ELECTROMECHANICAL ENGINEERING
STUDENT GUIDE

ELECTROMECHANICAL ENGINEERING STUDENT GUIDE

1. Welcome from the General Management

Twenty-seven (27) years or a little more is not a long time in the life of an institution, but it is enough to be able to stand out from the crowd. In its vision of the training of executives of a continent (Africa) in the making, IPSAS has always proposed to achieve a double objective:
To train engineers in the latest technologies;
To give him the capacity to react and adapt to situations where often
the minimum of technologies is assured.
By choosing IPSAS, you make the choice to learn how to think, react and manage situations. Thanks to a teaching staff totally involved in this process of acquiring a method in addition to knowledge, IPSAS can already be proud of its graduates who are making careers in Tunisia and throughout Africa and the world.

By becoming an IPSAS student, you make a choice, the best one, and you guarantee yourself the possibility to choose your future profession. As you progress through our site, you will hopefully feel part of the IPSAS world, the world of a future that can be achieved.

2. General presentation of the hierarchy

Chairman and Managing Director: Mr Najib KAMOUN

Director: Mr Mohamed Achraf KAMOUN

Secretary General: Mr Mohamed ZGHAL

Director of Studies: Mr George KANTCHEV

Financial Director: Mr Farid KAMOUN

Head of Schooling: Mr Moez KAMOUN

Communication Managers: Mrs Wabo Ulrich Kengne/ Ayman KAMOUN

Quality Manager: Mr Karim JELLALI

Head of Laboratories: Anis KAMOUN

3. IPSAS vision

The vision of the programme is an essential component of the IPSAS strategy and must necessarily reflect the main vocation of our organisation. A strategy clearly described in the IPSAS quality policy based on a fundamental principle that makes the satisfaction of stakeholders (such as students, teachers...) a priority of the organisation. Learner satisfaction should not only be understood as satisfaction during the student's academic career. The vision is broader than this concept because it is closely linked to the creation of programmes that respect the global evolution in the industrial and technological context and especially the demand imposed by the labour market. This will provide the learner with the opportunity to be an active component in the labour market upon graduation. This makes IPSAS a dynamic player in its societal contribution through the creation of value in the university training sector. A training that is not only based on theoretical training but also on a dynamic vision allowing the training of engineers with a combination of theoretical knowledge and practical know-how allowing the engineer to exercise and impose himself by his achievements as being competent at the level of the labour market. This vision can only be successful if a set of practical elements is implemented with a clear mission.

4. Missions

The missions reflecting the implementation of the strategic vision of IPSAS for all its programmes can be summarised in five main points

1) Organise innovative education based on innovative research results to produce graduates who are competent, respectful, entrepreneurial and competitive on a national and international scale;

2) To provide the necessary resources for the implementation of this curriculum;

3) Develop a quality assurance system for education based on good governance.

4) Organise a monitoring and evaluation service for the civil engineering programme to continuously improve its content.

5) Develop a network of cooperation with stakeholders related to the application of

5) Develop a network of cooperation with stakeholders related to the application of innovation in learning through the creation of a network of experts to participate in the updating of the programme.

The programme offers students the opportunity to acquire the required competences in the taught field of expertise are expected and needed. The learning outcomes are also determined according to the objectives.

5. The aims

IPSAS aims to :

1) Train and certify graduates who are competent in their specific engineering field, entrepreneurial and globally competitive. Engineers who :

a. have widely recognised "business" skills in their specific technological field;

b. are open-minded, adaptable and highly reactive due to a strong mix of cultures (wide range of recruitment both in terms of profile and social background);

c.apt to disseminate in the industrial fabric a culture of complex problem solving acquired through the diversity of practical cases studied throughout their course.

2) To deliver training :

Able to respond to the national and international needs and problems that concern their sector of activity.

Based on the results of research into recent technologies and labour market demand.

Where consultation with basic and applied industry stakeholders forms a basis for programme design and evaluation.
Able to respond to specific problems.

4) Strengthen the system of governance, quality assurance and awareness of the programmes.

5) Expand collaborative networks with stakeholders related to their discipline of study.

of study.

6. Curriculum design

Learning is no longer focused solely on outcomes, but also on the educational objectives of the civil engineering curriculum. Objectives that focus on producing graduates who are capable of becoming reliable professionals, leaders and change agents in the organization where they regularly practice and contribute to development.

The updating of the programme is an essential element of continuous improvement that allows us to offer training that evolves together with the demands of the labour market, the evolution of technology and the societal expectations of IPSAS. To this end, it is essential to review the competency profile by experts and teachers in the field, periodically to improve the quality of the graduates' profile. This also includes the evaluation and updating of the programme with the participation of the Scientific Council, teaching staff, students and related institutional stakeholders. The procedure for the development of the competency profile related to the redesign of the curriculum is explained below:

1) Assess and redesign the curriculum

2) Implement the follow-up study of graduates in their start-up and career development with the participation of relevant institutional stakeholders.

3) Construct the competence profile based on the outcome of the study and the improvement of the curriculum.

The participants in this process are the IPSAS Scientific Board, the students, the programme managers, the organisations with expertise in the field of civil engineering (building and construction companies, consultancies etc.) and the teaching staff. This vision of continuous improvement, based on the intervention of the stakeholders, is the approach that will be taken into account by the IPSAS management

7. General presentation of the programme

The "Electromechanical Engineering" engineering cycle is a curriculum conceived and designed by the Polytechnic Institute of Advanced Sciences (IPSAS) based in Sfax, Tunisia. This program has been authorized by the Tunisian Ministry of Higher Education since 2003.

Electromechanical Engineering

Competence framework: what are the competences attested at the end of the training?

A.1 The acquisition of scientific and technical knowledge and the mastery of their implementation:

1. knowledge and understanding of a wide range of basic sciences and the associated capacity for analysis and synthesis in the electromechanical field

The electromechanical engineer training aims to develop the ability to manage complex systems, using modelling, optimisation and visualisation to better analyse, predict and communicate

2. the ability to mobilise the resources of a specific scientific and technical field of electromechanical training

3. mastery of the methods and tools of the engineer:

- identification, modelling and resolution of complex problems,

- use of computer tools,

- design and modelling of systems

4. the ability to design, implement, test and validate innovative solutions, methods, products, systems and services:

- identify measurement, diagnostic and calculation tools and know how to propose their use

- make decisions in advanced technical fields

- demonstrate a spirit of synthesis

5. the ability to carry out fundamental or applied research activities, to set up Experimental devices, to be open to the practice of collaborative work

6. the ability to find relevant information, evaluate it and use it:

- informational competence

A.2 Adaptation to the specific requirements of the company and society :

7. the ability to take into account the company's challenges: economic dimension, respect for quality, competitiveness and productivity, commercial requirements, economic intelligence

- competitiveness and productivity,

- respect for quality,

8. the ability to take into account the issues of labour relations, ethics, responsibility,

safety and health at work

9. the ability to take into account environmental issues, in particular by applying the principles of sustainable development

10. the ability to take into account the challenges and needs of society

A.3 Taking into account the organisational, personal and cultural dimension :

11. the ability to fit into professional life, to integrate into an organisation, to manage it and to make it evolve: exercise of responsibility, team spirit, commitment and leadership,

project management, project management, communication with specialists and non-specialists

12. the ability to undertake and innovate, in the context of personal projects or through initiative and involvement within the company in entrepreneurial projects

13. the ability to work in an international context: mastery of one or more foreign languages and associated cultural openness, ability to adapt to international contexts

- mastery of French,

- mastery of English,

14. the ability to know oneself, to evaluate oneself, to manage one's competences (especially in a lifelong learning perspective), to make professional choices

Summary of skills acquired by graduates

The skills needed to carry out the activities of the "electromechanical" engineer profession can be presented under three categories

Basic skills

Engineers must be able to :

- analyse and synthesise complex electromechanical systems,

- mobilise scientific and technical resources,

- mastering computer methods and tools and modelling,

- have the capacity for research or R&D activities and be open to collaborative work.

Specific skills

Other skills are more specific to the electromechanical field. Engineers must be able to :

- design, implement, test and validate innovative solutions, methods, products, systems and services

- have the ability to find relevant information, evaluate it and exploit it,

- have the ability to take into account the economic dimension, respect for quality, competitiveness and productivity

quality, competitiveness and productivity, commercial requirements, economic intelligence.

Common skills

Certain skills are common to the engineering professions and more particularly applicable to "electromechanical" engineers who must be able to have

- the ability to work in an international context: mastery of one or more foreign languages and associated cultural openness,

- the ability to take into account environmental issues, particularly by applying the principles of sustainable development

- the ability to integrate into professional life, to become part of an organisation, to lead it and to develop it: exercise of responsibility, spirit of cooperation, ability to work in an international context: mastery of one or more foreign languages and associated cultural openness
teamwork, commitment and leadership, project management, project management, communication with specialists and non-specialists alike.

Behavioural skills are also necessary for these very complex jobs:

- ability to take into account the issues of workplace relations, ethics, responsibility, safety and health at work

- ability to take into account the challenges and needs of society,

- autonomy, decision-making capacity, organisational skills.

Based on the 14 competences listed in the reference framework, a matrix of competences was established for each of the three years of training.

8. Conditions of access

Admission to IPSAS is in accordance with the provisions of Law No. 2000-73 of 25 July 2000 regulating private higher education.
25 July 2000 regulating private higher education. Two types of admission are possible:

- Direct admission: This concerns students who have a Tunisian or foreign baccalaureate.
- Access after decision of admission: It concerns the candidates of Tunisian or foreign nationality, who wish to register in an engineering cycle.
- Tunisian students who have completed a public or private preparatory cycle may apply for enrolment in the engineering cycle.
- The Tunisian student holder of a technological licence having links with the chosen engineering course of study, can apply for a registration in the engineering cycle.
- Foreign students who hold a preparatory cycle, a DUT, Licence, BTS or equivalent obtained in their country of origin can apply for registration in the engineering cycle.

When to fill in an application form?

You must fill in an application form:

When you wish to enrol in a study programme;

- If you have already applied for admission but have not yet registered;
- If you have suspended your enrolment at IPSAS for more than one year and wish to be re-admitted to the same programme;

Admission procedure:

- To be admitted to one of the IPSAS study programmes, you must: Complete an application form to be collected from our premises or online.

- Send the completed application and the required supporting documents to the admissions office in our offices or by email to :

Each form allows you to apply for admission to two programmes according to your first and second choice.

Admission file and required documents:

- A completed application form

- A birth certificate in French

- A complete school file including :

● For applicants still in high school or in a secondary school at the time of application: transcripts of marks obtained at that date for the current year and the previous year.

● For applicants who are still in secondary school at the time of application: transcripts of marks obtained at that time for the current and previous years, admission being subject to obtaining the baccalaureate.

● For all other persons: transcripts of marks obtained during the three previous years as well as those of the current year, if applicable.

●The diplomas obtained, certified as true copies of the original.

●Where applicable, the certificate of registration issued by the last university attended.

●Any additional information deemed useful or necessary.

●All documents submitted, except the original diplomas, remain the property of IPSAS.

Final admission:

Registration is considered final only after acceptance of the student's file by the university and payment of the tuition fees and other required fees.

NB: Tuition fees are due for the whole year and are payable at the time of registration, unless otherwise agreed by the General Management. Any amount paid remains the property of IPSAS. No refunds or reductions will be made for

cancellation of registration, late entry, absence, illness, voluntary departure or exclusion, etc.

