CENTRALE NANTES

BACHELOR OF SCIENCE IN ENGINEERING

2025-2026

2e année

PROGRAMME SUPERVISOR

Grégory LEGRAIN

PROGRAMME BACHELOR OF SCIENCE IN ENGINEERING - 2e année

1er Semestre

Course unit	ECTS Credits	Course type	Course code	Title
UE31	12			
		Required course	BDM_MATHSV	Maths V: Probability and Statistics
		Required course	BSC_ACB	Automatic Control Basics
		Required course	BSC_IAS	Industrial Automation Systems
		Required course	BSC_MATHSVI	Maths VI: Analysis III
UE32	12			
		Required course	BSC_HEATTRANS1	Heat Transfer 1
		Required course	BSC_STRUCTMECH	MECH IV Structural Mechanics
		Required course	BSC_THERMODYN1	Thermodynamics
		Required course	BSC_VIBRATIONS	MECH II: Vibrations
UE33	6			
		Elective course	BSC_ALL3	LVC 3 - German
		Required course	BSC_BUSEN3	Business English 3
		Required course	BSC_ENGPROJ1	Engineering Project I (60h)
		Elective course	BSC_ESP3	LVC 3 - Spanish
		Elective course	BSC_FLE3	FLE 3 - French as a foreign language
		Required course	BSC_PREPRO3	Pre-professionnal activities 3
		Required course	BSC_SHS3	SHS3

Établissement public sous tutelle du ministère de l'Enseignement supérieur, de la Recherche et de l'Innovation
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2e Semestre

Course unit	ECTS Credits	Course type	Course code	Title
UE41	4			
		Required course	BSC_DATASCI	CS Introduction to Data Science
		Required course	BSC_MATHSVII	Maths VII: Numerical Analysis
UE42	12			
		Required course	BSC_FLUM1	MECH VI: Fluid Mechanics 1
		Required course	BSC_IENGBASIS	Industrial engineering Basis
		Required course	BSC_MANUFBASIS	Manufacturing I: Basis
		Required course	BSC_MECHDEFBODIES	MECH V: Mechanics of deformable bodies
UE43	9			
		Elective course	BSC_ALL4	LVC 4 - German
		Required course	BSC_BUSEN4	BUSEN4
		Required course	BSC_ENGPROJ2	Engineering Project II (72h)
		Elective course	BSC_ESP4	LVC 4 - Spanish
		Elective course	BSC_FLE4	FLE 4 - French as a foreign language
		Required course	BSC_PREPRO4	Pre-professionnal activities 4
		Required course	BSC_SHS4	SHS4
		Required course	BSC_SUSTAIN2	Sustainable engineering II
UE44	5			
		Required course	BSC_NSINTERNSHIP	Non-skilled Internship

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Autumn Semester - UE31

Maths V: Probability and Statistics [BDM_MATHSV]

LEAD PROFESSOR(S): Claire BRECHETEAU

Requirements

Objectives

Know and understand the basic concepts in probability and statistics. Know how to compute classical probabilities, based on numeration or on the Bayes rule. Master classical probability distributions. Being able to compute statistical descriptors (mean, variance, median, mode, quantiles, cumulative distribution functions). Being able to compute basic confidence intervals, and being able to apply classical statistical tests on the mean.

Course contents

1 - Bases on Sets theory and Enumeration
2 - Introduction to probabilities : from events to random variables
3 - Discrete and continuous random variables
4 - Convergence of random variables and Limit theorems
5 - Estimators in Statistics and Confidence intervals
6 - Statistical tests

Course material

Assessment

Individual assessment: EVI 1 (coefficient 1)

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

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Autumn Semester - UE31

Industrial Automation Systems [BSC_IAS]

LEAD PROFESSOR(S): Abdelhamid CHRIETTE

Requirements

BDM_MATHSII, BDM_MATHSIV
BDM_INFOI, BDM_INFOII, BDM_INFOIII, BDM_INFOIV

Objectives

After completing this lecture, students should be able to:

Know the hardware organization of PLCs (Programmable Logic Controllers), its input-output and communication peripherals.

Able to recognize the structure and components of automated systems.

Able to analyze automation problems using combinatorial and sequential logic.

Be able to represent solutions by logic circuits and their translation into programmed logic: Ladder, GRAFCET.

