



INSTITUT SUPÉRIEUR POLYTECHNIQUE PRIVÉ
المعهد العالي الخاص للتقنيات المتعددة



2020
2021

Génie
Mécatronique

ULT Mechatronics Engineering

Subjects Modules for S3

Semester 1 Year 2

U3.1: Electronics Electrotechnics EE3

U3.1.1: Discrete Systems Analysis

Module designation	Electronics Electrotechnics EE3
Module level, if applicable	Year 2, Semester 1
Code, if applicable	U3.1
Subtitle, if applicable	
Courses, if applicable	Discrete Systems Analysis
Semester(s) in which the module is taught	Semester 1 (S3)
Person responsible for the module	Dr Emna Rabhi
Lecturer	Dr Emna RABHI
Language	French
Relation to curriculum	Compulsory module ,
Type of teaching, contact hours	Lecture, 21 hours Classroom Lecture/ Semester
Workload	Total 51hours/ Semester (30 hours of Self Study)
Credit points	2
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	- Mathematics: handling of functions and sequences, integral calculus and series, Laplace transform. -Theory: Automatic Control: continuous-time linear systems.
Module objectives/intended learning outcomes	Objectives: 1. Understand Digital control. 2. Learn about Control process analysis in discrete control loop. 3. Familiarize with Performance Study of discrete systems. 4. Implement a digital correctors and related control law.

Content	<p>Chapter 1: Sampling and digitizing signals</p> <p>1.1 Principle of sampling 1.2 Spectral analysis of the sampled signal 1.3 Reconstruction of the continuous signal 1.4 Quantification 1.5 Coding</p> <p>Chapter 2: Numerical Process Control Modelling</p> <p>2.1 Order structure per computer 2.2 Characteristics of the digital control 2.3 Numerical System Bloc Diagram 2.4 Transfer Function of Numerical Systems <i>Tutorial1</i></p> <p>Chapter 3: Numerical Systems Stability</p> <p>3.1 Stability condition of the sampled linear systems 3.2 Algebraic stability criteria 3.3 Geometric criteria of stability a. Jury criterion b. Modified Routh criterion 3.4 Accuracy of closed loop sampled systems <i>Tutorial2</i></p> <p>Chapter 4: Sampled linear servo systems Regulation</p> <p>4.1 Principle 4.2 Dominant pole method (Zdan Corrector) 4.3 Synthesis with minimum response time 4.4 Regulator Servo-Tracking RST controller <i>Tutorial 3</i></p>
Study and examination requirements and forms of examination	Written Mid-Term Exam (40%) + Written Final Exam (60%)
Media employed	Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT) Video projection
Reading list	<p>Ph. Vanheeghe, C. Sueur, and P. Borne. Automatique des systemes echantillonnes. Technip, Paris, 2001 -</p> <p>- E. Dieulesaintand D. Royer. Automatique Appliquée { Systemes lineaires de commande a signaux echantillonnes, volume 2. Masson, Paris, 1990.</p> <p>- M. Ksouriand P.Borne. La commande par calculateur {APPLICATION aux procedes industriels. Technip, Paris, 1999.</p>

U3.1: Electronics Electrotechnics EE3

U3.1.2: Power Electronics

Module designation	Electronics Electrotechnics EE3
Module level, if applicable	Year 2, Semester 1
Code, if applicable	U3.1
Subtitle, if applicable	
Courses, if applicable	Power Electronics
Semester(s) in which the module is taught	Semester 1
Person responsible for the module	Dr Emna RABHI
Lecturer	Dr. Tarek Ben Saleh
Language	French
Relation to curriculum	Compulsory module ,
Type of teaching, contact hours	Lecture, 21 hours Classroom Lecture/ Semester 21 hours for Workshop in Lab / semester
Workload	Total 84 hours/ Semester (42 hours of Self Study)
Credit points	3
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Electrical Circuits, Analog & Digital Electronics
Module objectives/intended learning outcomes	Objectives: <ol style="list-style-type: none">1. Familiarize with Power Electronics devices2. Understand the operation and structure of rectifier3. Understand the operation of chopper, and Dimmer4. Understand the operation of an inverter and its control system

Content	<p>Chapter 1. The components of power electronics</p> <ol style="list-style-type: none"> 1. General <ol style="list-style-type: none"> 1.1- Introduction 1.2- The different power switches 2. Power components <ol style="list-style-type: none"> 2.1- Power diodes 2.2- Power transistors 2.3- Thyristors, IGBTs and MOSFETs 2.4- Comparative study of power switches <p>Chapter 2. The rectifier assemblies</p> <ol style="list-style-type: none"> 1. General <ol style="list-style-type: none"> 1.1- Definition of the rectifier assembly 1.2- Average value and effective value 1.3- Form factor and power factor 2. Uncontrolled rectifiers <ol style="list-style-type: none"> 2.1- Single-wave and double-wave assembly 2.2- Parallel three (P3) and double three (PD3) parallel mounting 3. Controlled rectifiers <ol style="list-style-type: none"> 3.1- Single-wave and double-wave assembly 3.2- P3 and PD3 assemblies 4. Mixed rectifiers <ol style="list-style-type: none"> 4.1- Symmetrical assemblies 4.2- Asymmetrical assemblies <p>Chapter 3. Chopping assemblies</p> <ol style="list-style-type: none"> 1. General <ol style="list-style-type: none"> 1.1- Role 1.2- Voltage source and current source 2. The series chopper <ol style="list-style-type: none"> 2.1- Structure 2.2- Equations of voltages and currents 2.3- Gaits of different sizes 3. The parallel chopper <ol style="list-style-type: none"> 3.1- Structure 3.2- Equations of voltages and currents 3.3- Gaits of different sizes 4. Reversible choppers <ol style="list-style-type: none"> 4.1- Reversible current chopper 4.2- Reversible tension chopper 4.3- Four quadrant chopper <p>Chapter 4. Dimmer assemblies</p> <ol style="list-style-type: none"> 1. Single phase dimmer <ol style="list-style-type: none"> 1.1- Structure 1.2- Flow on a resistive and inductive load 2. Three-phase dimmer <ol style="list-style-type: none"> 2.1- Structure 2.2- Flow on a resistive and inductive load <p>Chapter 5. The inverter assemblies</p> <ol style="list-style-type: none"> 1. Single phase inverter <ol style="list-style-type: none"> 1.1- Structure 1.2- Offset control 1.3- Adjacent command
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2. Three-phase inverter
 - 2.1- Structure
 - 2.2- Adjacent command
 - 2.3- Pulse Width Modulation PWM control