As soon as IPSAS confirms the final admission, the student must complete his/her admission file with the following documents

- 2 identity photos

- A photocopy of the national identity card for Tunisians

- Proof of payment of tuition fees as fixed by the payment procedure for foreign students (additional documents to be produced)

Université Privée Du Sud
POLYTECHNIQUE
DES SCIENCES AVANCÉES
SFAX - TUNISIE

Electromechanical Engineering

Program Plan

Modules repartition

Modules Sheets

Revised version October 2021

Electromechanical Engineering First Year Semester 1

Idnt	CTSE	Intitulé	CI	TP	CI+TP	T.per	T		Coef	E		GM
Course Id			**L**	**PW**	**L+PW**	**Self pr.**	**T**	**ECTS**		**E**	**Subject**	
Mth IN	MGEM11.01	Mathématique pour Ingénieur	30	0	30	25	55	2	2	CC+E	Mathematics for Engineers	GM1-1
Con Méc	MGEM11.02	Conception mécanique	30	15	45	50	95	3,5	2,5	CC+E	Mechanical Design	GM1-3
RDM	MGEM11.03	Résistance des matériaux	30	15	45	50	95	3,5	2,5	CC+E	Strength of materials	GM1-4
TF	MGEM11.04	Technologie de fabrication	30	15	45	40	85	3	2,5	CC+E	Manufacturing technology	GM1-3
Thrmo	MGEM11.05	Thermodynamique	24	15	39	40	79	3	2,5	CC+E	Thermodynamics	GM1-2
SCL	MGEM11.06	Système et circuit logique	30	15	45	40	85	3	2,5	CC+E	System and logic circuit	GM1-5
Elec	MGEM11.07	Electronique I (Electronique analogique)	30	15	45	40	85	3	2,5	CC+E	Electronics I (Analogue electronics)	GM1-6
CaidDe	MGEM11.08	Infographie (conception assisté par ordinateur)	0	51	51	30	81	3	1,5	CC	computer-aided design	GM1-3
Dr T	MGEM11.09	Droit de travail	24	0	24	20	44	2	1,5	CC+E	Labour law	GM1-7
Tech Com	MGEM11.10	Techniques de Communication	24	0	24	20	44	2	1,5	CC+E	Communication techniques	GM1-7
		Total (GEM1/Semester 1 :	**252**	**141**	**393**	**355**	**748**	**28**	**21,5**			

Electromechanical Engineering First Year Semester 2

Idnt	CTSE	Intitulé	CI	TP	CI+TP	T.per	T		Coef	E		GM
Course Id			**L**	**PW**	**L+PW**	**Self pr.**	**T**	**ECTS**		**E**	**Subject**	
TRP I	MGEM12.11	Transmission de Puissance et de Mouvement I	30	15	45	50	95	3,5	2,5	CC+E	Transmission of Power and Movement I	GM1-3
MMC	MGEM12.12	Mécanique des Milieux Continus	30	0	30	30	60	2	2	CC+E	Continuous Media Mechanics	GM1-4
HetTr	MGEM12.13	Transfert de chaleur	30	15	45	40	85	3	2,5	CC+E	Heat transfer	GM1-2
MF	MGEM12.14	Mécaniques des fluides	30	15	45	40	85	3	2	CC+E	Fluid mechanics	GM1-2
Em	MGEM12.15	Machines électriques (Machine à courant continu et moteur pas à pas)	30	15	45	40	85	3	2,5	CC+E	Electric machine (DC Machine and Stepper Motor)	GM1-6
Electro Tech	MGEM12.16	Electrotechnique	30	15	45	40	85	3	2,5	CC+E	Electrical engineering	GM1-6
AnaDy	MGEM12.17	Automatique I +II(Analyse des systèmes dynamiques et continus)	45	15	60	25	85	3	2,5	CC+E	Analysis of dynamic and continuous systems	GM1-5
Rop	MGEM12.18	Recherche Opérationnelle	24	0	24	25	49	2	1,5	CC+E	Operational research	GM1-1
Mini Pro	MGEM12.19	Mini projet	0	30	30	25	55	2	1,5	CC	Mini-project	GM1-3
Ang	MGEM12.20	Anglais I for SpecificPurposes	24	0	24	30	54	2	1,5	CC+E	Anglais I for SpecificPurposes	GM1-7
CreEnt	MGEM12.21	Création de l'entreprise	24	0	24	24	48	1,5	1,5	CC+E	Setting up the company	GM1-7
StatProb	MGEM12.22	Statistique et probabilités	24	0	24	24	48	2	1,5	CC+E	Statistics and Probability	GM1-1
		Total (GEM1/Semestre 2 :	321	120	441	393	834	30	24			
		Total GEM1 :	573	261	834	748	1582	58	45,5			

Electromechanical Engineering Second Year Semester 1

Idnt		Intitulé	CI	TP	CI+TP	T.per	T		Coef	E		GM
Course Id			**L**	**PW**	**L+PW**	**Self pr.**	**T**	**ECTS**		**E**	**Subject**	
MOSEM	MGEM21.24	Mise en œuvre sans enlèvement de matière	30	30	60	30	90	3	2,5	CC+E	Processing without material removal	GM2-2
CS	MGEM21.25	Calcul des structures	30	0	30	40	70	2,5	2	CC+E	Structural Analysis	GM2-3
Mét Phy	MGEM21.26	Métallurgie Physique	27	0	27	30	57	2	1,5	CC+E	Physical Metallurgy	GM2-3
Mec Vib	MGEM21.27	Mécanique vibratoire	30	15	45	40	85	3	2	CC+E	Mechanical Vibration	GM2-5
Rob	MGEM21.28	Robotique (Initiation au Robotique)	24	0	24	25	49	2	1,5	CC+E	Robotics (Introduction to Robotics)	GM2-6
Mach Ele II	MGEM21.29	Machines électriques II (Machines électriques à courant alternatif)	36	15	51	34	85	3	2,5	CC+E	Electrical machines II(AC Electrical Machines)	GM2-1
Sch Elc	MGEM21.30	Schémas électriques (Schéma et protection électriques)	24	15	39	30	69	2	2	CC+E	Electrical diagrams (Electrical diagrams and protection)	GM2-1
Auto Pro	MGEM21.31	Automates programmables	30	15	45	50	95	3,5	2,5	CC+E	Programmable Logic Controllers	GM2-6
An Num	MGEM21.32	Analyse numérique	24	0	24	40	64	2,5	1,5	CC+E	Numerical analysis	GM2-4
AngII	MGEM21.33	Anglais II	24	0	24	35	59	2	1,5	CC+E	English II	GM2-7
Tech Com	MGEM21.34	Techniques de communication	24	0	24	20	44	1,5	1,5	CC+E	Communication techniques	GM2-7
Info I	MGEM21.35	Informatique I	0	30	30	25	55	2	1,5	CC	Computer science I	GM2-7
		Total (GEM2/Semester1 :	**303**	**120**	**423**	**399**	**822**	**29**	**22,5**			

Electromechanical Engineering Second Year Semester 2

Idnt		Intitulé	CI	TP	CI+TP	T.per	T		Coef	E		GM
Course Id			**L**	**PW**	**L+PW**	**Self pr.**	**T**	**ECTS**		**E**	**Subject**	
TRP II	MGEM22.36	Transmission de puissance et de mouvement II	30	15	45	45	90	3,5	2,5	CC+E	Power and motion transmissionII	GM2-5
MTM	MGEM22.37	Métallurgie et traitement des métaux	30	12	42	40	82	3	2	CC+E	Metallurgy and metal processing	GM2-3
Pro F	MGEM22.38	Processus de fabrication	30	-	30	30	60	2	1,5	CC+E	Manufacturing process	GM2-2
ADM	MGEM22.39	Analyse dynamique des machines	30	12	42	40	82	3	2	CC+E	Dynamic analysis of machines	GM2-4
CND	MGEM22.40	Contrôle destructif et non destructif des métaux	24	15	39	30	69	2	2	CC+E	Destructive and non-destructive testing of metals	GM2-3
Mécato	MGEM22.41	Mécatronique	24	-	24	30	54	2	2	CC+E	Mechatronics	GM2-2
Elec Pui II	MGEM22.42	Electronique de puissance I	30	15	45	40	85	3	2,5	CC+E	Power electronics I	GM2-1
Diag M	MGEM22.43	Diagnostique et maintenance	21	9	30	30	60	2	2	CC+E	Diagnosis and maintenance	GM2-5
Electo II	MGEM22.44	Electronique II (Electronique analogique)	30	15	45	40	85	3	2,5	CC+E	Electronics II (Analogue Electronics)	GM2-1
MCN	MGEM22.45	Programmation des machines-outils commande numérique	30	24	54	40	94	3,5	2,5	CC+E	Programming of NC machine tools	GM2-6
Mini Pro	MGEM22.46	Mini projet	0	30	30	30	60	2	1	R	Mini-project	GM2-4
		Total (GEM2/Semester2 :	**279**	**147**	**426**	**395**	**821**	**29**	**22,5**			
		Total GEM2 :	**582**	**267**	**849**	**794**	**1643**	**58**	**45**			

Electromechanical Engineering third Year Semester 1

Idnt		Intitulé	CI	TP	CI+TP	T.per	T		Coef	E		GM
Course Id			**L**	**PW**	**L+PW**	**Self pr.**	**T**	**ECTS**		**E**	**Subject**	
GP	MGEM31.48	Gestion de production	24	0	24	30	54	2	1,5	CC+E	Production management	GM3-1
M Th	MGEM31.49	Moteur thermique	30	0	30	30	60	2	2	CC+E	Thermal engine	GM3-2
MCS	MGEM31.50	Modélisation et calcul des structures	0	24	24	20	44	1,5	1	CC	Modeling and calculation of structures	GM3-4
Hyd Ind	MGEM31.51	Hydraulique Industrielle	30	0	30	30	60	2	1,5	CC+E	Industrial hydraulics	GM3-2
Mnag	MGEM31.52	managment R&D	30	0	30	20	50	2	2	CC+E	RESEARCH METHODOLOGY	GM3-5
CRI	MGEM31.53	Conception des robots industriels	24	0	24	20	44	1,5	1,5	CC+E	Design of industrial robots	GM3-3
TSM	MGEM31.54	Tenue en service des matériaux	27	0	27	20	47	1,5	2	CC+E	Serviceability of materials	GM3-4
MISE	MGEM31.55	Mesure et instrumentation des systèmes électriques	24	12	36	25	61	2	2,5	CC+E	Measurement and instrumentation of electrical systems	GM3-3
Rg Co	MGEM31.56	Régulations et contrôles	24	12	36	35	71	2	2,5	CC+E	Regulations and controls	GM3-3
GestPrj	MGEM31.57	Gestion de projet	24	0	24	30	54	2	1,5	CC+E	Project management	GM3-1
GMAO	MGEM31.58	Gestion de la maintenance assistée par ordinateur	21	12	33	20	53	2	2	CC+E	Computer-assisted maintenance management	GM3-1
EngRnv	MGEM31.59	Energies renouvelables	30	0	30	30	60	2	2	CC+E	Renewable energies	GM3-2
CDP	MGEM31.60	Conception et démarche d'un projet	0	24	24	30	54	1,5	1	CC	Project design and approach	GM3-5
Ind4	MGEM31.61	industrie 4,0	30		30	20	50	2	2	CC+E	Industry 4.0 Advanced Operator	GM3-5
MSSP	MGEM31.62	Modélisation et Simulation des Systèmes de Production	24	9	33	30	63	2	2	CC+E	Modeling and Simulation of production systems	GM3-4
MSSP	MGEM31.63 OP1	Modélisation du comportement des matériaux	24	9	33	20	61	2	2	CC+E	Modeling and Simulation of production systems	GM3-4
MecEla	MGEM31.63 OP2	Mécanique et élaboration des matériuax composites								CC+E	Modeling and Simulation of production systems	GM3-4
		Total (GEM3/Semester1 :	**228**	**78**	**306**	**260**	**574**	**30**	**29**			

Electromechanical Engineering First Year

Idnt	CTSE	Intitulé	CI	TP	CI+TP	T,per	T		Coef	E		GM
Course Id			L	PW	L+PW	Self pr,	T	ECTS		E	Subject	
Mth IN	MGEM11.01	Mathématique pour Ingénieur	30	0	30	25	55	2	2	CC+E	Mathematics for Engineers	GM1-1
Rop	MGEM12.18	Recherche Opérationnelle	24	0	24	25	49	2	1,5	CC+E	Operational research	GM1-1
Droit	MGEM12.22	Statistique et probabilités	24	0	24	24	48	2	1,5	CC+E	Statistics and Probability	GM1-1
Total GM1-1			78	0	78	74	152	6	5			
Thrmo	MGEM11.05	Thermodynamique	24	15	39	40	79	3	2,5	CC+E	Thermodynamics	GM1-2
Trachal	MGEM12.13	Transfert de chaleur	30	15	45	40	85	3	2,5	CC+E	Heat transfer	GM1-2
MF	MGEM12.14	Mécaniques des fluides	30	15	45	40	85	3	2	CC+E	Fluid mechanics	GM1-2
Total GM1-2			84	45	129	120	249	9	7			
TF	MGEM11.04	Technologie de fabrication	30	15	45	40	85	3	2,5	CC+E	Manufacturing technology	GM1-3
Info	MGEM11.08	Infographie (conception assisté par ordinateur)	0	51	51	30	81	3	1,5	CC	computer-aided design	GM1-3
TRP I	MGEM12.11	Transmission de Puissance et de Mouvement I	30	15	45	50	95	3,5	2,5	CC+E	Transmission of Power and Movement I	GM1-3
Total GM1-3			60	81	141	120	261	9,5	6,5			
Con Méc	MGEM11.02	Conception mécanique	30	15	45	50	95	3,5	2,5	CC+E	Mechanical Design	GM1-3
RDM	MGEM11.03	Résistance des matériaux	30	15	45	50	95	3,5	2,5	CC+E	Strength of materials	GM1-4
MMC	MGEM12.12	Mécanique des Milieux Continus	30	0	30	30	60	2	2	CC+E	Continuous Media Mechanics	GM1-4
Total GM1-4			90	30	120	130	250	9	7			
SCL	MGEM11.06	Système et circuit logique	30	15	45	40	85	3	2,5	CC+E	System and logic circuit	GM1-5
	MGEM12.17	Automatique I +II(Analyse des systèmes dynamiques et continus)	45	15	60	25	85	3	2,5	CC+E	(Analyse des systèmes dynamiques et continus)	GM1-5
Mini Pro	MGEM12.19	Mini projet	0	30	30	25	55	2	1,5	CC	Mini-project	GM1-5
Total GM1-5			75	60	135	90	225	8	6,5			
Elec	MGEM11.07	Electronique I (Electronique analogique)	30	15	45	40	85	3	2,5	CC+E	Electronics I	GM1-6
Mach Ele I	MGEM12.15	Machines électriques (Machine à courant continu et moteur pas à pas)	30	15	45	40	85	3	2,5	CC+E	Electric machine	GM1-6
Electro Tech	MGEM12.16	Electrotechnique	30	15	45	40	85	3	2,5	CC+E	Electrical engineering	GM1-6
Total GM1-6			90	45	135	120	255	9	7,5			
Dr T	MGEM11.09	Droit de travail	24	0	24	20	44	2	1,5	CC+E	Labour law	GM1-7
Tech Com	MGEM11.10	Techniques de Communication	24	0	24	20	44	2	1,5	CC+E	Communication techniques	GM1-7
Ang	MGEM12.20	Anglais I	24	0	24	30	54	2	1,5	CC+E	English I for SpecificPurposes	GM1-7
CreEnt	MGEM12.21	Création de l'entreprise	24	0	24	24	48	1,5	1,5	CC+E	Statistics and Probability	GM1-7
Total GM1-7			96	0	96	94	190	7,5	6			
Total GEM1			411	216	627	554	1181	58	49			