Be able to program the control of simple processes using PLCs, sensors and actuators.

Course contents

History
Automatic system
Programmable Logic Controllers (PLC)
Basics of the language
Basic structures
Particular structures

Course material

Assessment

Individual assessment: EVI 1 (coefficient 1)

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

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Autumn Semester - UE31

Automatic Control Basics [BSC_ACB]

LEAD PROFESSOR(S): Ina TARALOVA

Requirements

Linear Algebra, Differential and Integral calculus

Objectives

This course is intended for bachelor-level students seeking to strengthen their foundations in Control systems engineering, with a focus on the application of control theory principles to practical problems that also address sustainability and societal challenges.

The course covers the fundamentals of control theory, including system modeling by transfer functions, analysis of stability and performances in thge open loop and the closed loop. Through the courses, tutorials and labs, it highlights the role of automatic control systems in improving the control input efficiency, analysing system stability and reliability under model uncertainties, and supporting responsible resource management. Particular emphasis is placed on the analysis and evaluation of robust, efficient, and environmentally responsible control strategies in the relation with the envisaged applications.

The course also introduces the use of MATLAB and Simulink (The MathWorks graphical programming environment) for the modeling, simulation, and analysis of linear dynamic systems in the time-domain, enabling students to connect theoretical concepts with real life implementations for the performance assessment.

Course contents

Part I: Partial Francion Expansion. First and second order systems time responses of LTI systems, transfer function characteristics, canonical form. Exercises on LTI system analysis using Matlab and Simulink
LTI (Linear Time invariant Systems)

Part II: Frequency responses, Magnitude and phase, Bode diagram. Nyquist plot. Stability criteria, stability margins in the frequency domain. Introduction to the design of control laws.

Course material

Norman S. Nise, Control Systems Engineering, Ed. Wiley, 2019 ISBN: 978-1-119-41472-8

R. C. Dorf and R. H. Bishop, Modern Control Systems, Pearson Education, Upper Saddle River, NJ, twelfth edition, 2011, ISBN-13:978-0-13-602458-3

G. Franklin, et al., “Feedback Control of Dynamic Systems”, Pearson

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	3	16 hrs	2 hrs	4 hrs	0 hrs	2 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Autumn Semester - UE31

Maths VI: Analysis III [BSC_MATHSVI]

LEAD PROFESSOR(S): Mazen SAAD

Requirements

Analysis I, Analysis II

Objectives

Develop the ability to analyze and understand functions of several variables, including limits, continuity, partial derivatives, and Taylor expansions, and acquire the skills to formulate, solve, and interpret solutions of first- and second-order ordinary differential equations (ODEs) in engineering contexts.

Course contents

1- Multivariable functions, limits, continuity, partial derivatives, Taylor series formula, minimum, maximum and saddle points
2- Double and triple integrals, line integral
2- First-order ordinary differential equations: Euler's method, equation with separate variables, linear equations
3- Second-order linear ordinary differential equations: homogeneous case, homogeneous case with constant coefficients, non homogeneous case, solution by variation of parameters

Course material

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, 2010
2. Robert G. Bartle, Donald R. Sherbert"Introduction to Real Analysis", Wiley, 2011

Assessment

Collective assessment: EVC 1 (coefficient 0.7)

Individual assessment: EVI 1 (coefficient 0.3)

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

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Autumn Semester - UE32

MECH IV Structural Mechanics [BSC_STRUCTMECH]

LEAD PROFESSOR(S): Vito RUBINO

Requirements

Statics

Objectives

- Learn to study statically determinate and indeterminate beam systems
- Understand external and internal reactions due t ovarious types of constraints
- Determine the diagrams of the characterists of internal reactions

Course contents

This course covers the following topics:
- Kinematics and static of rigid body systems
- Determination of support reactions
- Internal beam reactions
- Statically determinate beam systems (including multi-span beams, trusses, three-hinged arches and closed-frame structures)
- Statically indeterminate beam systems

Course material

- Carpinteri, Structural Mechanics Fundamentals, CRC Press, 2014.
- Gere and Goodno, Mechanics of Materials, Cengage Learning, 2011.

