Spring Semester - Course Unit 103 / 83

# Value Networks [RVAL]

*LEAD PROFESSOR(S): Catherine DA CUNHA*

### Requirements

Methods and tools for decision support

### Objectives

Identify the issues with value networks and master the tools to address them.

### Course contents

- Scheduling
- Location/allocation
- Logistics
- Physical internet

This course contributes to the Sustainable Development Goal 12 "responsible consumption and production" by increasing the knowledge of the students about global production systems, their KPI, and improvement levers.

### Course material

ASLOG 2008/2009 : L'état de l'art de la logistique globale des entreprises en France  
Montreuil B., R.D. Meller & E. Ballot (2012). Physical Internet Foundations, In: Service  
Orientation in Holonic and Multi Agent Manufacturing and Robotics, edited by T. Borangiu  
et al., Springer

O'Brien, C., 2013. Fifty years of shifting paradigms. International Journal of Production Research  
51, 6740–6745. doi:10.1080/00207543.2013.852267

### Assessment

Collective assessment: EVC 1 (coefficient 1.0)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	10 hrs	12 hrs	8 hrs	0 hrs	2 hrs



## ENGINEERING - OD GI

Year 2 / Year 3 - Spring Semester - Course Unit 103 / 83

# Simulation and Operations Research [SIROP]

LEAD PROFESSOR(S): Raphaël CHENOUIARD

### Requirements

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### Objectives

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Provide students with the major principles of discrete-event simulation, flow simulation and value network optimization.

### Course contents

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- Discrete-event and flow simulation
- Introduction to operations research
- Graph algorithms and linear programming
- Constraint programming
- Meta-heuristics

### Course material

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### Assessment

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Collective assessment: EVC 1 (coefficient 0.4)

Individual assessment: EVI 1 (coefficient 0.6)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
French	3	8 hrs	12 hrs	10 hrs	0 hrs	2 hrs