Electromechanical Engineering Second Year

Idnt		Intitulé	CI	TP	CI+TP	T.per	T		Coef	E		GM
Course Id			L	PW	L+PW	Self pr.	T	ECTS		E	Subject	
Mach Ele II	MGEM21.29	Machines électriques II (Machines électriques à courant alternatif)	36	15	51	34	85	3	2,5	CC+E	Electrical machines II (AC Electrical Machines)	GM2-1
Sch Elc	MGEM21.30	Schémas électriques (Schéma et protection électriques)	24	15	39	30	69	2	2	CC+E	Electrical diagrams (Electrical diagrams and protection)	GM2-1
Elec Pui II	MGEM22.42	Electronique de puissance I	30	15	45	40	85	3	2,5	CC+E	Power electronics I	GM2-1
Electo II	MGEM22.44	Electronique II (Electronique analogique)	30	15	45	40	85	3	2,5	CC+E	Electronics II (Analogue Electronics)	GM2-1
Total GM2-1			**120**	**60**	**180**	**144**	**324**	**11**	**9,5**			
MOSEM	MGEM21.24	Mise en œuvre sans enlèvement de matière	30	30	60	30	90	3	2,5	CC+E	Processing without material removal	GM2-2
Pro F	MGEM22.38	Processus de fabrication	30	0	30	30	60	2	1,5	CC+E	Manufacturing process	GM2-2
Mécato	MGEM22.41	Mécatronique	24	0	24	30	54	2	2	CC+E	Mechatronics	GM2-2
Total GM2-2			**84**	**30**	**114**	**90**	**204**	**7**	**6**			
CS	MGEM21.25	Calcul des structures	30	0	30	40	70	2,5	2	CC+E	Structural Analysis	GM2-3
Mét Phy	MGEM21.26	Métallurgie Physique	27	0	27	30	57	2	1,5	CC+E	Physical Metallurgy	GM2-3
MTM	MGEM22.37	Métallurgie et traitement des métaux	30	12	42	40	82	3	2	CC+E	Metallurgy and metal processing	GM2-3
CND	MGEM22.40	Contrôle destructif et non destructif des métaux	24	15	39	30	69	2	2	CC+E	Destructive and non-destructive testing of metals	GM2-3
Total GM2-3			**111**	**27**	**138**	**140**	**278**	**9,5**	**7,5**			
An Num	MGEM21.32	Analyse numérique	24	0	24	40	64	2,5	1,5	CC+E	Numerical analysis	GM2-4
ADM	MGEM22.39	Analyse dynamique des machines	30	12	42	40	82	3	2	CC+E	Dynamic analysis of machines	GM2-4
Mini Pro	MGEM22.46	Mini projet	0	30	30	30	60	2	1	R	Mini-project	GM2-4
Total GM2-4			**54**	**42**	**96**	**110**	**206**	**7,5**	**4,5**			
Mec Vib	MGEM21.27	Mécanique vibratoire	30	15	45	40	85	3	2	CC+E	Mechanical Vibration	GM2-5
TRP II	MGEM22.36	Transmission de puissance et de mouvement II	30	15	45	45	90	3,5	2,5	CC+E	Power and motion transmission II	GM2-5
Diag M	MGEM22.43	Diagnostique et maintenance	21	9	30	30	60	2	2	CC+E	Diagnosis and maintenance	GM2-5
Total GM2-5			**81**	**39**	**120**	**115**	**235**	**8,5**	**6,5**			
Auto Pro	MGEM21.31	Automates programmables	30	15	45	50	95	3,5	2,5	CC+E	Programmable Logic Controllers	GM2-6
Rob	MGEM21.28	Robotique (Initiation au Robotique)	24	0	24	25	49	2	1,5	CC+E	Robotics (Introduction to Robotics)	GM2-6
MCN	MGEM22.45	Programmation des machines-outils commande numérique	30	24	54	40	94	3,5	2,5	CC+E	Programming of NC machine tools	GM2-6
Total GM2-6			**84**	**39**	**123**	**115**	**238**	**9**	**6,5**			
AngII	MGEM21.33	Anglais II	24	0	24	35	59	2	1,5	CC+E	English II	GM2-7
Tech Com	MGEM21.34	Techniques de communication	24	0	24	20	44	1,5	1,5	CC+E	Communication techniques	GM2-7
Info I	MGEM21.35	Informatique I	0	30	30	25	55	2	1,5	CC	Computer science I	GM2-7
Total GM2-7			**48**	**30**	**78**	**80**	**158**	**5,5**	**4,5**			
Total GEM2			**582**	**267**	**849**	**794**	**1643**	**58**	**45**			

Electromechanical Engineering Third Year

Idnt		Intitulé	CI	TP	CI+TP	T.per	T		Coef	E		GM
Course Id			**L**	**PW**	**L+PW**	**Self pr.**	**T**	**ECTS**		**E**	**Subject**	
GP	MGEM31.48	Gestion de production	24	0	24	30	54	2	1,5	CC+E	Production management	GM3-1
GestPrj	MGEM31.57	Gestion de projet	24	0	24	30	54	2	1,5	CC+E	Project management	GM3-1
GMAO	MGEM31.58	Gestion de la maintenance assistée par ordinateur	21	12	33	20	53	2	2	CC+E	Computer-assisted maintenance management	GM3-1
Total GM3-1			**69**	**12**	**81**	**80**	**161**	**6**	**5**			
Mother	MGEM31.49	Moteur thermique	30	0	30	30	60	2	2	CC+E	**Thermal engine**	GM3-2
Hyd Ind	MGEM31.51	Hydraulique Industrielle	30	0	30	30	60	2	1,5	CC+E	Industrial hydraulics	GM3-2
EngRnv	MGEM31.59	Energies renouvelables	30	0	30	30	60	2	2	CC+E	Renewable energies	GM3-2
Total GM3-2			**90**	**0**	**90**	**90**	**180**	**6**	**5,5**			
CRI	MGEM31.53	Conception des robots industriels	24	0	24	20	44	1,5	1,5	CC+E	Design of industrial robots	GM3-3
MISE	MGEM31.55	Mesure et instrumentation des systèmes électriques	24	12	36	25	61	2	2,5	CC+E	Measurement and instrumentation of electrical systems	GM3-3
Rg Co	MGEM31.56	Régulations et contrôles	24	12	36	25	61	2	2,5	CC+E	Regulations and controls	GM3-3
Total GM3-3			**72**	**24**	**96**	**70**	**166**	**5,5**	**6,5**			
MCS	MGEM31.50	Modélisation et calcul des structures	0	24	24	20	44	1,5	1	CC	Modeling and calculation of structures	GM3-4
TSM	MGEM31.54	Tenue en service des matériaux	27	0	27	20	47	1,5	2	CC+E	Serviceability of materials	GM3-4
MSSP	MGEM31.62	Modélisation et Simulation des Systèmes de Production	24	9	33	30	63	2	2	CC+E	Modeling and Simulation of production systems	GM3-4
MSSP	MGEM31.63 OP1	Modélisation du comportement des matériaux	24	9	33	20	61	2	2	CC+E	Modeling and Simulation of production systems	GM3-4
Méc éla	MGEM31.63 OP2	Mécanique et élaboration des matériaux composites	24	9	33	20	61	2	2	CC+E	Modeling and Simulation of production systems	GM3-4
Total GM3-4			**75**	**42**	**117**	**90**	**215**	**7**	**7**			
MangR	MGEM31.52	managment r&d	30	0	30	20	50	2	2	CC+E	RESEARCH METHODOLOGY	GM3-5
CDP	MGEM31.60	Conception et démarche d'un projet	0	24	24	20	44	1,5	1	CC	Design and process of a project	GM3-5
INd4	MGEM31.61	industrie 4,0	30		30	20	50	2	2	CC+E	Industry 4.0 Advanced Operator	GM3-5
Total GM3-5			**60**	**24**	**84**	**60**	**144**	**5,5**	**5**			
Total GEM 3:			**366**	**102**	**468**	**390**	**866**	**30**	**29**			

GEM1

	Module Description	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 1

Module: Mathematics for Engineers

Code: M.GEM11.01

Module group: GM1-1

Specialty modules	Main module	Engineering Sciences and Techniques	Preparation for the practice of profession
	X		

Teacher: Emna Gargouri

Status : Assistant Professor

E-Mail: emnagargouri@yahoo.fr

Courses	Laboratory and Practical works	Individual work	Total volume
30 h		**25 h**	**55 h**

Coefficient :	ECTS credits :
2	2

	Module Description	Department :Electromechanical Engineering
		Date : 15/10/2021
		Version N°: 2
		Semester : 1

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

The Mathematics for Engineers course is organized around the fundamental concepts of univariate and multivariate functions. The mastery of integral calculus and its implementations in differential geometry is main objective.

1.2 Objectives

The objective is to initiate students with functions with several variables, double, triple and curvilinear integrals and to apply them to the calculations of physical quantities such as areas, centres of inertia, volume, moments of inertia, length of a trajectory and material point subjected to a force field.

1.3 Prerequisites

Upstream modules	Module taught	Downstream modules
	MGEM11.01	

1.4 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	Concepts of multivariate functions	8h	Topology of R ^ n. Continuity. First and higher order partial derivatives. Class functions C ^ k. Schwarz's theorem. Extrema of two-variable functions.
Chapter 2	Double integrals	8h	Double integrals over a rectangle. Linearity. Growth. Invariance by translation. Additivity to a domain. Fubini's theorem. Switch to polar coordinates. Integration on a disc, ring or angular sector.
Chapter 3	Triple integrals	8h	Growth. Invariance by translation. Additivity to a region. Iterated integrals. Conversion in cylindrical and spherical coordinates. Integration on a parallelepiped, cylinder, cone, paraboloid or sphere.
Chapter 3	Curvilinear integrals	6h	Definition. Length of an arc. Areas. Green-Riemann theorem. Circulation of a vector field.

2. METHODOLOGY

The educational approach of this course is based on a deep understanding of the methods, while focusing on the computational aspect.

Integrated courses (h)	30
Labs and Practical work (h)	
Project (h)	25
Visits (h)	

3. Evaluation

Activity	Chapter(s)	Weighting
Mini-project		
Practical works		
Continuous assessment	Chapters 1 and 2	0.25
Presentation		
Final Exam	Chapters 2, 3 and 4	0.75

4. Bibliographic References

[1] D. Fredon, M. Bridier, Mathematics for Engineering Sciences. Edition Dunod.

[2] M. Gaultier, Analysis - curvilinear, multiple and surface integrals - Passage formulas. Edition Ellipses

[3] J. Bass, E. Masson, Calcul différentiel, intégrales multiples, fonctions de variable complexe. Edition Dunod.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 1

Module: Mechanical Design

Code: M.GEM11.02

Module group: GM1-3

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
		x	x

Teacher: Georges Kantchev

Status: Professor

Mail: georges.kantechev@gmail.com

Courses	Laboratory and Practical works	Individual work	Total volume
30 h	15 h	50 h	95 h

Coefficient :	ECTS credits :
2,5	3.5

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Objectives

- With this module, students should be familiar with the principles and methods of mechanical design.

- Students should know how to analyse the structure of mechanisms and machines.

- Students are able to study the kinematics of lever mechanisms, cam mechanisms, indexers, etc.

1.2 Prerequisites

Upstream modules	Module taught	Downstream modules
	MGEM10.02	MGEM12.11 - MGEM12.19

1.3 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	Introduction to Mechanical Design.	3	Examples of machine design.
Chapter 2	Structure and classification of machine mechanisms.	3	Basics of machine structure. Classification of mechanisms and machines.
Chapter 3	Lever mechanisms	6	Design, classification and kinematic analysis of lever mechanisms Determination of reactions in the kinematic links of mechanisms.
Chapter 4	Cam mechanisms	7	Design and classification of cam mechanisms. Transmission of forces. Kinematic analysis of cam mechanisms. Determination of cam profiles.
Chapter 5	Screw mechanisms.	4	Design, classification and analysis of screw mechanisms.
Chapter 6	Indexing mechanisms and variable structure mechanisms	6	Design, analysis and application of indexing mechanisms. Design, analysis and applications of variable structure mechanisms.