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	3	8 hrs	10 hrs	4 hrs	0 hrs	2 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Autumn Semester - UE32

Heat Transfer 1 [BSC_HEATTRANS1]

LEAD PROFESSOR(S): Ernesto MURA

Requirements

Thermodynamics 1

Objectives

Analysis and modelling of heat transfer for elementary systems. Study of basic and stationary heat transfer problems considering conductive and convective heat transport phenomena; as stand alone as well as in coupled condition.

Course contents

Energy and Mass balances: use of the first principle for setting of simple problems involving heat transfer. Discrimination between the different heat transfer phenomena (radiation, convection, conduction).
Concepts of heat, heat flow and internal energy.
Use of the energy equation balance in reduced forms: steady state and monodimensional cases (cartesian, spherical cylindrical coordinates). Problem with internal produced heat.
Conduction (Fourrier Law in one dimensional form - heat balance in steady state): introduction to the conduction phenomena and material properties for the thermal field description. Example of the finite bar under a defined thermal field.
Convection: Introduction to the Newton's Law. Concept of heat transfer coefficient. Conceptual relationship with the velocity profile of a gas (introduction of the concept of turbulence and Reynold's Number). Example of the heated surface for the forced convection and of the heated flat plate for the free convection. Competition between conduction and convective resistence: Nusselt's Number.
Concept of velocity and thermal boundary layer.

Course material

R.Byron Bird, Transport Phenomena, Revised Second Edition, Jhon Wiley & Sons, Inc. New York 2007.
C.P. Kothandaraman, Fundamental of Heat and Mass Transfer, Revised Third Edition, New age International Publisher, New Delhi 2006

Assessment

Individual assessment: EVI 1 (coefficient 1)

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

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Autumn Semester - UE32

MECH II: Vibrations [BSC_VIBRATIONS]

LEAD PROFESSOR(S): Jessy SIMON

Requirements

STATICS
DYNAMICS
MATHEMATICS

Objectives

Vibrations play an important rôle in engineering. Although they can be wanted on purpose, vibrations are usually undesirable as they can prevent the proper functioning of the systems.
This course focuses on the study of vibrations of system of mass points.

At the end of this course, the students will:
- be able to obtain the equation of motion of a system of solids by means of Lagrange equations
- write the response of a mass point or a system of mass points to free or forced vibrations

Course contents

- Dynamic of systems of point masses
- Lagrange equations
- 1 dof free and forced vibrations
- N dofs free and forced vibrations

Course material

Engineering Mechanics 3, Gross, Hauger, Schröder, Wall and Govindjee. Springer

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	3	10 hrs	8 hrs	4 hrs	0 hrs	2 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Autumn Semester - UE32

Thermodynamics [BSC_THERMODYN1]

LEAD PROFESSOR(S): Georges SALAMEH

Requirements

physics

Objectives

Introduce the main concepts of thermodynamics applied to fluids and machines

Course contents

General information about systems and settings ;
Pressure and temperature ;
State functions in thermodynamics (internal energy, enthalpy, entropy)
Work and heat ;
Thermodynamic Principles in closed system ;
Gas kinetics; ideal gas equation ;
Thermodynamic transformations (isochoric, isothermal, isobaric, adiabatic).
Principles of thermodynamics – open system

Course material

Introduction to Engineering Thermodynamics, 2nd ed. R.E. Sonntag and C. Borgnakke, John Wiley & Sons, New York, 2007

Assessment

Individual assessment: EVI 1 (coefficient 1)

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

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Autumn Semester - UE33

Pre-professionnal activities 3 [BSC_PREPRO3]

LEAD PROFESSOR(S): Grégory LEGRAIN

Requirements

Objectives

The objective of this course is to provide an opening to business world through various activities.

Course contents

- Company tours
- Professional days
- Company driven workshops
- Hackaton
- Startup challenge
- Ideation workshops
- Innovation workshops
- Industrial mentoring

Course material

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	-	0 hrs	36 hrs	0 hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Autumn Semester - UE33

Engineering Project I (60h) [BSC_ENGPROJ1]

LEAD PROFESSOR(S): Grégory LEGRAIN / Ricardo Jorge DA SILVA VIOLA

Requirements

None

Objectives

Learn how to manage a project.

Course contents

Variable according to the support used in the current year.