Practical workshop In Laboratory

- General Reminder

1. Safety Precaution:

- Do not touch any exposed wires.
 - Do not unplug the cable while the power is switched on.
2. Presentation of the work environment, Equipment's
 3. Presentation of power electronics components that will be used in the practical workshop
 4. How to read & implement un electronic circuit diagram

TP1: Uncontrolled Rectification

The goal of this practical work is to understand:

- The operating principle of the diode
- The structure of a non-controlled single-wave rectifier.
- The non-controlled structure PD2 and PD3.
- How to analyse their operations for different loads and plot the voltage and current chronograms.
- How to calculate the average value of the output voltage.

TP2: Controlled Rectification.

The aim of this practical work is to understand:

- The operating principle of the Thyristor.
- The structure of a half-wave controlled rectifier.
- The PD2 all-Thyristor structure,
- The Mixed PD2 of a full-wave rectifier and the PD3 all-Thyristor structure of a three-phase rectifier,
- How to analyse their operations for different loads and plot the voltage and current timing diagrams.
- How to calculate the average value of the output voltage.

TP3: Dimmers

The goal of this workshop is to understand:

- The structure of a single-phase and three-phase dimmer.
- The operation principles.
- How to analyze the operation for different loads and plot the current and voltage chronograms.
- The applications of dimmers.
- How to calculate the average value of the output voltage.

TP4: Direct Current (DC) Choppers.

The goal of this lab is:

- Implement the hardware circuit of a DC Chopper and carry-out necessary verifications tests
- Visualize and analyze different input/output waveforms.
- Interpret and use the measurements data.
- Check the relationship between the DC input voltage and the output voltage of the DC chopper, and determine the direction of the power flow.

	<p>-Check the operation of the DC Chopper while making a variation in the frequency.</p> <p>Concept:</p> <p>The goal is to understand and use, in complete safety, the main components of electricity and power electronics. By its concept and its quality, the student will be able to develop all types of power electronics assemblies without any danger. Quality, safety, diversity and modularity are the key words of this set of equipment which enables the acquisition and consolidation of the basics of electricity and power electronics.</p> <p>Equipment used :</p> <ol style="list-style-type: none">1. Power supply unit: DC, single-phase AC, three-phase AC,2. Measuring devices (voltmeters, ammeter, multimeters, power meters, Tachometer).3. Connection cables,4. The freewheeling diode;5. The different loads (resistance, inductance and capacitance);6. Thyristor control unit.7. Data acquisition interface card connected to a computer.
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Study and examination requirements and forms of examination	Written Mid-Term Exam (25%) + Practical Workshop(25%)+Written Final Exam (50%)
Media employed	Workshop Handbook in Lab Video projection
Reading list	<ul style="list-style-type: none"> - Document technique LAB-VOLT - A.Cunière, G.Feld, M.Lavabre :(2012) : Electronique de Puissance (Casteilla) - Gy .Seguier : (1999) : Electronique de puissance 7 eme édition (Dunod) - Alain Hebert, Claude Naudet et Michel Pinard (1997) : Machines Electriques Electronique de Puissance (DUNOD)

ULTE Université

U3.1: Electronics Electrotechnics EE3

U3.1.3: Signal Processing

Module designation	Electronics Electrotechnics EE3
Module level, if applicable	Year 2, Semester 1
Code, if applicable	U3.1
Subtitle, if applicable	
Courses, if applicable	Signal Processing
Semester(s) in which the module is taught	Semester 3 (S3)
Person responsible for the module	Dr Emna RABHI
Lecturer	Dr Emna RABHI
Language	French
Relation to curriculum	Compulsory module ,
Type of teaching, contact hours	Lecture, 21 hours Classroom Lecture/ Semester
Workload	Total 51 hours/ Semester (30 hours of Self Study)
Credit points	2
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Mathematics
Module objectives/intended learning outcomes	Objectives: 1. Understand the basic digital signal processing. 2. Understand Signal sampling and the reconstruction of an Analog signal, 3. Use the FOURIER transform of a discrete time signal, 4. Master the tools of time/ and frequency representation of Analog and Digital signals and systems. 5. Perform basic processing such as filtering and digital spectral analysis.

Content	<p>Chapter I- Introduction to Signal Processing</p> <ul style="list-style-type: none"> 1-Signals and systems general description 2- Class of Signals and Systems 3- Signals representation 4- Class of systems <p>Chapter II- Fourier Representation of Signals</p> <ul style="list-style-type: none"> 1- Periodic signals: Fourier series 2- Aperiodic signals: Fourier transform 3- The convolution product 4- Correlation <p>Chapter III- Signals digitization</p> <ul style="list-style-type: none"> 1- Ideal Sampling 2- Quantification 3- Coding (Binary, NRZ, Manchester, ...) <p>Chapter IV- Digital Filtering</p> <ul style="list-style-type: none"> 1- Linear Filtering 2- Digital Filters Classification 3- Digital Filter Design
Study and examination requirements and forms of examination	Written Mid-Term Exam (40%) + Written Final Exam (60%)
Media employed	<p>Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT)</p> <p>Workshop Handbook in Lab</p> <p>Video projection</p>
Reading list	<ol style="list-style-type: none"> 1. f. heitz « Introduction au traitement de signal » université strasbourg /icube cnrs ,janvier 2015 2. S. DOS SANTOS « signaux déterministes et signaux aléatoires » insa Centre Val de Loir, 2016 3. J.Yves Tournet « Traitement de signal » Université of Toulouse, ENSEEIHT-IRIT, 2013