Practical work	Lab activity 1: Study of a crank mechanism	5h	The students have to make a geometrical and kinematic study of a crank mechanism using a didactic model Calculation of speed, accelerations using graphic methods (equiprojectivity and instantaneous centre of rotation)
	Lab activity 2: Study of a mechanism with 4 revolute joints	5h	Using the didactic model and the data of the mechanism with 4 revolute joints links, the students are asked to study its geometric and kinematic characteristics. Calculation of speed, accelerations using graphical methods (equiprojectivity and instantaneous centre of rotation)
	Manipulation 3: Study of a sliding mechanism	5h	With the didactic model and the data of the slide mechanism, the students have to make its geometrical and kinematic characterisation. Calculation of speed, accelerations using graphical methods (equiprojectivity and instantaneous centre of rotation)

2. METHODOLOGY

Integrated courses (h)	30 h
Labs and Practical work (h)	15 h
Project (h)	
Visits (h)	

3. Evaluation

Activity	Chapter(s)	Rating
Mini-project		
Practical works	From 1 to 7	0.25
Continuous assessment	From 1 to 4	0.25
Presentation		
Final Exam	From 1 to 9	0.5

4. Bibliographic References

[1] Neil Sclater & Nicholas P. CHIRONIS, MECHANISMS & MECHANICAL DEVICES SOURCEBOOK, Third Edition

[2] Jean MARTIN, Mechanisms for transforming motion with local contact, Techniques de l'Ingénieur, B5910. - René BOUDET, Presentation of mechanisms, Techniques de l'Ingénieur, B599.

[3] Hamilton H. Mabie and Charles F. Reinholtz, Mechanisms and dynamics of machinery . Fourth edition. 1987

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 1

Module: Strength of materials

Code: M.GEM11.03

Module group: GM1-4

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the practice of profession
x			

Teacher : Fatma Walha

Status : assistant Professor

E-Mail: walha.fatma@gmail.com

Course	Laboratory and Practical works	Personal work	Total volume
30 h	15 h	50 h	95 h

Coefficient :	ECTS credits :
2,5	3.5

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

Strength of materials studies the behaviour of deformable solids. It is particularly interested in calculating the dimensions of mechanical systems so that they are able to resist the forces applied to them during their service under the required safety conditions.

1.2 Objectives

- Understand the general objectives of SoM and its assumptions.
  - Determine the cohesive torsor along a beam. - Determine loading types in a beam.
  - Drawing of stress diagrams.
- Determine the stress distribution in a beam section subjected to tensile, shear, torsion and bending stresses.
- Check the strength condition for beams under tension, shear, torsion and bending.
- Apply the principle of superposition to break down complex loads into simple loads.
- Stress distribution in the cross-section of a beam subjected to compound loading.
- Check the resistance condition of a beam subjected to a composite load.
- Size a beam subjected to compound loading.

1.3 Prerequisites

Modelling of mechanical actions.
Basic principle of statics.
Cohesion Torsor
Normal and Tangential Stress
Polar quadratic moment

Upstream modules	Module taught	Downstream modules
--	MGEM11.03	MGEM21.25

1.4 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	Introduction to Strength of materials	2H	Objectives of SoM General assumptions
Chapter 2	Cohesion Torsor	4H	Internal loads Components of cohesion Torsor Introduction to stress analysis
Chapter 3	Traction and Compression	3H	Tensile test, strain, Stresses. Tensile strength condition. Tensile stiffness Condition.

				Stress concentration
Chapter 4	Shear		3H	Shear test, strain, Stresses. Shear strength condition.
Chapter 5	Torsion		5H	Torsion test. Relations: Stress - strain / Stress – torsion moment. Torsional strength / stiffness conditions. Stress concentration
Chapter 6	bending		5H	Study of stress / strain in bending. Relation stress - bending moment. Bending strength / stiffness conditions. Stress concentration.
Chapter 7	Superposition theorem		4H	Apply the principle of superposition to transform complex stresses into simple stresses.
Chapter 8	Buckling		4H	Distribution of stresses in a beam cross section subjected to compound stress.
Practical works	Lab activity 1 :	Bending test	4H	- Implement theoretical knowledge -Be familiar with the beam bending test rig (component parts, instructions for use, etc.) - be able to develop and conduct various bending tests. -Apply acquired theoretical knowledge
	Lab activity 2 :	Torsion test	4H	-Characteristics of a test specimen subjected to torsional loading. -Plot the torsion test curves for different materials (steel, brass) and determine the experimental value of elasticity modulus and the shear limit.
	Lab activity 3 :	Bending computation using RDM6 software	4H	- Analysis of a structure by the finite element method (straight beams subjected to bending)
	Lab activity 4 :	Tensile test	3H	-Determine the mechanical characteristics (elasticity modulus, elastic resistance, tensile strength, etc.) of different materials (steel, brass, aluminium)

2. METHODOLOGY

The Contact Hours consist of the presentation of different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For the individual activities, students have to do homework assignments.

Integrated courses (h)	30h
Labs and Practical work (h)	15h
Project (h)	
Visits (h)	

3. Assessment

Activity	Chapter(s)	Rating
Mini-project		
Practical works	Chapters 3, 5, 6	0.25
Continuous assessment	Chapters 1 to 4	0.25
Presentation		
Final Exam	All chapters	0.5

4. bibliographical references

[1]. J. L. Fanchon, Guide des sciences et technologies industrielles. Afnor Nathan, Paris 2001.
[2]. Chevalier, Guide de calcul en mécanique. Hachette Livre 1993.
[3]. N.BOURAHLA , Resistance of basic materials. Edition GECOTEC
[4]. A. Delaplace, F. Gatuingt, F. Ragueneau , Mécanique des structures : Résistance des matériaux , Dunod, Paris, 2008.
[4].J.FANCHON, Guide de mécanique : sciences et technologies industrielles, NATHAN 1998.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 1

Module: Manufacturing Technology

Code: M.GEM11.04

Module group: GM1-3

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the practice of profession
X			X

Teacher: Khlif Mohamed

Status : Assistant Professor

E - Mail: Mohamed.khlif@enis.tn

Course	Laboratory and Practical works	Personal work	Total volume
30 h	**15 h**	**40 h**	**85 h**

Coefficient :	ECTS credits :
2,5	**3**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

The aim of the course and the practical work is to provide students the methodology of materials manufacturing techniques (turning, milling, grinding, and drilling). The main goals of the course are to enable the acquisition of basic knowledge in the field of machining parts (operations, tools, cutting conditions, measuring instruments).

1.2 Objectives

- Seelect the cutting tool per operation in the machining range
- Select the cutting conditions (speeds, feeds, depth of cut)
- Calculate the machining time
- Setting up turning, milling and grinding machines
- Part machining (face milling, surfacing, grooving, centring, drilling, counter boring, tapping),
- Dimensional control of functional specifications (dimensions, geometric tolerances and roughness).

1.3 Prerequisites:

Upstream modules	Module taught	Downstream modules
MGEM11.09	MGEM11.04	MGEM21.24- MGEM22.38

1.4 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	General introduction on material shaping	2 h	Overview on manufacturing methods
Chapter 2	Turning	5 h	At the end of these chapters students will be able to identify machine tools and machining operations
Chapter 3	Milling	5 h	
Chapter 4	Drilling, reaming and tapping	4 h	
Chapter 5	The rectification	4 h	
Chapter 6	Choice of cutting conditions	5 h	At the end of these chapters students will be able to select cutting tools and cutting methods
Chapter 7	General information on non-conventional machining methods (HSM)	5 h	
Practical work	Lab activity: 1 turning Lab activity 2 : milling Lab activity 3: Grinding	15 h	At the end of these activities, students will be able to machine parts in turning and milling and select the necessary cutting tools

2. METHODOLOGY

The course is based on a methodology combining lectures, tutorials, practical work and individual work.

The face-to-face integrated courses combines lectures and tutorials. Students are asked to complete personal work in the classroom and present it as a lecture. The practical work allows the application of the concepts studied during the course

Integrated courses (h)	30 h
Labs and Practical work (h)	15 h
Project (h)	28 h
Visits (h)	12 h

3. Assessment

Activity	Chapter(s)	Weighting
Mini-project		
Practical works	1 à 7	0.25
Continuous assessment	1 à 4	0.25
Presentation		
Final Exam	1 à 7	0.5

4. Bibliographic References

[1] Engineering Technique

[2] Machining: Processes and Methods, W. Bouzid - CPU 2004

[3] Mechanical Manufacturing, Course Notes and Corrected Exercises J. Ben Younes - CPU 2008

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 1

Module: Thermodynamics

Code: M.GEM11.05

Module group: GM1-2

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the practice of profession
	X		

Teacher : Jemal Hassen

Status : Assistant Professor

Mail: hassenedjemel@yahoo.fr

Course	Laboratory and Practical works	Individual work	Total volume
24 h	**15 h**	**40 h**	**79 h**

Coefficient :	ECTS credits :
2,5	**3**

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description** **M.GEM11.05**	**Department :Electromechanical Engineering** **Date : 15/10/2021** **Version N°: 2** **Semester : 1**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This course explains the principles of thermodynamics and highlight the usefulness of fundamental quantities such as internal energy, enthalpy, entropy, etc.
In addition, this course provides the student with the knowledge to understand systems and to evaluate the efficiency of energy systems in terms of energy and exergy.

1.2 Objectives

- Understanding the principles of thermodynamics
- Mastering energy balances
- Studying irreversible processes
- Apply thermodynamic principles to energy processes

1.3 Prerequisites:

Thermodynamics level BAC+2 - Mathematical tools: differential calculus, integral calculus and mutivariate functions.

Upstream modules	Module taught	Downstream modules
M.GEM11.01	*M.GEM11.05*	M.GEM12.13, MGEM31.49

1.4 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	Basic principles.	8 H	Master the fundamental principles of thermodynamics: 1- First principle 2- Second principle 3- Formalism in thermodynamics - Variations of state functions - Balance sheet concepts - Characteristic functions
Chapter 2	Thermodynamic diagrams and cycles	4 H	Become familiar with thermodynamic diagrams and cycles

Chapter 3	Energy systems analysis	12 H	Learn how to establish the various balances for energy analysis 1- Enthalpy balances 2- Entropic balances 3- Energy balances 4- Applications to the study of real energy systems
Practical work	Lab activity 1: Calorimetry. Lab activity 2: Determination of the adiabatic index of air Lab activity 3: Determination of the overall efficiency of the	5 H 5 H 5 H	Use a calorimeter to measure the heat capacity of liquids. Study air compression and determine the efficiency of a compressor.

2. METHODOLOGY

Integrated courses (h)	24
Labs and Practical work (h)	15
Project (h)	40
Visits (h)	

3. Assessment

Designation	Chapter(s)	Rating
Mini-project		
Practical works	Ch1 Ch2 Ch3	25%
Continuous assessment	CH1 Ch2	25%
Presentation		
Final Exam	CH1 Ch2 Ch3	50%

4. Bibliographic References

[1] YunusCengel, Michael Boles , Mehmet Kanoglu, Thermodynamics: An Engineering Approach, McGraw-Hill Higher Education, 2008.
[2] L. Borel, D. Favrat, Thermodynamics and Energy, Volume 1. PPUR presses polytechniques, 2005
[3] J. M. Smith, Hendrick C Van Ness, M. Abbott. Introduction to Chemical Engineering Thermodynamics. The Mcgraw-Hill Chemical Engineering Series
[4] Richard E. Sonntag , Gordon J. Van Wylen , Pierre Desrochers. Applied thermodynamics. Edition: Erpi.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 1

Module: System and logic circuit

Code: M.GEM11.06

Module group: GM1-5

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
	X		

Teacher : Omaya Bellaaj

Status : Assistant Professor

E-Mail: bellaj_omaya@hotmail.fr

Course	Practical work	Personal work	Total volume
30 h	15 h	40 h	85 h

Coefficient :	ECTS credits :
2,5	3

	Module Description M.GEM11.06	Department :Electromechanical Engineering
		Date : 15/10/2021
		Version N°: 2
		Semester : 1

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

Logic circuit course presents the methods of analysis and low-level synthesis of combinatorial logic systems starting from a specification and leading to a physical achievement of the system through logic gates.

1.2 Objectives

- Representation of numbers in number bases
- Writing and simplifying logic functions
- Analysis and synthesis of logic systems
- Implementation of arithmetic combinatorial circuits
- Implementation of combinatorial coding, transcoding and multiplexing circuits
- Implementation of sequential circuits based on flip-flops.

1.3 Prerequisites

Knowledge of computer components
Synthesis of the different numbering systems and the different types of codes.

Upstream modules	Module taught	Downstream modules
MGEM11.01	MGEM11.06	MGEM21.31

1.4 learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	*Combinatorial Logic*	4h	- Basic logic functions - Properties of Boolean algebra - Karnaugh's method - Representation of negative numbers, binary arithmetic - Arithmetic combinatorial circuits (comparator, adder, substractor) - Binary codes and error detection codes
Chapter 2	Special combinatorial circuits	4h	- Coders - Decoders - Transcoders - Multiplexer - De-multiplexer

Chapter 3	Sequential Logic	4h	RS scale Rocker D JK rocker Synchronous counters Asynchronous meters
Practical work	Combinatorial and sequential logic	15h	- RS, D and JK rocker - Synchronous and asynchronous meters

2. METHODOLOGY

The Contact Hours consist of the presentation of different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For the individual activities, students have to do homework assignments.

Integrated courses (h)	30h
Labs and Practical work (h)	15h
Project (h)	25h
Visits (h)	15h

3. Assessment

Activity	**Chapter(s)**	**Weighting**
Mini-project		
Practical works	Chapter 1-2-3	0.25
Continuous assessment	Chapter 1-2-3	0.25
Presentation		
Final Exam	Chapter 1-2-3	0.5

4. Bibliographic References

[1] Th. l. Floyd, DIGITAL FUNDAMENTALS, Prentice Hall, 2006.