Course material

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	3	8 hrs	16 hrs	0 hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Autumn Semester - UE33

Business English 3 [BSC_BUSEN3]

LEAD PROFESSOR(S): Anna POLONYI

Requirements

Objectives

- to produce a high-quality English CV
- to produce a high-quality English cover letter
- to plan and prepare for an internship or job interview in English

Course contents

CVs
- structure and layout
- order and content
- key cultural differences of an English CV

Cover letters
- structure and layout
- key paragraph content
- key cultural elements of an English letter

Interviews
- planning and preparing
- presenting yourself
- tactics and techniques
- types of interview questions
- what to ask

Course material

- teacher led with student input
- group discussions
- student and teacher feedback
- role plays

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	1	0 hrs	20 hrs	0 hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Autumn Semester - UE33

LVC 3 - Spanish [BSC_ESP3]

LEAD PROFESSOR(S): Marta HERRERA

Requirements

Objectives

Can understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialisation. Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.

Course contents

- Present how an object or process works
- Present your experience 5 stars

GRAMMAR CONTENT
- Revision of present and past tenses
- Perífrasis (revision + news)
- Imperative with pronoun
- Conditional sentences
- Conditional sentences
- Other uses of ser and estar
- Time markers
- Connectors
- Subordination

FUNCTIONAL CONTENT :
- Asking for and giving advice
- Transferring information
- Giving an opinion and arguing, making suggestions, reacting
- Recount facts in the past tense
- Describe and judge
- Giving an opinion on social behaviour (value judgements, surprises, tastes)

Course material

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
German	1	0 hrs	40 hrs	0 hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Autumn Semester - UE33

LVC 3 - German [BSC_ALL3]

LEAD PROFESSOR(S): Katja BORCK

Requirements

Objectives

This course builds on the competences acquired in Year 1 and aims to further develop students' basic communicative skills in German. It focuses on increasing confidence and independence in everyday spoken and written interaction.

Course contents

Students further develop their ability to understand and use spoken and written German in familiar, everyday contexts. The course focuses on extending basic vocabulary, strengthening control of key grammatical structures as well as introducing past tenses, and improving confidence in simple interactions. By the end of the course, students are expected to participate in routine communicative situations and to produce short, simple texts on familiar topics.

Course material

Full range of practical communication language exercises: reading and listening comprehension, written expression and expression.

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
German	1	0 hrs	40 hrs	0 hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Autumn Semester - UE33

FLE 3 - French as a foreign language [BSC_FLE3]

LEAD PROFESSOR(S): Stéphanie MASSOT

Requirements

N/A

Objectives

The objective is to familiarize international students with the French language and culture through communicative tasks and by teaching situations focused on comprehension and oral practice. In addition, the acquisition of vocabulary, syntax and pronunciation completes the training in order to acquire the necessary knowledge to communicate in everyday situations.

Students acquire general skills: specific communicative skills, language skills (knowledge of grammar, syntax and phonology) as well as social and cultural knowledge allowing them to use the appropriate vocabulary in communication situations. everyday life. Sociolinguistic and pragmatic skills are also required.

Course contents

Learners will be able to use the foreign language in a simple way for the following purposes:

Establishing and maintaining social and professional contacts / interact in daily life, particularly:

- Request a service / request authorization
- Propose, accept, refuse
- Warn of an impediment
- Explain a health problem
- Express the obligation, the possibility, the impossibility
- Suggest, give advice
- Non-verbal communication: gestures to communicate.

Course material

We design our materials from press articles, television news, news magazines and the Internet. We also use digital tools such as Kahoot, Flipgrid or Padlet to boost our courses.

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	1	0 hrs	40 hrs	0 hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Autumn Semester - UE33

SHS3 [BSC_SHS3]

LEAD PROFESSOR(S): Julie BERGER

Requirements

None

Objectives

Whether for academic applications, grant writing or business design, we all need essential storytelling skills

Course contents

Why are stories the best way to convey information? And what makes a good story ? This workshop will draw on exeamples from North American and international literature to see how creators hook our hearts and engage our empathy. With generative writing prompts, close reading and constructive, critical feedback, students wills sharpen their storytelling skills, strenghtn self-knowledge and overcome fear of failure in order to take risks and produce stories tha engage the heart as well as the mind.