U3.1: Electronics Electrotechnics EE3
U3.1.4 Electrical CAD (Altium Designer)

Module designation	Industrial Computing 3
Module level, if applicable	2 nd year, Semester 1
Code, if applicable	U3.1
Subtitle, if applicable	
Courses, if applicable	Electrical CAD (Altium Designer)
Semester (s) in which the module is taught	Semester 3 (S3)
Person responsible for the module	Dr Emna Rabhi
Lecturer	Dr Maher Ben HARIZ
Language	French
Relation to curriculum	Workshop + Project
Type of teaching, contact hours	12 hours practical workshop in Lab/ semester 09 hours project
Workload	Total 30 hours/semester (9 hours of Self-Study/semester)
Credit points	1
Requirements according to the examination regulations	Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Digital electronics, logical gates, fundamental laws of electricity, electronic components
Module objectives/intended learning outcomes	<p>Objectives:</p> <ol style="list-style-type: none"> 1. Familiarization with Altium Designer software 2. Drawing of an analogue circuit diagram 3. SPICE simulation of a circuit and analysis of the results 4. Creating a new library for Altium Designer software <p>Learning Outcomes:</p> <p>Students will be able to :</p> <ol style="list-style-type: none"> 1. Design a printed circuit board 2. Generate manufacturing output files

Content	<p style="text-align: center;">Practical Workshop</p> <p>Title 1. Introduction to Altium Designer Objectives :</p> <ul style="list-style-type: none"> - Discover the Altium Designer software - Familiarization with Altium Designer software <p>Title 2. Drawing of an analogue circuit Objectives :</p> <ul style="list-style-type: none"> - Drawing of an analogue circuit diagram - SPICE simulation of a circuit - Analysis of the results <p>Title 3. Design of a printed circuit board with Altium Designer Objectives :</p> <ul style="list-style-type: none"> - Design of a printed circuit board - Generate Manufacturing Output Files <p>Title 4. Creation of a new library and design of a printed circuit board Objectives :</p> <ul style="list-style-type: none"> - Creation of a new library for Altium Designer software - Design a printed circuit board - Generate manufacturing output files <p>Project: Project based on the creation of an exemple of Printed Circuit based on the exploitation of Altium Designer</p>
Study and examination requirements and forms of examination	100 % Oral Exam (Presentation + report)
Media employed	<p>Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT)</p> <p>Practical workshop in Laboratory</p> <p>Video projection</p>
Reading list	<p>1. Features and Benefits on Altium Designer 20 - PCB Design Software », archive sur Altium</p> <p>2. http://www.altium.com/en/mixed-signal-simulation</p>

U3.2: Mechanics 3
U3.2.2: Resistance Of Materials ROM

Module designation	Mechanics 3
Module level, if applicable	Year 2 , Semester 1
Code, if applicable	U3.2
Subtitle, if applicable	
Courses, if applicable	Resistance Of Materials ROM
Semester(s) in which the module is taught	Semester 3
Person responsible for the module	Dr Emna RABHI
Lecturer	M Yassine Ferchichi
Language	French
Relation to curriculum	Compulsory module ,
Type of teaching, contact hours	Lecture, 10.5 hours of Classroom Lecture/ Semester 10.5 hours for Workshop in Lab/ semester
Workload	Total 30 hours/ Semester (9 hours of Self Study)
Credit points	1
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Basic Mathematics, & Chemistry
Module objectives/intended learning outcomes	<p>Course Objectives:</p> <ol style="list-style-type: none"> 1. Understand the resistance of materials analysis method for structures to be deformable 2. Explain the nature of stresses developed in simple geometries for various types of simple loads. 3. Understand the different failure theories adopted in designing of mechanical structures considered to be deformable. <p>Course Outcomes Students will be able to:</p> <ol style="list-style-type: none"> 1. Model and define the internal forces in isostatic structures 2. Analyse and design structural parts subjected to tension, compression, and torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behaviour of materials. 3. Know the mechanical characteristics of materials; 4. Study the mechanical resistance of a part or a set of parts; 5. Study the deformation of a part or a set of parts;