[2] M. Rafiquzzaman, Fundamentals of Digital Logic and Microcomputer Design, WILEY- INTERSCIENCE, 2005.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 1

Module: Electronique I (Analogue electronics)

Code: M.GEM11.07

Module group: GM1-6

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the practice of profession
X		X	

Teacher : Mallek Jihen

Status : Assistant Professor

Mail: mallek.jihen@gmail.com

Course	Laboratory and Practical works	Individual work	Total volume
30 h	15 h	40 h	85 h

Coefficient :	ECTS credits :
2,5	3

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

Apply the general theorems of electrical circuit analysis.

Study the characteristics of basic electronic components.

Study dipoles, quadrupoles and passive filters,

Study diodes and diode circuits,

Apply the general theorems of electrical circuit analysis. Know the characteristics of basic electronic components.

1.2 Objectives

- Be able to design electronic acquisition, control and display devices. In addition, they will be able to set up experimental devices in a context of collaborative work in the field of industrial electronics.
- Master methods and tools of analogue electronics engineering: identification, modelling and resolution of even unfamiliar and incompletely defined problems, use of computer tools, analysis and design of analogue circuits

1.3 Prerequisites

Upstream modules	Module taught	Downstream modules
	MGEM11.07	MGEM31.55; MGEM31.59.

1.4 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	Linear Electric Circuits	6h	Apply the general theorems of electrical circuit analysis
Chapter 2	Variable Speed Electric Circuits	6h	Characteristics of basic electronic components.
Chapter 3	Study of Passive Filters	9h	Study dipoles, quadrupoles and passive filters,
Chapter 4	Study of Junction Diodes	9h	Characteristics of basic electronic components.
Practical work	- Lab activity 1 : Passive Circuits - Lab activity 2: Application of the general laws of electricity - Lab activity 3: RC Filter - Lab activity 4: Diode rectification - Lab activity 5. Practical exercises: Transistor amplifier assemblies (Common Transmitter)	15h	To set up experimental devices, to be open to the practice of collaborative work in the field of industrial electronics.

2. METHODOLOGY

Integrated courses (h)	30
Labs and Practical work (h)	15
Project (h)	
Visits (h)	

3. Assessment

Activity	Chapter(s)	Rating
Mini-project		
Practical works	CHP1, ChP2and ChP3	
Continuous assessment	CHP1 and ChP2	
Presentation		
Final Exam	All Chapters	

4. Bibliographic References

[1] ANALOGIC ELECTRONICSComponents and complex systems (Engineering Sciences),Bernard Latorre Corinne Berland, François de Dieuleveult, Christophe Delabie,Olivier Français, Patrick Poulichet, Dunod, 2018ISBN 978-2-10-077566-8.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 1

Module: Computer graphics (computer-aided design)

Code: M.GEM11.08

Module group: GM1-3

Specialty modules	Main module	Engineering Sciences and Techniques	Preparation for the practice of
		x	x

Teacher : Dorra Trabelsi

Status : Assistant Professor

E-Mail: dorraso@gmail.com

Course	Practical work	Personal work	Total volume
-	51 h	30 h	81 h

Coefficient :	ECTS credits :
1,5	3

	Module Description M.GEM11.08	Department :Electromechanical Engineering
		Date : 15/10/2021
		Version N°: 2
		Semester : 1

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

- This course provides students with an overview of the techniques for representing a curve using CAD and the associated geometrical transformations. During the practical sessions, the student will be able to use the CAD software SOLIDWORKS and the CAD software CATIA and apply what he/she has seen in class.

1.2 Objectives

- Ability to define the path of a complex curve using a parametric equation
- Ability to apply geometric transformations to any point in space
- Ability to use SOLIDWORKS design software
- Design mechanical parts by extrusion, revolution and multi-extrusion
- Carrying out analyses and numerical simulations (example: calculation of VON MISES stress using CATIA V5)

Production of surface parts and Assembly of mechanical parts (example: a four-cylinder ICE engine)

Animation of a mechanical assembly

1.3 Prerequisites:

- Technical drawing, Mechanical design -

Upstream modules	Module taught	Downstream modules
--	MGEM11.08	MGEM12.12

1.4 Learning outcomes

Activity	Title	Duration	Learning outcomes
Lab activities 1 and 2	3D part design	12H	At the end of this course, students will be able to draw 3D parts by extrusion, revolution and scanning
Lab activity 3	Creation of assemblies	12H	At the end of this course, students will be able to assemble parts with constraints
Lab activity 4	Digital simulation	6H	At the end of this course, students will be able to simulate parts under imposed load

Lab activity 5	Introduction of CATIA V5 software - Creation of parts by extrusion - Creating parts by revolution -Creation of parts by	21 h	The student will be able to design and assemble parts using Catia V5 Calculation of VON MISES stress using CATIA V5
Lab activity 6	-Assembly of parts - Design and animation of a single stage gear system		

2. METHODOLOGY

Integrated courses (h)	
Labs and Practical work (h)	30 h
Project (h)	25 h
Visits (h)	

3. Assessment

Acivity	**Chapter(s)**	**Rating**
Mini-project		0.5
Practical work		0.5
Continuous monitoring		
Presentation		
Final Review		

4. Bibliographic References

[1] SolidWorks® Software Student Guide *solidworks tutorial pdf*,

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 1

Module: Labour law

Code: M.GEM11.09

Module group: GM1-7

Specialty modules	Main module	Engineering Sciences and Techniques	Preparation for the practice of profession
			X

Teacher : Ben Mahfoudh

Status : Assistant Professor

Mail: maitrerafaabenmahfoudh@gmail.com

Course	Laboratory and Practical works	Individual work	Total volume
24 h		20 h	44 h

Coefficient :	ECTS credits :
1,5	2

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description:

This module initiates students about the legal rules governing the employment contract, the commitments of the parties to the employment contract and the causes of the end of the employment contract and their consequences.

1.2 Objectives:

- To prepare the student for professional life

- Knowledge of legal rules organising the relationship between the different parties in the professional environment.

1.3 Prerequisites

The French language

Upstream modules	Module taught	Downstream modules
No	**M.GEM11.09**	No

1.4 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	Introduction	4h	- Knowing what labour law is - Be familiarwith the componenets of employment contract and how to distinguish it from other contracts of exchange of services for remuneration.
Chapter 2	The sources of labour law	6h	- Know the sources of labour law and the relationship between them. - The aim of labour law is to protect the weaker party to the contract who is the employee. A lower rule may derogate from a higher rule in a way that is favourable to the employee.

Chapter 3	The life of the employment contract : - Formation of the employment contract - Performance of the employment contract - End of the employment contract	14 h	- Determining the conditions of building the employment contract based mainly on consensualism - distinguish between the types of employment contract: fixed-term and open-ended - Know the commitments of the parties to the employment contract (salary, leave, OHS, loyalty, vigilance, etc.) - Determining the causes of the termination of the employment contract and their consequences.

2. METHODOLOGY

The Contact Hours consist of the presentation of different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For the individual activities, students have to do homework assignments.

Integrated courses (h)	24 h
Labs and Practical work (h)	
Project (h)	20 h
Visits (h)	

3. Assessment

Activity	Chapter(s)	Weighting
Mini-project		
Practical works		
Continuous assessment	The whole course	30%
Presentation		
Final Exam	The whole course	60%

4. Bibliographic References

[1] Nouri Mzid, course on labour law, Faculty of Law of Sfax, academic year 2019-2020.

[2] Mohamed Hadi Ben Abdallah, Code de travail avec jurisprudence tunisienne et comparée, Tunis, 2005.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 15/10/2021

Module: Communication Techniques

Code: M.GEM11.10

Module group: GM1-7

Specialty modules	Main module	Engineering Sciences and Techniques	Preparation for the practice of profession
	x		

Teacher : Jouda Ghorbel

Status : Assistant Professor

E - Mail: joudaghorbel@yahoo.fr

Course	Laboratory and Practical	Individual work	Total volume
24 h	- h	20 h	44 h

Coefficient :	ECTS credits :
1,5	2

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This course is a preparation for entry into the workplace; it begins with a general chapter on French communication, which covers the different elements of the communication situations as well as the different language registers.

The second chapter is devoted to the study of the cover letter and the difference between the spontaneous cover letter and the one following an advertisement.

The third chapter of this module is focused on how to prepare a good CV.

The course ends with the final stage of recruitment preparation, the job interview, where the majority of the questions asked in an interview are covered and how to find the right answers and get the job.

1.2 Pre-requisite:

Upstream modules	Module taught	Downstream modules
	MGEM11.10	MGEM21.34

1.3 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	Communication	6h	The student masters the elements of the communication situation and the language registers.
Chapter 2	The cover letter	6h	The student is able to write an effective cover letter and to distinguish between a spontaneous cover letter and a cover letter following an advertisement.

Chapter 3	The CV	6	The student is able to write a standard CV.
Chapter 4	The job interview	6	The student is able to have a successful job interview; he/she is able to present him/herself correctly and answer the questions often asked during an interview.

2. METHODOLOGY

The Contact Hours consist of an introduction to the course. Practical applications are dealt with separately in the tutorials.

Active methods, brainstorming, simulations and group exercises are used in the applications.

For self-study activities, students should complete the exercises given as homework.

3. Assessment:

Activity	**Chapter(s)**	**Rating**
Mini-project		
Practical works		
Continuous assessment	1-2	0.5
Presentation		
Final Exam	1-2-3	1

4. Bibliographic References

[1] Christelle Capo-Chichi; Le CV. Studyrama. Collection Emploi

[2] Uriel Megnassan; *Le CV et la lettre de motivation, Mettez du punch dans vos candidatures*. Collection Eyrolles.

[3] Uriel Megnassan; *Get your dream job in 5 rounds*. Eyrolles Collection.

[4] Patrick De Sainte Lorette; La lettre de motivation spécial étudiants et jeune diplômé. Edition d'organisations.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 2

Module: Power and Motion Transmission I

Code: M.GEM12.11

Module group: GM1-3

Specialty modules	Main module	Engineering Sciences and Techniques	Preparation for the practice of profession
		x	x

Teacher: Georges Kantchev

Status: Professor

Mail: georges.kantechev@gmail.com

Course	Laboratory and Practical works	Individual work	Total volume
30 h	15 h	50 h	95 h

Coefficient :	ECTS credits :
2,5	3.5

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description** **M.GEM12.11**	**Department :Electromechanical Engineering** **Date : 15/10/2021** **Version N°: 2** **Semester : 2**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

Engineering education requires much more than knowledge of the characteristics of power transmission components. For mechanical engineering designer, it is necessary to address the dynamic behaviour of mechanical assemblies to succeed in the adequate selection of power transmission components between the driving machine and the receiving machine. On the other hand, the selection of power transmission components such as coupling, clutch and brake, based on technical documentation, is essential for a mechanical engineer.

1.2 Objectives

- This course provides students with knowledge about the mechanical characteristics of machines and the dynamic modelling of mechanical systems.
- Students should know the technology and construction of the main components of power transmission couplings, clutches, brakes.
- Students are able to select and calculate the main power transmission and braking components.

1.3 Prerequisites

Knowledge of General Mechanics
Mechanical design course

Upstream modules	Module taught	Downstream modules
MGEM11.02	Mgem12.11	MGEM22.36

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Power transmission devices.	3 h00	Application and classification of power transmission devices.
Chapter 2	Driving and receiving machines.	4 h00	Mechanical characteristics definition
Chapter 3	mechanical assemblies	4 h00	Dynamic modelling of mechanical assemblies. Operating regimes.
Chapter 4	Rigid and elastic couplings.	4 h00	Classification, technology and selecion. Resonance phenomena avoidance
Chapter 5	Clutches and couplers.	3 h00	Classification, control systems, technology.

Chapter 6	Brakes and braking theory	12h00	- Brakes and braking theory in the case of industrial mechanical systems - Mechanically operated brakes - Hydraulic, pneumatic and electrically operated brakes. - ABS braking system.
Practical work	Lab activity 1: Moment of inertia of a crank-crank system	5h	Experimentally determine the moment of inertia of a mechanical assembly (crank mechanism of an internal combustion engine) and demonstrate that it is variable as a function of a positional parameter.
	Lab activity 2 : Simple universal joints and constant velocity joints	5h	Study of a simple universal non-homokinetic joint (Hook joint). Study a constant velocity joint and compare its behaviour to that of the simple universal joint
	Lab activity 3: Oldham Joint	5h	Study the characteristics of an Oldham joint and understand how it works

2. METHODOLOGY

Integrated courses (h)	30
Labs and Practical work (h)	15
Project (h)	40
Visits (h)	10

3. Assesement

Activity	Chapter(s)	Rating
Mini-project		
Practical works		0.25
Continuous assessment		0.25
Presentation		0.5
Final Exam		

4. Bibliographic References

[1] Robert LE BORZEC, Gearboxes, Techniques de l'Ingénieur, B5640.
[2] Bernard KOHLER & Edgard SZTRYGLER, Mechanical Chains, Techniques de l'Ingénieur, B5650. [3] René HULIN, Gearboxes, Techniques de l'Ingénieur, B5660.
[4] Roland FARGES, Pulleys and transmission belts, Adhesion drive, Techniques de l'Ingénieur, B5680
[5] Hamilton H. Mabie and Charles F. Reinholtz, Mechanisms and dynamics of machinery . Fourth edition. 1987
[6] Michel Aublin, René Boncompain, Michel Boulaton,Daniel Caron Emile Jeay, Bernard Lacage , Jacky Réa , Systèmes Mécanique théorie et dimensionnement, Dunod

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 2

Module: Continuous Media Mechanics

Code: M.GEM12.12

Module group: GM1-4

Specialty modules	Main module	Engineering Sciences and Techniques	Preparation for the practice of profession
x	x		

Teacher : Chokri Ben Selem

Status : Assistant Professor

Mail: bensalem.chokri@yahoo.fr

Course	Laboratory and Practical works	Individual work	Total volume
30 h	- h	30 h	60 h

Coefficient :	ECTS credits :
2	2

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description** **M.GEM12.12**	**Department :Electromechanical Engineering** **Date : 15/10/2021** **Version N°: 2** **Semester : 2**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This course provide the student with the basic knowledge (techniques and issues) of Continuum Mechanics.