Course material

None

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	1	0 hrs	24 hrs	0 hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - 2e année - 2e Semestre - UE41

CS Introduction to Data Science [BSC_DATASCI]

Responsable(s) du cours : Grégory LEGRAIN

Pré-requis

MATHSI
MATHSII
MATHSIII
MATHSIV
MATHSV
MATHSVI

Objectifs

La science des données est un domaine multidisciplinaire qui aide à identifier les tendances, les modèles, les connexions et les corrélations dans les grands ensembles de données.
Il est construit sur les compétences de programmation, les connaissances de domaine et les connaissances mathématiques et statistiques.

L'objectif de ce cours est d'introduire la base de la science des données aux ingénieurs. Les aspects théoriques et pratiques sont tous deux examinés de manière globale.

Plan de l'enseignement

- Aperçu du pipeline de science des données
- Collecte et prétraitement des données
- Analyse de données avec des méthodes statistiques
- Analyse de données avec des méthodes d'apprentissage automatique
- Méthodes de visualisation

Bibliographie

Évaluation

Évaluation individuelle : EVI 1 (coefficient 1)

LANGUE DU COURS	CRÉDITS ECTS	COURS MAGISTRAUX	TRAVAUX DIRIGÉS	TRAVAUX PRATIQUES	PROJET	DEVOIRS SURVEILLÉS
Anglais	2	16 hrs	8 hrs	0 hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - 2e année - 2e Semestre - UE41

Maths VII: Numerical Analysis [BSC_MATHSVII]

Responsable(s) du cours : Françoise FOUCHER

Pré-requis

Analyse et algèbre linéaire

Objectifs

Connaitre et savoir mettre en oeuvre sur ordinateur des méthodes de résolution approchée de différents problèmes mathématiques.

Plan de l'enseignement

1- Equations non linéaires : méthode de dichotomie, méthode du point fixe, méthode de Newton
2- Systèmes linéaires : méthodes directes (Gauss, LU), méthodes itératives (Jacobi, Gauss-Seidel)
3- Interpolation et approximation: Lagrange interpolation, interpolation polynomiale par morceaux, approximation par moindres carrés
5- Integration numérique : méthode des trapèzes, méthode de Simpson, formules composites
6- Méthodes numériques de résolution des équations différentielles : méthodes d'Euler et de Runge-Kutta

Bibliographie

Grégoire Allaire, Sidi Mahmoud Kaber, Algèbre linéaire numérique, Springer, 2008.

Évaluation

Évaluation individuelle : EVI 1 (coefficient 1)

LANGUE DU COURS	CRÉDITS ECTS	COURS MAGISTRAUX	TRAVAUX DIRIGÉS	TRAVAUX PRATIQUES	PROJET	DEVOIRS SURVEILLÉS
Anglais	2	8 hrs	8 hrs	8 hrs	0 hrs	2 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Spring Semester - UE42

Industrial engineering Basis [BSC_IENGBASIS]

LEAD PROFESSOR(S): Imane Inès DIB

Requirements

Objectives

This course provides students with fundamental concepts and practical tools for industrial engineering. Upon completion, students will be able to analyze production systems through flow management, inventory control, demand forecasting, and scheduling techniques.

Course contents

Physical flows
Demand and forecasting
Inventory management
Data management (Bill of material, routings)

Course material

http://www.apics.org/
Handbook of industrial and systems engineering, A. Badiru, 2013

Assessment

Individual assessment: EVI 1 (coefficient 1)

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

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Spring Semester - UE42

MECH VI: Fluid Mechanics 1 [BSC_FLUM1]

LEAD PROFESSOR(S): Boris CONAN

Requirements

Mathematical operators
Vectors, tensors

Objectives

This course introduces the fundamental principles governing incompressible fluids.