Content	<p>CHAPTER 1: INTRODUCTION TO THE STRENGTH OF MATERIALS</p> <p>1 - Aim of the resistance of materials</p> <p>2 - General assumptions</p> <p style="padding-left: 20px;">2.1 - Assumptions on the material</p> <p style="padding-left: 40px;">2.1.1 - Continuity</p> <p style="padding-left: 40px;">2.1.2 - Homogeneity</p> <p style="padding-left: 40px;">2.1.3 - Isotropy</p> <p style="padding-left: 20px;">2.2 - Assumptions on the beams</p> <p style="padding-left: 20px;">2.3 - Assumptions on the external forces</p> <p style="padding-left: 20px;">2.4 - Assumptions on the strains</p> <p>CHAPTER 2: TORSE OF COHESION EFFORTS</p> <p>1 - Introduction</p> <p>2 - Balance of the beam</p> <p>3 - Components of cohesion efforts</p> <p>4 - Method of determining the cohesion torsor</p> <p>5 - Definition of simple stresses</p> <p>6 - Constraints</p> <p style="padding-left: 20px;">6.1 - Definition</p> <p style="padding-left: 20px;">6.2 - Normal stress and Tangential stress</p> <p style="padding-left: 40px;">6.2.1 - Normal stress</p> <p style="padding-left: 40px;">6.2.2 - Tangential stress</p> <p>7 - Applications</p> <p>CHAPTER 3: SIMPLE SOLICITATIONS</p> <p><i>Simple traction – compression</i></p> <p><i>Simple traction</i></p> <p>1 - Definition</p> <p>2 - Extension test</p> <p>3 - Study of deformations</p> <p>4 - Study of constraints</p> <p>5 - Stress strain relation: HOOKE law</p> <p>6 - Mechanical characteristics of a material</p> <p>7 - Stiffness condition</p> <p>8 - Resistance condition</p> <p>9 - Concentration of constraints</p> <p>10 - Application</p> <p><i>Flowchart for solving a simple traction problem /</i></p> <p><i>Simple compression</i></p> <p>1 - Definition</p> <p>2 - Note</p> <p><i>Simple Compression Problem Solving Flowchart</i></p> <p><i>Simple twist</i></p> <p>1 - Definition</p> <p>2 - Torsion test</p> <p>3 - Distribution of constraints</p> <p>4 - Polar quadratic moment</p> <p>5 - Deformation equation</p> <p>6 - Stiffness condition</p> <p>7 - Study of constraints</p> <p>8 - Resistance condition</p> <p>9 - Concentration of constraints</p>
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	<p>10 - Application Simple torsion shaft calculation flowchart Simple bending 1 - Definition 2 - Study of constraints 2.1 - Distribution of the stresses in a cross section: 2.2 - Note: 3 - Quadratic moment 4 - Resistance condition 5 - Concentration of constraints 6 - Stiffness condition 6.1 - Distorted 6.2 - Relationship between deflection and bending moment 6.3 - Condition of maximum deflection Applications: Simple bending beam dimensioning flowchart Coefficient of tensile stress concentration Torsional stress concentration coefficient Bending stress concentration coefficient Quadratic Moment Calculation Form Quadratic moment and characteristics of joists</p>
Study and examination requirements and forms of examination	Written Mid-Term Exam (25%) + Practical Workshop (25%) + Written Final Exam (50%)
Media employed	Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT) Video projection
Reading list	<ol style="list-style-type: none"> 1. Mécanique industrielle tome <u>1 ET 2</u>, Auteurs : a.j. Ballereau, j.p. Busato, g. Tranier , edition : foucher 1995. 2. Notion de résistance des matériaux tome 3, Auteur : g. Toulemonde, Edition : société des éditions technip 1973 3. Guide de calcul en mécanique, Auteurs : d. Spenle, r. Gourhant, edition : hachette 1996. 4. Application a la résistance des matériaux, Auteur : m. Kerguignas, edition : dunod 1981, 5. Résistance des matériaux, Auteurs : m. Kerguignas, g. Caignaert, Edition : bordas 1977. <p>- Calcul pratique des structures (exercices de résistance des matériaux), Auteur : w.a. Jalil, edition : eyrolles 198</p>

U3.2: Mechanics 3

U3.2.3: Manufacturing Techniques

Module designation	Mechanics 3
Module level, if applicable	Year 2 , Semester 1
Code, if applicable	U3.2
Subtitle, if applicable	
Courses, if applicable	Manufacturing Techniques
Semester(s) in which the module is taught	Semester 1
Person responsible for the module	Dr Emna RABHI
Lecturer	M Hamdi Mouellhi
Language	French
Relation to curriculum	Compulsory module ,
Type of teaching, contact hours	21 hours for Workshop in Lab/ semester
Workload	Total 51 hours/ Semester (30 hours of Self Study)
Credit points	2
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Technical Drawing ; Material & Resistance Of Material ; Manufacturing Technology-S2
Module objectives/intended learning outcomes	Objectives: 1- Understand mechanical manufacturing process 2- To Know the manufacturing quality control methods 3- Study "conventional" machining methods
Content	Practical workshop: 1) Introduction to mechanical manufacturing workshops: equipment, tasks, organization, safety standards. 2) Overview of conventional machine tools: lathe, milling machine, drilling machine - composition, design, operation, control devices, adjustment. 3) Adjustment of machine tools and realization of elementary surfaces: cylindrical, conical, plane, helical, exterior, interior. 4) Realization of real parts such as all elementary surfaces on different machines according to the part design drawings. 5) Dimensional control and necessary measurements of produced parts.

Study and examination requirements and forms of examination	100 % Practical evaluation (Oral+ Report)
Media employed	Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT) Workshop in Lab Video projection
Reading list	<ol style="list-style-type: none"> 1. production mécanique. castelli, 2004 2. Usinage : procédés et méthodes. cpu, 2002 3. précis construction mécanique. tome 1, tome 2. nathan, 2002 4. fabrication mécanique : notes des cours et exercices corrigés. cpu, 2006. 5. guide du technicien en productique. hachette, 2006

ULT Université

U3.2: Mechanics 3
U3.2.3: Transmission Mechanics

Module designation	Mechanics 3
Module level, if applicable	Year 2 , Semester 1
Code, if applicable	U3.2
Subtitle, if applicable	Transmission Mechanics
Courses, if applicable	
Semester(s) in which the module is taught	Semester 3 (S3)
Person responsible for the module	Dr Emna RABHI
Lecturer	Dr. Amine Karoui
Language	French
Relation to curriculum	Compulsory module ,
Type of teaching, contact hours	Lecture, 42 hours Classroom Lecture/ Semester
Workload	Total 84 hours/ Semester (42 hours of Self Study)
Credit points	3
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Basic Mathematics, Mechanical Technology, Resistance Of Material
Module objectives/intended learning outcomes	<p>Objectives:</p> <ol style="list-style-type: none"> 1- Identify the different transmission mechanisms; 2- Explain the main characteristics and the role of each organ; 3- Choose and justify a solution. 4- Identify the power transmitters. 5- Study the different types of reducers, gearboxes and variators.