1.2 Objectives

The aim of this module is to enable the student to:

- Understand and become familiar with the concepts of stresses and strains for a continuous medium. For stresses, be able to relate make a formulation using Cauchy tensor.
- Discover the problems of behavioural laws and apply them to real examples,
- Know how to propose a mechanical problem and interpret the results.
- Know how to use the right techniques to solve a problem in continuum mechanics

1.3 Prerequisites

Basic knowledge of material properties and classical mechanics

Upstream modules	Module taught	Downstream modules
MGEM11.01 MGEM11.03	Continuum Mechanics	MGEM 21.25 MGEM12.14

1.4 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	Tensor analysis : - Concept of partial derivatives Enstein's convention - Tensor,: definition, properties of tensors, frame change - Vector analysis formulas, (Cartesian, cylindrical and spherical coordinate systems) - Introduction to continuum mechanics	7h	At the end of this chapter the student will be able to: - to understand tensors and their properties, - Understand index notation and vector functions in the Cartesian, cylindrical and spherical coordinate systems.

Chapter 2	Study of a continuous medium strain. Extensiometry	7h	At the end of this chapter the student will be able to: - to understand the strain tensor, - calculate, analytically and graphically by Mohr's circle representations, the relative strain, elongation and slip, - to understand the practical techniques of strain measurement (extensiometry).
Chapter 3	Stresses in a continuous medium	5h	At the end of this chapter the student will be able to: - understand the Cauchy tensor, - determine, analytically and graphically by Mohr's circle representations, the normal and tangential stresses exerted on a surface, - Formulate the equations of dynamics.
Chapter 4	Behavioiur Laws	2h	At the end of this chapter the student is able to relate the strain tensor to the stress tensor.
Chapter 5	strain energy	2h	At the end of this chapter the student is able to calculate the strain energy.
Chapter 6	Methods for solving linear elasticity problems	5h	At the end of this chapter the student is able to use the Lame-Navier and Beltrami methods for solving linear elasticity problems.
Chapter 7	Elastic limit criteria	2h	At the end of this chapter the student is able to understand the elastic limit criteria: Rankine, Tresca and Von-Mises criteria

2. METHODOLOGY

Integrated courses (h)	30h00
Labs and Practical work (h)	
Project (h)	30h00
Visits (h)	

3. Assesement

Activity	Chapter(s)	Rating
Mini-project		
Practical works		
Continuous assessment	1 à 4	0.25
Presentation		
Final Exam	1à 7	0.75

4. References :

[1] L. CHEVAIER, Mechanics of systems and deformable media, ellipse, 2004,

[2] D. DESJARDIN and Marie TOUZET, Introduction à la mécanique des milieux continus, Ed Dunod, 1999.

[3] G. Duvaut, Mécanique des milieux continue, ed, Masson, 1990

[4] P. Germain and P. Muller, Introduction à la mécanique des milieux continus, ed, Masson, 1995.

[5] D. Calecki, Phydique des milieux continus T2, ed. Hermann, 2007

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 2

Module : ***Heat transfer***
Code : ***MGEM12.13***
Module group : ***GM1-2***

Specialty modules	Main module	Engineering Sciences and Techniques	Preparation for the practice of profession

Teacher: ***Yasser Rahmani***
Status: ***Maître assistant***
E-Mail: ***rahmaniyasser@gmail.com***

Courses	Laboratory and Practical works	Individual work	Total volume
h	*15 h*	*40 h*	*85 h*

Coefficient :	ECTS credits:
2.5	*3*

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This course provides the necessary knowledge to study the different modes of heat transfer: Conduction, Convection, Radiation. The course also provides the student with the methodology to establish an energy balance for a system that exchanges energy with its environment and to determine how to limit or improve heat transfer within different systems (thermal insulation, fins, etc.)

1.2 Objectives

- Understand the principles of heat and heat transfer
- Master the main modes of heat transfer

1.3 Prerequisites

Thermodynamics, Fluid mechanics, Mathematical tools

Upstream modules	Module taught	Downstream modules
M.GEM11.05, M.GEM12.15	M.GEM22.43	MGEM31.52

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	General introduction	4 H	Understand the principle of the different modes of heat transfer: - Definition of fundamental quantities - Formulation of a heat transfer problem - Heat transfer modes
Chapter 2	Conduction	8 H	Master Fourier's law and learn about transient conductive transfer: - Fourrier's Law - Unidirectional heat transfer - Transient conduction
Chapter 3	Convection	6 H	Study of the convection coefficient h : - Forced convection - Natural convection
Chapter 4	Radiation	4 H	Acquire the basic concepts of radiation transfer: - definitions
			- Blackbody radiation - Heat exchange between any bodies

Chapter 5	Heat exchangers	8 H	Learn the methodology for calculating heat exchangers: - Heat exchanger technology - DTLM method - NUT method.
Practical work	Lab activity 1: Study of conduction in plane and cylindrical geometries Lab activity 2: Heat exchange by convection Lab activity 3: Study of a water-air radiator	5 H 5 H 5 H	Experimental determination of the thermal conductivity of different materials Study of heat transfer by forced convection in a cylindrical pipe (counter-currents and co-currents) Study of heat transfer in the case of a radiator)

2 METHODOLOGY

Integrated courses (h)	30
Practical work (h)	15
Project (h)	40
Visits (h)	

3 Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work	Ch2 Ch3 Ch5	25%
Continuous monitoring	CH1 Ch2 Ch3	25%
Presentation		
Final Review	Ch1 Ch2 Ch3 Ch4 Ch5	50%

4 Bibliographic References

- J-L. Battaglia, A. Kusiak , J-R. Puiggali, Introduction aux transferts thermiques, Dunod, Paris, 2010
- J.P. Couderc, C. Gourdon, A. Liné, Phénomènes de transfert en génie des procédés, Lavoisier, Paris, 2008.
- J.M., Coulson, J.F., Richardson, Chemical Engineering: volume 1, Fluid Flow, Heat transfer and mass transfer, Elsevier, 1980
- R. Leleu, Heat Transfers, Techniques de l'Ingénieur, J1080
- J. H., Lienhard, A Heat Transfer Textbook, Phlogiston Press, Cambridge, 2003
- A. Fortier, Mécanique des fluides et transferts de chaleur et de masse par convection, Masson, 1975

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 2

Module: Fluid Mechanics

Code: M.GEM12.14

Module group: GM1-2

Specialty modules	Main module	Engineering Sciences and Techniques	Preparation for the practice of profession
	x	x	

Teacher : Jemii Hiba

Status : Assistant Professor

E-Mail : h.jemai@hotmail.fr

Course	Laboratory and Practical works	Individual work	Total volume
30 h	15 h	40 h	85 h

Coefficient :	ECTS credits :
2	3

	Module Description M.GEM12.14	Department :Electromechanical Engineering
		Date : 15/10/2021
		Version N°: 2
		Semester : 2

1- COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

- Provide basic knowledge on statics and fluid dynamics
- Calculate the pressure drop experienced by a flowing fluid in a pipe.
- Provide the basic knowledge to calculate pumps (Hmt, NPSH,...)

1.2 Prerequisites

Knowledge of basic mathematical concepts

Thermodynamics

Upstream modules	Module taught	Downstream modules
MGEM11.01 MGEM11.05	MGEM12.14	MGEM22.51

1.3 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	Physical characteristics of fluids	3h	Mechanical behaviour and physical properties of fluids (compressible and incompressible)
Chapter 2	Fluid statics	6h	The students will acquire the following knowledge: a)The pressure difference between two points b) Fundamental laws of hydrostatics c) Pascal's theorem. d) Torsor associated with the pressure forces of a fluid on a plane wall e)Thrust centre position f) Archimedes' thrust
Chapter 3	FLUID KINEMATICS	6h	a) Types of flow b) Continuity equations
Chapter 4	PERFECT FLUID DYNAMICS	6h	- Flow rate and average speed - Flow regimes - Euler equation - Bernoulli equation
Chapter 5	VISCOUS FLUID DYNAMICS	6h	- Classification of pressure losses - Calculation of pressure losses - Reduction of pressure losses

Chapter 6	Pump calculation	3h	- Pump characteristic curve and network curve - Pump cavitation - Coupling of pumps and laws of similarity

Practical work	Title	Duration	Learning outcomes
Lab activity 1:	Properties of fluids	4h	Density measurement of fluids Measurement of fluid viscosity (ball drop)
Lab activity 2:	Pressure losses	4h	Pressure losses (Linear, 45° elbow, and 90° elbow)
Lab activity 3:	Venturi, valves and filter	4h	Venturi tube Pressure losses (Filter, Valves)
Lab exam	Assessment	3h	

2- METHODOLOGY

Integrated courses (h)	30
Labs and Practical work (h)	15
Project (h)	-
Visits (h)	-

3- Assessment

Activity	**Chapter(s)**	**Rating**
Mini-project	-	
Practical works	Chapters 1, 3, 4, 5 and 6	0.25
Continuous assessment	Chapter 2	0.25
Presentation	-	
Final Exam	All Chapters	0.5

4- Bibliographic References

[1] A. Fortier, Mécanique des fluides et transferts de chaleur et de masse par convection, Masson, 1975
[2] R.B. Bird, W.E., Steawart, E.N. Lightfoot, Transport phenomena, John Wiley and Sons, New York, 1960
[3] E. Baltaretu, Les pompes centrifuges: conditions fonctionnelles-constructives, chaînes de cotes, Eyrolles, 1975
[4] H. Fauduet, Fundamentals of Process Engineering and Chemical Technology, Lavoisier 1997.
[5] G. Towler, R. Sinnott, Chemical Engineering Design, Principles, Practice and Economics of Plant and Process Design, 2008, Elsevier
[6] R. Gibert, Génie chimique Tome 1 mécanique des fluides, Eyrolles, 1963

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 2

Module: Electrical Machines (DC Machine and Stepper Motor)

Code: M.GEM12.15

Module group: GM1-6

Specialty modules	Main module	Engineering Sciences and Techniques	Preparation for the practice of profession
		x	x

Teacher : Randa Kallel

Status : Assistant Professor

E-Mail: kallelranda1986@gmail.com

Course	Laboratory and Practical works	Individual work	Total volume
30 h	**15 h**	**40 h**	**85 h**

Coefficient :	ECTS credits :
2,5	**3**

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description** **M.GEM12.15**	**Department :Electromechanical Engineering** **Date : 15/10/2021** **Version N°: 2** **Semester : 2**

1. COURSE DESCRIPTION AND TARGET COMPETENCIES

1.1 : Description

Presentation of the DC machine and its applications in the industrial environment, advantages and drawbacks
Study of the operation of the DC machine in motor mode and in generator mode
Analysis of the characteristics of the DC machine in motor mode and in generator mode
Study of the operating principle of the stepper motor, its control and modelling

1.2 Objectives

To enable the student to use the fundamental principles of electromagnetism and the principles of electromechanical energy conversion to master the performance of this type of electrical machine and its applications in the industrial field related to electric traction and renewable energy conversion.

1.3 Prerequisites

Upstream modules	Module taught	Downstream modules
M.GEM12.16	M.GEM12.15	- M.GEM21.29 - M.GEM22.42

1.4 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	General	4h	- Learn the components of the different types of DC machines and their operating principle in motor mode and in generator mode - Study of the industrial applications of the different types of excitation of DC machines and the stepper motor
Chapter 2	Different types of armatures	4h	Analysis of the characteristics of the Gramme ring machine and the drum-winding machine
Chapter 3	Operating characteristics under load	4h	Analysis and development of switching phenomena, armature magnetic response and characteristic equations

Chapter 4	Characteristics of the DC machine	10h	Analysis and synthesis of the characteristics (no-load, on-load and control) of DC machines for different excitation modes, independent, shunt, series and compound in the field of electric vehicles and renewable energies
Chapter 5	Stepper motor	8 h	Analysis and synthesis of the different types of stepper motors, their operation and control
Practical work	Presentation of test rigs, safety procedures and equipment to be used - Lab activity 1: DC Generator - Lab activity 2: DC Motor	15h	Mastery of the reading of nameplates, selection of measuring equipment and the analysis of the characteristics recorded

2. METHODOLOGY

- Presentation of the objectives of the subject and the goals to be achieved.
- Directed and organised activation of students' knowledge using structuring methods.
- Use of the resources prescribed to the students: processing, deepening, consolidation of the required knowledge, exercises and industrial applications.
- The contact hours consist of presenting different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For individual activities, students have to do homework assignments.