On completion of the course, students should be able to
- understand the basic physics of fluid flows,
- understand and manipulate the Navier-Stokes equations and associated mathematical operators
- solve basic problem of hydrostatics
- use dimensional analysis to estimate orders of magnitude of different flow processes

Course contents

Courses and seminar on:
- phenomenology
- description and manipulation of the Navier-Stokes equations
- dimensionless numbers
- hydrostatics

10h of lesson
14h of seminars on applied exercices

Course material

Fundamentals of Fluid Mechanics, B.R. Munson, D.F. Young, T.H. Okiishi, (4th edition) 2002, Wiley

Assessment

Individual assessment: EVI 1 (coefficient 1)

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

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Spring Semester - UE42

MECH V: Mechanics of deformable bodies [BSC_MECHDEFBODIES]

LEAD PROFESSOR(S): Vito RUBINO

Requirements

Statics, Structural Mechanics

Objectives

- Understand the concept of strains and stresses
- Use Saint Venant's Principle
- Determine stress in various loading configurations including bending and shear
- Study the failure of materials

Course contents

This course covers the following topics:
- Analysis of strain and stress
- Theory of elasticity
- Saint Venant problem
- Beams and plates in flexure
- Statically indeterminate beam systems

Course material

- R.C. Hibbeler, Mechanics of Materials, Pearson, 2018.
- Gere and Goodno, Mechanics of Materials, Cengage Learning, 2011.

Assessment

Individual assessment: EVI 1 (coefficient 1)

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

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Spring Semester - UE42

Manufacturing I: Basis [BSC_MANUFBASIS]

LEAD PROFESSOR(S): Grégory LEGRAIN

Requirements

Objectives

The objective of this course is to present the basis of manufacturing activities (machining, joining) for both metallic and non-metallic materials.

Course contents

Product realization steps
Conventional machining
Joining Processes – welding
Processes for non metallic materials

Course material

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	3	10 hrs	14 hrs	null hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Spring Semester - UE43

LVC 4 - German [BSC_ALL4]

LEAD PROFESSOR(S): Katja BORCK

Requirements

Objectives

This course builds on the competences acquired in Year 1 and aims to further develop students' basic communicative skills in German. It focuses on increasing confidence and independence in everyday spoken and written interaction.

Course contents

Students further develop their ability to understand and use spoken and written German in familiar, everyday contexts. The course focuses on extending basic vocabulary, strengthening control of key grammatical structures as well as introducing past tenses, and improving confidence in simple interactions. By the end of the course, students are expected to participate in routine communicative situations and to produce short, simple texts on familiar topics.

Course material

Full range of practical communication language exercises: reading and listening comprehension, written expression and expression.

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
German	1	0 hrs	40 hrs	0 hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Spring Semester - UE43

FLE 4 - French as a foreign language [BSC_FLE4]

LEAD PROFESSOR(S): Stéphanie MASSOT

Requirements

N/A

Objectives

The objective is to familiarize international students with the French language and culture through communicative tasks and by teaching situations focused on comprehension and oral practice. In addition, vocabulary, syntax and pronunciation are taught to provide students with the necessary skills to communicate in everyday situations and to understand and follow courses at the Ecole Centrale.

During the course, students acquire general skills: specific communication skills, language skills (knowledge of grammar, syntax and phonology) as well as social and cultural knowledge enabling them to use the appropriate vocabulary in everyday situations. Sociolinguistic and pragmatic skills are also required.

Course contents

Learners will be able to use the foreign language in a simple way for the following purposes:

Relating events and describing experiences (present, past, future)

- Describe the environment in which you live
- Tell your experience of life in Nantes
- Tell a story
- Present a French public figure (biography)
- Describe your educational background
- Describe your future plans
- Describe wishes, desires

Course material

We design our teaching materials from press articles, television news, news magazines and the Internet. We also use digital tools such as Kahoot, Flipgrid or Padlet to make our lessons more dynamic.

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	1	0 hrs	40 hrs	0 hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Spring Semester - UE43

Engineering Project II (72h) [BSC_ENGPROJ2]

LEAD PROFESSOR(S): Grégory LEGRAIN / Ricardo Jorge DA SILVA VIOLA

Requirements

None

Objectives

Learn how to manage a project.

Course contents

Variable according to the support used in the current year.

Course material

Assessment

Collective assessment: EVC 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	4	12 hrs	24 hrs	0 hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Spring Semester - UE43

Sustainable engineering II [BSC_SUSTAIN2]

LEAD PROFESSOR(S): Thomas CORRE

Requirements

- Sustainable engineering I
- Product design methodology

Objectives

Further study of the impacts of climate change, with a focus on organizational tools and strategies.
– Master the Carbon Footprint (Bilan Carbone) methodology.
– Identify the different emission reduction and adaptation strategies at the organizational level.