Content	<p>Chapter 1: Power transmission components</p> <p>I. COUPLING</p> <ol style="list-style-type: none"> 1- Principle, function 2- Properties: Relative movements and homokinetic 3- Classifications <ol style="list-style-type: none"> a-Rigid couplings b-Torsionally rigid flexible couplings c-Elastic torsional couplings d-Cardan joint and similar 4- Selection criteria <p>II- CLUTCHES</p> <ol style="list-style-type: none"> 1- Classification <ol style="list-style-type: none"> a- Clutches by obstacle b- Adhesion clutches c- Couplers and converters 2- Study of the main types of clutches <ol style="list-style-type: none"> a-Study of the dog clutch b-Study of the disc clutch c-Study of the drum clutch 3- Selection criteria <p>III- BRAKES</p> <ol style="list-style-type: none"> 1- Classification <ol style="list-style-type: none"> a-Contact brakes b-Contactless brakes 2- Study of the main types of brakes <ol style="list-style-type: none"> a-Study of the shoe brake b-Study of the disc brake (s) c-Study of the drum brake d-Study of the strap brake 3- Selection criteria <p>IV- BELTS</p> <ol style="list-style-type: none"> 1- Classification <ol style="list-style-type: none"> a-Asynchronous belts (flat and trapezoidal) b-Synchronous belts (notched) 2- Kinematic and dynamic study of belts <ol style="list-style-type: none"> a-Flat belt b-V-belt 3- Selection criteria <p>Chapter 2: Power transmitters</p> <p>I-GEARS</p> <ol style="list-style-type: none"> 1- Parallel axis gears <ol style="list-style-type: none"> a- Geometric characteristics: Straight teeth, helical teeth b- Analysis of transmissible forces 2- Concurrent axis gears <ol style="list-style-type: none"> a- Geometric characteristics b- Analysis of transmissible forces 3- Left axle gears, wheel and worm <ol style="list-style-type: none"> a- Geometric characteristics b- Analysis of transmissible forces c- Yield – Irreversibility
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	<p>II- GEAR TRAINS</p> <p>1- Fixed axis gear train 2- Gear train with movable axis a- Plan epicyclic train b- Spherical epicyclic train</p> <p>III- SPEED DRIVERS</p> <p>1. General 2-Classification 3-Examples</p>
Study and examination requirements and forms of examination	Written Mid-Term Exam (40%) + Written Final Exam (60%)
Media employed	Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT) Video projection
Reading list	<ol style="list-style-type: none"> 1. Romdhane Ben Slama, Ali Fellah et Fethi Gmir, Technologie de conception : transmissions mécaniques. Tome II, centre de publication universitaire, Tunisie, 2013. 2. Francis Esnault, Transmission de puissance, Tome 2, 3eme édition, Dunod, 2009. 3. Dobrovolski V. Eléments de machines. Ed MIR, Moscou 1971 4. Artobolevski. Eléments de machines. Ed MIR, Moscou 1975 5. Henriot G. Traité théorique des engrenages. Dunod 1979.

U3.3: Mechatronics Elements 3
U3.3.1: Robotics 2

Module designation	Mechatronics Elements 3
Module level, if applicable	Year 2 , Semester 1
Code, if applicable	U3.3
Subtitle, if applicable	
Courses, if applicable	Robotics 2
Semester(s) in which the module is taught	Semester 3
Person responsible for the module	Dr Emna RABHI
Lecturer	M Moncef Chahed/ Melle Latifa Neffati
Language	French
Relation to curriculum	Compulsory module ,
Type of teaching, contact hours	Lecture, 21 hours Classroom Lecture/ Semester
Workload	Total 51 hours/ Semester (30 hours of Self Study)
Credit points	2
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Logic functions, Sensors-Actuators
Module objectives/intended learning outcomes	<p>Objectives:</p> <ol style="list-style-type: none"> 1. Understand modelling technique of the speeds at the level of a Robot manipulator 2. Calculate the Jacobean matrix related to the Robot manipulator 3. Determine the inverse kinematic model (deduce the singularities) 4. Familiarize with dynamic Modelling of robots (Lagrangian formulation) 5. Understand the basic of Dynamic Modelling techniques 6. Modelling by Lagrangian formulation 7. Modelling by Newton-Euler formulation

Content	<p>Part A Kinematic modelling of robots</p> <p>Chapter I- Introduction (review Robotics I)</p> <p>Chapter II- Inverse manipulator kinematics</p> <ol style="list-style-type: none"> 1. Introduction 2. Solvability 3. The notion of manipulator subspace when $n < 6$ 4. Algebraic vs. geometric 5. Algebraic solution by reduction to polynomial 6. Paul's solution 7. Application examples <p>Part B Introduction to dynamic robot modelling</p> <p>Chapter III- Jacobian and static efforts</p> <ol style="list-style-type: none"> 1. Linear And Rotational Velocity Of Rigid Bodies 2. Motion Of The Links Of A Robot 3. Velocity "Propagation" From Link To Link 4. Jacobians 5. Singularities 6. Static Forces In Manipulators <p>Chapter IV- Manipulator Dynamics</p> <ol style="list-style-type: none"> 1. Introduction 2. Acceleration Of A Rigid Body 3. Mass Distribution 4. Newton's Equation, Euler's Equation 5. Iterative Newton—Euler Dynamic Formulation 6. An Example Of Closed-Form Dynamic Equations 7. The Structure Of A Manipulator's Dynamic Equations 8. Lagrangian Formulation Of Manipulator Dynamics
Study and examination requirements and forms of examination	Written Mid-Term Exam (25%) + oral exam (presentation) (25%)+Written Final Exam (50%)
Media employed	Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT) Video projection
Reading list	<ul style="list-style-type: none"> • ROBOT MODELLING AND CONTROL: M.W.SPONG • Introduction to Robotics: Mechanics and Control (3rd Edition) JOHN J. CRAIG

U3.3: Mechatronics Elements 3
U3.3.2: Sensors & Actuators

Module designation	Mechatronics Elements 3
Module level, if applicable	Year 2, Semester 1
Code, if applicable	U3.3
Subtitle, if applicable	
Courses, if applicable	Sensors & Actuators
Semester(s) in which the module is taught	Semester 3 (S3)
Person responsible for the module	Dr Emna RABHI
Lecturer	Dr. Mohamed Nizar Bettaieb
Language	French
Relation to curriculum	Compulsory module ,
Type of teaching, contact hours	15 hours of Classroom Lecture/ Semester 6 hours for Workshop in LAB
Workload	Total 51 hours/ Semester (30 hours of Self Study)
Credit points	2
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Electricity, Fluid Mechanics
Module objectives/intended learning outcomes	<p>Objectives</p> <ol style="list-style-type: none"> 1. Familiarize with the Automated system components and functional structure Identification 2. Understand pneumatic and electric action chain analysis method 3. Identification and selection criteria for the acquisition chain 4. Study and design of the operating part and control part 5. Gain hands on experience on using sensors, actuators and data acquisition during project realization.