Integrated courses (h)	30h
Labs and Practical work (h)	15h
Project (h)	20h
Visits (h)	20h

3. Assessment

Activity	Chapter(s)	Rating
Mini-project		
Practical works	1-2-3-4	25%
Continuous assessment	1-2-3-4	25%
Presentation		
Final Exam	1-2-3-4-5	50%

4. BIBLIOGRAPHICAL REFERENCES

[1] G. Seguier, F. Notelet, Electrotechnique Industrielle, 3 ème Edition, Lavoisier, 2006,

[2] J. Chatelain, Machines Electriques, Volume X, Edition Georgi, 1983,

[3] Th. Wildi, Electrical Engineering, 3 ème Edition, 2000,

[4] R. Bourgeois, D. Cogniel, Mémotech Electrotechnique, Collection A. Capliez, 2002,

[5] F. Warme, P. Maye, Génie Electrotechnique, Dunod, 2013.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 2

Module: Electrical engineering

Code: M.GEM12.16

Module group: GM1-6

Specialty modules	Main module	Engineering Sciences and Techniques	Preparation for the practice of profession
		x	x

Teacher : Rafik Neji

Status: Professor

E-Mail: rafik.neji@gmail.com

Course	Laboratory and Practical works	Individual work	Total volume
30 h	**15 h**	**40 h**	**85 h**

Coefficient :	ECTS credits :
2,5	**3**

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description** **M.GEM12.16**	**Department :Electromechanical Engineering** **Date : 15/10/2021** **Version N°: 2** **Semester : 2**

1. COURSE DESCRIPTION AND TARGET COMPETENCIES

1.1 Description

Study of the single-phase circuit: Definition of the sinusoidal quantity, Presentation and properties of sinusoidal quantities, Impedance and Admittance of a circuit, Study of circuits in steady state, Active power, reactive power, apparent power, Laws relating to powers, Power factor, Improvement of the power factor, other concepts.

Study of balanced three-phase systems: Definition, Usual set-ups - Star set-up - Delta set-up, Active power, reactive power, Laws relating to power, Different set-ups for measuring active and reactive power, Improvement of the power factor, Practical notions.

1.2 Objectives

The aim of this module is to familiarise engineering students with the specific concepts of this discipline, which will enable them to practice their future profession in an extremely vast field of application. The application covers many industrial companies, in the fields of production and transport of electrical energy, in electrical equipment, in transport using electric motors, in power electronics and microelectronics

1.3 :Prerequisites

Upstream modules	Module taught	Downstream modules
Preparatory studies in : - Mathematics (Complex numbers and Trigonometry) - Basic electricity	M.GEM12.16	- M.GEM21.29 - M.GEM22.42

1.4 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	Single-phase AC circuit	15h	- Mastery of single-phase electrical circuits for the calculation of various electrical quantities

Chapter 2	Balanced three-phase systems	15h	- Mastery of balanced three-phase systems for the correct selection of the load assembly, for the calculation of the various electrical and energy quantities, and for the measurement of power
Practical work	- Presentation of test rig, safety procedures and equipment to be used - Lab activity 1: Single-phase AC circuit - Lab activity 2: Power measurement for a balanced three-phase system	15h	Mastery of the reading of nameplates, selection of measuring equipment and the analysis of the characteristics recorded

2. METHODOLOGY

- Presentation of the objectives of the subject and the goals to be achieved.
- Directed and organised activation of students' knowledge using structuring methods.
- Use of the resources prescribed to the students: processing, deepening, consolidation of the required knowledge, exercises and industrial applications.
- The contact hours consist of presenting different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For individual activities, students have to do homework assignments.

Integrated courses (h)	30h
Labs and Practical work (h)	15h
Project (h)	10h
Visits (h)	30h

3. Assessment

Activity	**Chapter(s)**	**Rating**
Mini-project		
Practical works	1 and 2	25%
Continuous assessment	1	25%
Presentation		
Final Exam	1-2	50%

4. BIBLIOGRAPHICAL REFERENCES

[1] J. Lessenne, F. Notelet, G. Seguier, Introduction à l'Electrotechnique approfondie, Lavoisier, 1994,

[2] G. Seguier, F. Notelet, Electrotechnique Industrielle, 3 ème Edition, Lavoisier, 2006,

[3] F. Warne, P. Maye, Génie Electrotechnique, Dunod, 2013,

[4] Th. Wildi, Electrical Engineering, 3 ème Edition, 2000,

[5] R. Bourgeois, D. Cogniel, MémotechElectrotechnique, Collection A. Capliez, 2002.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 2

Module: Automation I+II (Analysis of dynamic and continuous systems)

Code: M.GEM12.17

Module group: GM1-5

Specialty modules	Main module	Engineering Sciences and Techniques	Preparation for the practice of profession
		x	

Teacher : Omaya Bellaaj

Status : Assistant Professor

E-Mail: bellaj_omaya@hotmail.fr

Course	Laboratory and Practical works	Individual work	Total volume
45 h	15 h	25 h	85 h

Coefficient :	ECTS credits :
2.5	3

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This course is an introduction to Automatic Control commonly qualified as the science of automatisms. The study, analysis, synthesis and the implementation of control systems is provided to students

In the second step the student will learn about different approaches to stability, including the Routh approach, Evans loci, Nyquist, Black and Bode. The student will be able to manipulate

1.2 Objectives

This first parts course aims to introduce the main concepts of Automatic Control: system modelling, the feedback control structure, the study and representation of first and second order system transfer functions. In order to implement and use these concepts, mathematical tools (Laplace Transform) are presented and studied in detail and is considerd as the the technical core of this course.

In the second part the student will learn about different approaches to stability, including the Routh approach, Evans loci, Nyquist, Black and Bode. The student will be able to manipulate

1.3 Prerequisites

- Solving differential equations,
- Basic mathematics.

Upstream modules	Module taught	Downstream modules
MGEM11.01	MGEM12.17	MGEM22.42

1.4 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	Control systems	9h	- Examples of Physical System Modelling - Example of control systems - Systems and signals - Electrical and dynamic systems Electromechanical analogy Applications

Chapter 2	Mathematical concepts: Laplace transformation	9h	Definition of the Laplace transformation Properties Application to the response of a linear system: transfer function
Chapter 3	Computation of transfer functions	12h	Study and representation of transfer functions - First order system - Time analysis - Frequency analysis - Second order system - Time analysis - Frequency analysis Frequency representation of transfer functions
Chapter 4	Calculation of transfer functions	9h	Block diagram transformation methods - Fluency graph Mason's Rule Examples
Chapter 5	Slave systems	12h	- Concept of a controlled system - Stability of servo systems - Routh stability criterion - Evans place (root locations) - Reversal criterion - Safety margin - Final regime of the slaves
Chapter 6	Correctors	9h	Position of the problem Phase advance correcting network Phase delay correcting network
Practical work	Analysis of first and second order systems	15h	- First order system - Time analysis - Frequency analysis - Second order system - Time analysis - Frequency analysis Stability study of servo systems - Location of Black - Nyquist location Location of Bode

2. METHODOLOGY

- The Contact Hours consist of the presentation of the training objectives and the programme.
- Directed and structured activation of students' prior knowledge using structuring methods.
- Concrete use of the resources provided to students: treatment, deepening, exercise, application, consolidation of new knowledge

Integrated courses (h)	30h
Labs and Practical work (h)	15h
Project (h)	10h
Visits (h)	10h

3. Assessment

Activity	**Chapter(s)**	**Rating**
Mini-projet		
Travaux Pratiques	Chapter 1-2-3	0.25
Contrôle continu	Chapter 1-2-3	0.25
Exposé		
Examen Final	Chapter 1-2-3	0.5

4. Bibliographic References

[1] J. Nagrath, M. Gopal, Contro Systems Engineering, Willy Eastern Limited, New Delhi, 1982.

[2] P. de Larminat, Y. Thomas, Automatique des Systèmes Linéaires - Tomes 1:

[3] Signals and Systems and 2: Identification, Ed. Flammarion Sciences, Paris, 1977. [4]

Thomas Kailath, T. KAILATH - Linear systems, Information and System Sciences

[5] Series - Prentice Hall, Englewood, 1988;

[6] Francis Milsant, Asservissements Linéaires, T1- Analyse, T2- Synthese, Eyrolles, Paris, 1971

[7] Yves Granjon , Linear, non linear, state time systems...Collection : Sciences Sup, Dunod, September 2015

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **- Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: Operational Research

Code: M.GEM12.18

Module group: GM1-1

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
	x	x	

Teacher : Amina Arousse

Status : Assistant Professor

Mail: Arousse.amina@gmail.com

Course	Practical work	Personal work	Total volume
24 h	- h	25 h	49 h

Coefficient :	ECTS credits :
1,5	2

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM12.18**	**Department :Electromechanical** **- Semester: 2** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 : Description

Operations research is a discipline that draws on the operational aspects of mathematics, economics and engineering sciences. The objective is to propose quantitative approaches to produce better decisions. These approaches provide tools to rationalise simulate and optimise industrial and economic systems.

1.2 Objectives

The objective is to have a first contact with the formulation and solution of linear programs with different geometrical, algebraic and algorithmic methods in several case studies.

1.3 Prerequisites

Upstream modules	Module taught	Downstream modules
	MGEM12.18	

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Introduction to linear programming	4h	Formulation of a linear program. Examples of applications. Graphical solution.
Chapter 2	Solving a continuous linear program	8h	Standard form of a linear program. Simplex method: Algebraic and algorithmic descriptions. Presence of equality constraints. Big M method. Two phase method. Special cases
Chapter 3	Duality and post-optimal analysis	6h	Construction of a dual problem. Optimal solutions of the dual and the primal. Sensitivity analysis. Adding a variable or a constraint.
Chapter 4	Integer linear programming	6h	Introduction. Method of Gomory cuts. Branch-and-Bound method

2. METHODOLOGY

The pedagogical approach of this course is based on a deep understanding of the methods, while focusing on the computational aspects.

Integrated courses (h)	24
Practical work (h)	
Project (h)	25
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work		
Continuous monitoring	Chapters 1 and 2	0.25
Presentation		
Final Review	Chapters 2, 3 and 4	0.75

4. Bibliographic References

[1] S.I. Gass, Linear programming: Mathods and Applications. Dover Books on Computer Science.

[2] F. Faure, B. Lemaire, C. Picouleau, Précis de recherche opérationnelle. Edition Dunod.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **- Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: Mini project

Code: M.GEM12.19

Module group: GM1-3

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
		x	x

Teacher : Frikha Moez

Status : Assistant Professor

Mail: frmoez@gmail.com

Course	Practical work	Personal work	Total volume
- h	30 h	25 h	55 h

Coefficient :	ECTS credits :
1,5	2.

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

The mini-projects are an opportunity for the student to deepen and apply the knowledge acquired during the courses. The student learns how to divide the provided time of the project between analysis and understanding of the problem. They also learn to check and propose optimal solutions

1.2 Objectives:

- Drawing up the specifications for a project according to requirements.

- Propose technological solutions for design, transmission and control and select the best among the proposed solutions.

- Designing a mechanical system

1.3 Prerequisites:

- Mechanical design

- Strength of materials

Upstream modules	Module taught	Downstream modules
MGEM11.02; MGEM11.03; MGEM11.09	MGEM12.19	MGEM22.46

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Practical work	- Study of the existing situation and problematic - Formulation of the specifications Bibliographic study - Functional analysis and selection of solutions - Design with Solidworks		- Understand the relationships between the system under study and the environment around it. - Define all the parameters to be taken into account for the proper running of the system. - Propose technological solutions to ensure system operation

2. METHODOLOGY

Integrated courses (h)	—
Practical work (h)	30 H
Project (h)	25 H
Visits (h)	—

3. Evaluation

Designation	Chapter(s)	Weighting
Mini-project	———	
Practical work	———	0.5
Supervised Homework	———	
Presentation	———	0.5
Final Review	———	

4. bibliographical references

[1] Guide de calcul en mécanique, *D. SPENLE & R. GOURHANT*, Hachette, edition n°3, 2001.

[2] Guide du dessinateur industriel, *A. CHEVALIER*, Hachette, 2004.

[3] Mémotech Productique: conception et dessin, *C. Barlier& R. Bourgeois*, Casteilla, edition n°3, 1995.

[4] Mémotech Génie Mécanique, C. Barlier& B. Poulet, Casteilla, edition n°3, 1995.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **- Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: English for SpecificPurposes

Code: M.GEM12.20

Module group: GM1-7

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
	x		

Teacher : Mariem Feki

Status : Assistant

Professor

Mail: fekimariem@gmail.com

Course	Practical work	Personal work	Total volume
24 h	- h	30 h	54 h

Coefficient :	ECTS credits :
1,5	2

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM12.20**	**Department :Electromechanical** **- Semester: 2** **Version number: 02** **Date: 15/10/2021**

1. DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED :

1.1 Description

knowledge: students should embrace a pack of vocabulary concerning the tool, the equipments and the processes. 2-Competences: students should be able to make accurate sentences, with simple structures, conjugate verbs in simple forms of the tenses. 3- Skills: students would be able to answer correctly, using the appropriate structure and vocabulary in specific contexts.

1.2 Objectives

After completing this course , students are expected to master three language skills: Reading, writing and speaking.

Students are able to find out the main idea of the text and to find explicit and, then, implicit information from the text. Students are able to find out word definitions related to the text and to relate information to their life. Students are able to write and tell on site activities and challenges.

1.3 Pre-requisites

There is a minimum level according to international tests, that is, between A2 and B1, to reach by the end of the year having a B2 in the two skills (reading, speaking) and B1 in listening and writing.