Course contents

Course material

-Bilan Carbone, ABC, v8
- Méthodologie ACT - Accelerate Climate Transition, Ademe

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	2	12 hrs	12 hrs	0 hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Spring Semester - UE43

SHS4 [BSC_SHS4]

LEAD PROFESSOR(S): Julie BERGER

Requirements

None

Objectives

Managing cultural shock - Confronting multicultural conflicts - Remote communication methods - Increasing the cohesion of a multicultural team

Course contents

Managing a multicultural team - Oh, how shocking! We've all had culture shock at one time or another and in the world of work, it can take on catastrophic proportions. Whether you are French or foreign, you will undoubtedly have to work within a multicultural team during your career; how to work in harmony? The objective of this course is to understand and then overcome the challenges of multiculturalism in the world of work.

Course material

None

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	1	12 hrs	12 hrs	0 hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Spring Semester - UE43

Pre-professionnal activities 4 [BSC_PREPRO4]

LEAD PROFESSOR(S): Grégory LEGRAIN

Requirements

Objectives

The objective of this course is to provide an opening to business world through various activities.

Course contents

- Company tours
- Professional days
- Company driven workshops
- Hackaton
- Startup challenge
- Ideation workshops
- Innovation workshops
- Industrial mentoring

Course material

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	-	0 hrs	36 hrs	null hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Spring Semester - UE43

BUSEN4 [BSC_BUSEN4]

LEAD PROFESSOR(S): Anna POLONYI

Requirements

Objectives

To become familiarized with the general concepts of intercultural communication
To develop sensitivity towards the inherent value of cultural differences in a professional context
To be able to communicate across different cultures effectively

Course contents

Current approaches to intercultural communication in social sciences
Multiculturalism & interculturalism
Diversity in the workplace
Equity vs. equality
Integration vs. assimilation
The problem with stereotypes

Methods:

Research and analysis of current theories
Discussions based on the reading and analysis of case studies
Final group presentation
Continuous assessment / participation
Final group presentation

Course material

https://en.unesco.org/interculturaldialogue/core-concepts
Manual for developing intercultural competencies: story circles. https://unesdoc.unesco.org/ark:/48223/pf0000370336
Hall, Stuart. Culture, media, language : working papers in cultural studies. https://archive.org/details/culturemedialang0000unse/page/8/mode/2up
https://www.crossculture.com/

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
English	1	0 hrs	20 hrs	0 hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - Year 2 - Spring Semester - UE43

LVC 4 - Spanish [BSC_ESP4]

LEAD PROFESSOR(S): Marta HERRERA / Silvia ERTL

Requirements

Objectives

Can understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialisation. Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.

GRAMMAR CONTENT
- Revision of present and past tenses
- Perífrasis (revision + news)
- Imperative with pronoun
- Conditional sentences
- Conditional sentences
- Other uses of ser and estar
- Time markers
- Connectors
- Subordination

FUNCTIONAL CONTENT :
- Asking for and giving advice
- Transferring information
- Giving an opinion and arguing, making suggestions, reacting
- Recount facts in the past tense
- Describe and judge
- Giving an opinion on social behaviour (value judgements, surprises, tastes)

Course contents

Course material

Assessment

Individual assessment: EVI 1 (coefficient 1)

LANGUAGE OF INSTRUCTION	ECTS CREDITS	LECTURES	TUTORIALS	LAB	PROJECT	EXAM
Spanish	1	0 hrs	40 hrs	0 hrs	0 hrs	0 hrs

BACHELOR OF SCIENCE IN ENGINEERING

2025/2026 - 2e année - 2e Semestre - UE44

Non-skilled Internship [BSC_NSINTERNSHIP]

Responsable(s) du cours : Grégory LEGRAIN

Pré-requis

Objectifs

Ce stage est réalisé à la fin de la deuxième année. L'étudiant découvrira le monde du travail en tant que stagiaire non qualifié.

Plan de l'enseignement

Bibliographie

Évaluation

Évaluation individuelle : EVI 1 (coefficient 1)

LANGUE DU COURS	CRÉDITS ECTS	COURS MAGISTRAUX	TRAVAUX DIRIGÉS	TRAVAUX PRATIQUES	PROJET	DEVOIRS SURVEILLÉS
Anglais	5	0 hrs	0 hrs	0 hrs	0 hrs	0 hrs