Content	<p>Chapter I. Automated System Structure</p> <ol style="list-style-type: none"> 1. Hardware structure of an automated system 2. Functional structure of an automated system <ol style="list-style-type: none"> a. News channel b. Power chain <p>Chapter II. Control Unit</p> <p>Chapter III. The operative part</p> <ol style="list-style-type: none"> 1. Action Chain <ol style="list-style-type: none"> a. Pneumatic Action Chain (distributors, cylinders) b. Electrical Action Chain (DC, AC and stepping motor) 2. Acquisition Chain <ol style="list-style-type: none"> a. Definition and role b. Sensor Operation c. Sensor families (Analog, Logical and Digital) <p>Chapter IV. The operational part and control part link</p> <p>Applications Example: Electro-pneumatic circuit Analysis Carry out a complete study (electrical and pneumatic) of an automated "palletizer" production system.</p> <p>Workshop:</p> <p>TP1: Sensors Static characteristics (Sensitivity, Linearity, Hysteresis, Thermal drift)</p> <p>TP2: Temperature measurement (RTD, Thermistor and Thermocouple)</p> <p>TP3: Data Acquisition</p> <p>TP4: Calibration techniques (Standards, Instruments: Balance and caliper)</p>
Study and examination requirements and forms of examination	Written Mid-Term Exam (25%) + oral presentation (25%) + Written Final Exam (50%)
Media employed	Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT) Video projection
Reading list	<ul style="list-style-type: none"> - Guide des sciences et technologies industrielles, Jean-Louis Fanchan, édition NATHAN 1994. - La pneumatique dans les systèmes automatisés de productions, S. Moreno, E. Peulot , Edition Casteilla 2001 - Moteurs électrique industriels, Pierre Mayé, Edition Dunod 2005. Les capteurs en instrumentation industrielle Georges Asch et coll, Edition Dunod 2010. - Measurement Fundamentals; National Instruments - Measurement, Instrumentation and Sensors Handbook, J.G.Webster, H.Eren, CRC Press (2019) - Data Acquisition and Signal Conditioning Course Manual; National Instruments; (2003) - Evaluation of measurement data — Guide to the expression of uncertainty in measurement; JCGM (2008) - Calibration guide series ; EURAMET (2009)

U3.4: Supervised & Embedded Systems
U3.4.3: Introduction to Internet Of Things (IOT)

Module designation	Supervised & Embedded Systems
Module level, if applicable	Year 2, Semester 1
Code, if applicable	U3.4
Subtitle, if applicable	
Courses, if applicable	Introduction to Internet Of Things (IOT)
Semester(s) in which the module is taught	Semester 3 (S3)
Person responsible for the module	Dr Emna RABHI
Lecturer	M Ahmed BOUGHANMI
Language	English
Relation to curriculum	Compulsory module ,
Type of teaching, contact hours	21 hours Workshop in Lab/ Semester 21 hours for Project in Lab / Semester
Workload	Total 51 hours/ Semester (9 hours of Self Study)
Credit points	2
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Microcontroller Architecture S2, Programming (S1),
Module objectives/intended learning outcomes	<p>Objectives:</p> <ol style="list-style-type: none"> 1. Define a complete IoT architecture, identify the available IoT networks and the communication protocols. 2. Take charge of open source IoT platform (software operation). 3. Develop IoT applications (prototyping) with the Raspberry pi platform and NodeMCU (software and Hardware)

Content	<p>Introduction to the Internet of Things</p> <p>1.1-Basic IoT concepts. Links with M2M. IoT architectures. 1.2-Problems of communication and energy. 1.3-The specificities of IoT networks (distance, positioning of equipment, autonomy). 1.4-The different communication protocols in the IoT field. 1.5-Storage and visualization of sensor data (take charge of open source solutions). 1.6-Application domain</p> <p>Project 1: with the NodeMCU Open Source platform (Wi-Fi platform)</p> <p>-Implementation of the NodeMCU platform (hardware design + programming language). -Prototyping: -Application 1: hardware communication to the Cloud. -Application 2: Cloud to Hardware communication.</p> <p>Project 2: with the Raspberry Pi platform</p> <p>-Application communicating with IBM's IoT platform -IoT application with the free ThingSpeak platform.</p>
Study and examination requirements and forms of examination	100% Practical evaluation (Oral Presentation + Report)
Media employed	Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT) Workshop handbook in Lab Video projection
Reading list	https://thingspeak.com/ https://www.nodemcu.com/index_en.html https://www.raspberrypi.org/

U3.4: Supervised and Embedded Systems

U3.4.2: Python Programming

Module designation	Supervised & Embedded Systems
Module level, if applicable	Year 2 , Semester 1
Code, if applicable	U3.4
Subtitle, if applicable	
Courses, if applicable	Python Programming
Semester(s) in which the module is taught	Semester 3
Person responsible for the module	Dr Emna RABHI
Lecturer	M ROUISSI Tawfik
Language	French
Relation to curriculum	Compulsory module ,
Type of teaching, contact hours	21 hours for Workshop in Lab / semester
Workload	Total 30 hours/ Semester (9 hours of Self Study)
Credit points	1
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Algorithmic, Basic programming, Mathematics, Simulation
Module objectives/intended learning outcomes	Objectives: 1- Learn Python language programming 2- Familiarize with the basic instructions, conditional and iterative structures, mathematical functions and the turtle. 3- Learn about advanced concepts: graphs, lists, probabilities and statistics, strings and functions.

Content	<p>Chapter 1: Introduction to the Python language</p> <ol style="list-style-type: none"> 1. Introduction 2. Checking for errors (debug) 3. Types of variables 4. Installing Python 5. Application: First Steps <p>Chapter 2: Basic Instructions</p> <ol style="list-style-type: none"> 1. Introduction 2. Choose: <ul style="list-style-type: none"> -Ifelse -Compact syntax of an alternative 3. Buckles 4. Sequence breaks 5. Exercises <p>Chapter 3: Mathematical functions</p> <ol style="list-style-type: none"> 1. Lists 2. Tuples 3. Associative arrays 4. Sets 5. Iterations on containers 6. Assignments <p>Chapter 4: The Turtle</p> <p>Chapter 5: Graphics</p> <p>Chapter 6: Lists</p> <p>Chapter 7: Probability and Statistics</p> <p>Chapter 8: Strings</p> <p>Chapter 9: Functions</p>
Study and examination requirements and forms of examination	100% Practical Workshop Evaluation (Oral+ Report)
Media employed	Workshop Handbook in Lab Video projection
Reading list	<ol style="list-style-type: none"> 1. « Python en concentré » A. Martelli, O'Reilly, France. 2. « Introduction à Python » M. Lutz et D. Ascher, O'Reilly, 3. « Python précis & concis » M. Lutz, O'Reilly, France.

U3.4: Supervised and Embedded Systems

U3.4.3: Synthesis & Technologies of Integrated Circuits

Module designation	Supervised & Embedded Systems
Module level, if applicable	Year 3, Semester 1
Code, if applicable	U3.4
Subtitle, if applicable	
Courses, if applicable	Synthesis & Technologies of Integrated Circuits
Semester(s) in which the module is taught	Semester 3
Person responsible for the module	Dr Emna RABHI
Lecturer	Dr. Tarek Ben Salah
Language	French
Relation to curriculum	Compulsory module ,
Type of teaching, contact hours	Lecture, 21 hours Classroom Lecture/ Semester 21 hours for Workshop in Lab / semester
Workload	Total 84hours/ Semester (42 hours of Self Study)
Credit points	3
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Logic circuit, digital electronics
Module objectives/intended learning outcomes	Objectives: 1. Familiarization with the Hardware Description Language VHDL 2. Understand digital design methods using VHDL language. 3. Practices on Coding, creating test-benches, simulation.

Content	<p>Chapter 1: Introduction</p> <p>I. Description of Programmable Logic Circuits</p> <p>II. Reminder on logic circuits (combinatorial / sequential)</p> <p>Chapter 2: VHDL Programming</p> <p>I. Introduction</p> <p>II. Definition</p> <ol style="list-style-type: none"> 1. Hardware Description Language 2. The VHDL language <p>III. Description in VHDL</p> <ol style="list-style-type: none"> 1. Description of the entity 2. Description of the architecture 3. Concurrent and sequential operation 4. Processes and functions <p>IV. Basic instructions and operators</p> <ol style="list-style-type: none"> 1. The operators 2. Instructions in concurrent mode <ol style="list-style-type: none"> 2.1. Conditional assignment 2.2. Selective assignment 2.3. Generated instruction 3. Instructions in sequential mode <ol style="list-style-type: none"> 3.1. Conditional assignment 3.2. Selective assignment 3.3. Loop instruction <p>V. Instantiation of components in VHDL</p> <p>VI. Sequential systems</p> <p>Chapter 3: Finite State Machines</p> <p>I. Introduction</p> <p>II. Definition</p> <p>III. The state machine</p> <ol style="list-style-type: none"> 1. Architecture of the state machine (Moore and Mealy) 2. State graph <p>VI. Writing in VHDL language of a state machine</p> <ol style="list-style-type: none"> 1. Description with 2 processes (G + M) / F 2. Description with 2 processes (G + F) / M 3. Description with 3 process G / F / M
Study and examination requirements and forms of examination	Written Mid-Term Exam (25%) + Practical Workshop(25%)+Written Final Exam (50%)
Media employed	Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT) Workshop Handbook in Lab Video projection
Reading list	<p>1- Lire et comprendre VHDL et AMS, ISBN 978-1-4092-2787-8</p> <p>2- Le Langage VHDL du langage au circuit, du circuit au langage, ISBN 978-2-10-072688-2</p> <p>3- VHDL Tutorials</p>

U3.5: Languages & Social Science 3

U3.5.1 Scientific Writing

Module designation	Languages & Social Science 3
Module level, if applicable	2 nd year of engineering Cycle
Code, if applicable	U3.5
Subtitle, if applicable	-
Courses, if applicable	Scientific Writing
Semester (s) in which the module is taught	Semester 3 (S3)
Person responsible for the module	Dept. Head
Lecturer	Amel Zougha
Language	English
Relation to curriculum	Professional Module, Compulsory
Type of teaching, contact hours	21 Seminar- Project
Workload	Total 51 Hours (30 Hours of Self Study)
Credit points	2
Requirements according to the examination regulations	-Minimum Attendance rate : 80% >20% of non-attendance= elimination for exams
Recommended prerequisites	English language skill (S1, S2)
Module objectives/intended learning outcomes	<p>Objectives:</p> <p>1. Learn how to write a clear and concise article that will appeal to a broad audience.</p> <p>Learning Outcomes:</p> <p>Students will be able to :</p> <ol style="list-style-type: none"> 1. Write an abstract 2. Structure project data 3. Write a full publication (in Poster session)

<p>Content</p>	<p style="text-align: center;">Classroom Lecture</p> <p>Chapter 1. Elements of writing style In this chapter student will learn:</p> <ul style="list-style-type: none"> • some simple changes you can make when writing to make your papers easier to read • how to use different paragraph types and transitions to create focus and flow in your manuscript • how to improve your writing style through exercises. <p>Chapter 2. Titles and abstracts In this chapter student will learn:</p> <ul style="list-style-type: none"> • what makes a good title • two easy-to-use abstract templates that you can apply directly to your own writing • what to avoid when writing titles and abstracts. <p>Chapter 3. From introduction to conclusion In this chapter student will learn:</p> <ul style="list-style-type: none"> • what should be included in, or excluded from, each section of the paper • how to organize your ideas effectively and avoid common mistakes • how to create a narrative flow to help readers follow your argument. <p>Chapter 4. Data management In this chapter student will learn:</p> <ul style="list-style-type: none"> • why it is important to accurately record, share and preserve your data • the best approaches to managing your research data • the importance of sharing your data and who might use it. <p>Chapter 5. Data presentation In this chapter student will learn:</p> <ul style="list-style-type: none"> • the four principles of creating clear and engaging figures for your paper • how to choose which figures to include in your manuscript • best practices in raw data processing and image preparation • tips to ensure that your figures are clear and informative for your readers. <p style="text-align: center;">Project :</p> <p>Content: Each Student will prepare a publication for the Poster session organized every year at the end of the Annual Project.</p>
<p>Study and examination requirements and forms of examination</p>	<p>Evaluation of Publication, Poster and oral presentation (100%)</p>

Media employed	Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT) Video projection
Reading list	1. UC Berkeley Student Learning Center https://slc.berkeley.edu/writing-worksheets-and-other-writing-resources

ULT Université

U3.5 : Languages & Social Science 3

U3.5.2 : English TOEIC 1

Module designation	Languages & Social Science 3
Module level, if applicable	Year 2, Semester 1
Code, if applicable	U3.5
Subtitle, if applicable	
Courses, if applicable	English TOEIC 1
Semester(s) in which the module is taught	Semester 1
Person responsible for the module	Dr Emna RABHI
Lecturer	Nadia Zardi
Language	English
Relation to curriculum	Compulsory module , Soft Skills
Type of teaching, contact hours	Lecture, 42 hours Classroom Lecture/ Semester
Workload	Total 51 hours/ Semester (9 hours of Self Study)
Credit points	2
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Upper intermediate level in both listening and reading skills.
Module objectives/intended learning outcomes	<p>Prepare students to take TOEIC test by providing related necessary linguistic knowledge. Focus is put on how to approach the different parts of test items and to develop test taking skills, in order to reach the highest score possible.</p> <p>Competencies: By the end of the course the student should be able to:</p> <p>General Competencies</p> <ul style="list-style-type: none"> - Reach the highest score possible - Develop at most his/her Listening and reading skills. <p>Specific Competencies</p> <ul style="list-style-type: none"> - Recognize the different parts of TOEIC. - Develop tactics and strategies appropriate to each type of activity, (ex: skimming and scanning). - Distinguish tasks to be performed in every activity. - Establish a proper pace to follow throughout the exam. - Managing allocated time. - Follow steps

Content	<p><u>Unit 1 Careers</u> Vocabulary builder:</p> <ul style="list-style-type: none"> • Professions • Recruitment, job interview, temp agency • Job fair talks, training <p>Grammar check:</p> <ul style="list-style-type: none"> • Present simple/continuous • Why Questions • Suffixes <p><u>Unit 2 Workplaces</u> Vocabulary builder:</p> <ul style="list-style-type: none"> • Office description (architecture, law, chemistry, mechanical Engineering, industry) • Technology and communication at work: hardware/ electrical equipment <p>Grammar check:</p> <ul style="list-style-type: none"> • Count/ non-count nouns • Prepositions: place, movement, time. <p><u>Unit 3 Communication</u> Vocabulary builder:</p> <ul style="list-style-type: none"> • Internet (information technology) • Media: print media, broadcasting, news bulletin, postal services • Advertising: Commercials, banners, flyers... <p>Grammar check:</p> <ul style="list-style-type: none"> • Present perfect/ past simple • Compound nouns
Study and examination requirements and forms of examination	Written Mid-Term Exam (40%) + Written Final Exam (60%)
Media employed	Course Material (Hard/ Soft copy) for Classroom & Online (Moodle ULT) Video projection
Reading list	<ul style="list-style-type: none"> ✓ Market leader, David cotton, David Falvey , Simon Ken; FINANCIAL TIMES (Pearson Longman) ✓ Tactics for TOEIC® Listening and Reading Test: Grant Trew, OUP Oxford, 2007. ✓ Target Score Student's: A Communicative Course for TOEIC® Test Preparation, Charles Talcott & Graham Tullis, Cambridge University Press, 2007 ✓ Understanding and Using English Grammar, Betty Schramper Azar; Prentice Hall Regents; ✓ YouTube Videos

U3.6: Project 2
U3.6.1: Supervised Project 2

Module designation	Year Project 1
Module level, if applicable	Year 2, Semester 1
Code, if applicable	U3.6
Subtitle, if applicable	
Courses, if applicable	Supervised Project 2
Semester(s) in which the module is taught	Semester 1 (S3)
Person responsible for the module	Dr Emna RABHI
Lecturer	M Nizar Mertah
Language	French
Relation to curriculum	Compulsory module ,
Type of teaching, contact hours	21 hours for project Supervision / semester
Workload	Total 51 hours/ Semester (30 hours of Self Study)
Credit points	2
Requirements according to the examination regulations	- Minimum attendance rate: 80% of the total contact hours >20 % of nonattendance = elimination for exams
Recommended prerequisites	Subjects S1-S3 Tools: Catia, Matlab, PLC, STM32, C, etc
Module objectives/intended learning outcomes	<ol style="list-style-type: none"> 1- Project topic selection 2- Project studies (functional and structural analysis, design (preparation of technical files) 3- Design Simulation using the appropriate software tools

Content	<p>Project 1: Module de mesure de puissance avec alerte</p> <ul style="list-style-type: none"> - Programmation Arduino - Proposer une solution optimale - Calcul électronique de puissance <p>Project 2: Control d'accès sécurisé</p> <ul style="list-style-type: none"> - Programmation Arduino - Empreinte digitale, RFid et code - Conception boitier + Réalisation <p>Project 3: Input Raspberry Pi avec LeapMotion</p> <p>Programmation Raspberry Pi</p> <ul style="list-style-type: none"> - Mouse Input API - Changement de repère <p>Project 4: Miroir interactif:</p> <ul style="list-style-type: none"> - Conception (Solidworks ou Catia) + Réalisation - Programmation Raspberry Pi - Application Python <p>Project 5 : Module IOT de control d'éclairage à distance (Locale)</p> <ul style="list-style-type: none"> - Programmation Arduino Node MCU - Conception de carte électronique (selon cahier des charges) + Réalisation - Application Android (Facultatif)
Study and examination requirements and forms of examination	Project presentation + report
Media employed	Email, Video Projector, Meeting Online
Reading list	PROVIDED BY SUPERVISOR