Upstream modules	Taught module	Downstream modules
	M.GEM12.20	

1.4 Learning outcomes

Chapters	Title	Duration	Learning outcomes
Chapter 1	Placement Test	4 hrs	Learning from mistakes of the placement test Student is able to identify from which point he should start
Chapter 2	Tools and devices. - naming tools and their uses. - Simple present and present continuous	6 hrs	The main outcome is to have students familiar with the equipments on plants or sites, and able to understand

	- describing tools in different work areas and their uses (adjectives and adverbs) Technical drawings		and talk about work areas
Chapter3	Automation and robotics. Safety at work: - PPE / IPE / CPE - instructions / hazards and accidents / remedies. - making orders and giving advice (modal verbs)	4 hrs	The objective is mainly to have students able to talk about challenges and hazards in mechanical engineering contexts. Students should be able to participate in group conversations in an emergency context. Prepare and introduce presentations on safety measures and equipments.
Chapter4	Reading articles about energy and mechanical advances Summarizing articles Presenting main ideas of articles	6 hrs	Students should be able to understand an article on mechanical advances. To write summaries with guidance .
Practicalworks	Continuous presentations	4hrs	Presentations in every unit are compulsory.

2.METHODOLOGY :

The Contact Hours consist of the presentation of different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For the self-study activities, students have to do the exercises given as homework.

Integrated courses (h)	24hrs
Practicalwork (h)	
Project (h)	
Visits (h)	

3. Assessment:

Designation	**Chapter(s)**	**Rating**
Mini-project		
Practical works		
Continuous assessment	Units 1&2	10%
Presentation	All units	10%
Final Review	All units	80%

4. Bibliography:

[1] Sporanzi, Sabrina. Flash on English for Mechanics , Electronics and technical assistance.ESP series.
Eric.H. Glendinning, Norman Glendinning, Oxford English for Electrical and Mechanical Engineering, Ed Oxford University Press.
https://eprints.umm.ac.id/36610/3/Prastiyowati%20Lestiono%20Khoiriyah%20Khoyyimah%20Herdianto%20Fitriati%20-%20English%20for%20Mechanical%20Engineering.pdf

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **- Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: Setting up the company

Code: M.GEM12.21

Module group: GM1-7

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
	x		

Teacher : Mohamed Zghal

Status : Assistant Professor

Mail: m.zghal@yahoo.fr

Course	Practical work	Personal work	Total volume
24 h	- h	24 h	48 h

Coefficient :	ECTS credits :
1,5	1,5

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM12.21**	**Department :Electromechanical** **- Semester: 2** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This module aims to help students in developing their own business models and business plans. It enables the student to :

- acquire a global vision on the blocks of a business model and the components of a business plan - distinguish between business model and business plan - discover the enthusiasm of entrepreneurs, their need to create and innovate - know how to develop their professional potential as an entrepreneur - be able to elaborate their business plan and defend their project.

1.2 Objectives

- Taking initiative, taking risks with discernment, autonomy, leadership capacity,...
- Development of creativity,
- Ability to develop a project with analogue convictions

1.3 Prerequisites:

Upstream modules	Module taught	Downstream modules
	MGEM11.21	

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	- Definition of a business creation project	6	
Chapter 2	- Methods of generating project ideas	8	- Presentation of methods for generating ideas for business creation projects using creativity techniques: (Brainstorming, Brain Writing,.)
Chapter 3	- The Business Model	8	- Key points of the business model - From Business Model to Business Plan - Commercial feasibility study - Technical and human feasibility study - Legal feasibility study - Economic and financial feasibility study
Chapter 4	Support for business creation in Tunisia	8	Support organisations for business
			creation - Financing mechanisms for starting a business - Finalisation of the business plan

2. METHODOLOGY

Integrated courses (h)	30
Practical work (h)	
Project (h)	20
Visits (h)	

3. Evaluation

Designation	Chapter(s)	Weighting
Mini-project		
Practical work		
Continuous monitoring	CHP1 and ChP2	0.25
Presentation		
Final Review	All Chapters	0.75

4. Bibliographic References

[1] Catherine Léger-Jarniou: Réaliser l'étude de marché de son projet d'entreprise, Paris, Dunod, coll. "Entrepreneurs", 3rd edition, 2007.

[2] Robert Papin. (1993): Stratégie pour la création d'entreprise: Création, Reprise et développement, Paris Dunod, 1989.

[3] Guide to financing small and medium-sized enterprises.

[4] Guide to Preparing a Business Plan "The Key to Your Business Success

[5] Guide for young entrepreneurs: My Business Plan

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **- Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: Statistics and Probability

Code: M.GEM12.22

Module group: GM1-1

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession

Teacher : Bouri Mohmed

Status: Professor

Mail :

Course	Practical work	Personal work	Total volume
24 h	h	24 h	48 h

Coefficient :	ECTS credits :
1,5	2

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM12.22**	**Department :Electromechanical** **- Semester: 2** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This course intends to present some iterative numerical methods to be implemented for mechanical problems in other courses of the electromechanical engineering program.

1.2 Objectives

- use the concepts and vocabulary of probability theory and statistics
- assess the probability of events using combinatorial analysis or the main laws of probability
- construct the probability distribution of a discrete random variable and calculate its expectation and Variance
- normalise data
- correctly use the binomial, Poisson, normal, Student's law and chi-square tables

1.3 Prerequisites

The subject matter concepts

Upstream modules	Module taught	Downstream modules
MGEM11.01	MGEM12.22	

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Combinatorial analysis and probability	4	Know the basic definitions of combinatorial analysis, probability calculus and statistics.
Chapter 2	Binomial law and Poisson law	5	Understand intuitively and mathematically the main elements in probability and statistics.
Chapter 3	Normal law	5	Apply fundamental concepts in probability and statistics to various situations
Chapter 4	Statistical inference: parameter estimation	5	
Chapter 5	Statistical inference: hypothesis testing	5	Demonstrate rigour and critical thinking in statistics.

2. METHODOLOGY

- The lecture periods consist of theoretical presentations and examples.

- There is no compulsory textbook for this course.

Exercises and notes will be provided to students in class. Some useful books are included in the bibliography.

Integrated courses (h)	24 h
Practical work (h)	
Project (h)	24 h
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work		
Continuous monitoring	Chp1 -chp2 chp 3	0.25
Presentation		
Final Review	Chp 1+2+3+4+5	0.75

4. Bibliographic References

[1] Amyotte, Luc. (2012). Complément de méthodes quantitatives : Applications a la recherche en sciences humaines. Editions du renouveau pédagogique. ISBN 978-2-7613-4164-6

GEM2

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromechanical Engineering Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 1

Module: Processing without material removal

Code: M.GEM21.24

Module group: GM2-2

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
X			

Teacher : Moez Souissi

Status : Assistant Professor

Mail: souissi.moez@yahoo.fr

Course	Practical work	Personal work	Total volume
30 h	30 h	30h	90 h

Coefficient :	ECTS credits :
2,5	3

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description** **M.GEM21.24**	**Department :Electromechanical Engineering Engineering** **Date : 15/10/2021** **Version N°: 2** **Semester : 1**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

The aim of this module is to teach students about all the manufacturing processes for metal parts, and then describes in details the forming operations by plastic deformation without removing material. After specifying the geometry and kinematics of the various processes, the chapter presents the practical implementation of the processes according to the temperature and the type of the main alloys (iron, aluminium and copper base).

1.2 Prerequisites

Implementation and manufacturing technology

Upstream modules	Module taught	Downstream modules
MGEM11.09 - MGEM11.04	MGEM21.24	

1.3 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	Foundry materials	2	Review on the different types and characteristics of foundry materials.
Chapter 2	General	2	Comparison between processing of materials methods with and without chip removal.
Chapter 3	Sand casting	8	Define the architecture, method of preparation of the sand moulds taking into account all the calculation parameters necessary to determine the dimensions and shape of the model. Understand the areas of application. To know the characteristics of the parts made.
Chapter 4	Shell moulding	2	Define the method of making a shell mould. Understand the areas of application. To know the characteristics of the parts made.

Chapter 5	Moulding in expanded polystyrene	2	Learn how to make a model in expanded polystyrene. Method of preparing a shell for casting. Understand the areas of application. To know the characteristics of the parts made.
Chapter 6	Lost wax casting	2	Method of preparing lost wax moulds. Understand the areas of application. To know the characteristics of the parts made.
Chapter 7	Introduction to metal moulding	2	Difference between permanent and non-permanent moulds. Comparison of the quality of parts obtained by different processes.
Chapter 8	Casting in metal moulds	7	Method of preparing metal moulds. Understand the areas of application. To know the characteristics of the parts made.
Practical work	Lab activity 1: Sand casting Lab avctivity 2: Shell Lab activity 3: Lost wax casting	15	Melting of the metal to be cast. Prepare a sand mould and make the casting. Finishing of the resulting parts. Casting of the Aluminium in a metal mould. Assignment of the necessary finishing operations.

2. METHODOLOGY

Integrated courses (h)	27
Practical work (h)	15
Project (h)	
Visits (h)	

3. Assessment

Activity	**Chapter(s)**	**Rating**
Mini-project		
Practical works		0.25
Continuous assessment	1 à 4	0.25
Presentation		
Final Exam	1 à 8	0.5

4. Bibliographic References

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Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Structural Analysis

Code: M.GEM21.25

Module group: GM2-3

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
		X	X

Teacher : Fakher Chaari

Status: Professor

Mail: fakher.chaari@gmail.com

Course	Practical work	Personal work	Total volume
30 h		40h	70 h

Coefficient :	ECTS credits :
2	2.5

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM21.25**	**Department :Electromechanical** **-Semester: 1** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

The structural design course introduces students to the various methods of solving isostatic and hyperstatic structures

1.2 Objectives

- Calculation of hyperstatic structures by the force method
- Calculation of isostatic and hyperstatic lattices

1.3 Prerequisites:

Upstream modules	Module taught	Downstream modules
MGEM11.03	MGEM21.25	

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Reminder on the resolution of isostatic systems	8 hours	Recall of the basic concepts acquired in SoM and introduce the energy methods
Chapter 2	Introduction to hyperstatic systems	6 hours	Know how to calculate the degrees of hyperstatism of structures
Chapter 3	Resolution of hyperstatic systems by the Force method	10 hours	Be able to solve a hyperstatic structure of the portal frame type
Chapter 4	Lattices	6 hours	Solving isostatic and hyperstatic lattices
Practical work			

2. METHODOLOGY

Integrated courses (h)	24 hours
Practical work (h)	
Project (h)	30 hours
Visits (h)	

3. Evaluation

Designation	Chapter(s)	Weighting
Mini-project		
Practical work		
Continuous monitoring	Chapters 1 and 2	
Presentation		
Final Review	Chapters 1 to 4	

4. bibliographical references

[1] Pierre Latteur, Calculer une structure, Editions Academia; 4th edition, 2016

[2] Salah Khalfallah, Structural analysis, Wiley Publishing, 2019

[3] Devdas Menon, Advanced Structural Analysis, Alpha Science, 2019

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description**	**Department :Electromecanical Engineering**
		Date : 15/10/2021
		Version N°: 2
		Semester : 2

Module: Physical Metallurgy

Code: M.GEM21.26

Module group: GM2-3

Specialty modules	Main module	Engineering Sciences and Techniques	Preparation for the practice of profession
x	x		

Teacher: Khlif Mohamed

Status : Assistant Professor

E-mail: mohamed.khlif@enis.tn

Course	Laboratory and Practical works	Individual work	Total volume
27 h	- h	30 h	57 h

Coefficient :	ECTS credits :
1,5	2

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**Module Description** **M.GEM21.26**	**Department :Electromecanical Engineering** **Date : 15/10/2021** **Version N°: 2** **Semester : 2**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

The course is dedicated to the study of crystallography to understand crystal structure, solid state bonding and states properties of matter. The physical phenomena such as defects, diffusion and transformations are developed to understand how alloys are built and to be able to interpret equilibrium and non-equilibrium binary diagrams.

1.2 Objectives

- Understanding crystallography and solid state bonding
- Mastering alloys and their evolution as a function of temperature
- Know how to read and interpret an equilibrium diagram (binary and ternary) and predict the crystal morphology
- Understand the effect of non-equilibrium solidification on transformations and crystal structure

1.3 Prerequisites:

Crystallographic concepts

Upstream modules	Module taught	Downstream modules
	MGEM21.26	MGEM22.39

1.4 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	General overview on materials and states of matter.	4 h	Knowing the different materials
Chapter 2	Atomic architecture, solid state bonding, crystal structures, direction finding and plane finding, defects.	10 h	At the end of this chapter students will be able to know the different crystal structures
Chapter 3	Diffusion	3 h	At the end of this chapter the students will be able to know the diffusion of atoms and defects in a crystal lattice

Chapter 4	Equilibrium diagram of alloys, miscibility and solid state transformations.	5	At the end of this chapter students will be able to identify the binary diagram
Chapter 5	Interpretation of a diagram and the reality of solidification	5	

2. METHODOLOGY

Integrated courses (h)	27 h
Labs and Practical work (h)	
Project (h)	20
Visits (h)	10

3. Assessment

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical works		
Continuous assessment	Ch1+2+3	0.25
Presentation		
Final Exam	Ch1+2+3+4+5	0.75

4. Bibliographic References

[1] Engineering Technique

[2] Materials, *Polytechnique Montrial*

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Mechanical Vibration

Code: M.GEM 21.27

Module group: GM2-5

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
X			

Teacher: Walid Meslmani

technologist Status : Master

Mail: meslameni.walid@gmail.com

Course	Practical work	Personal work	Total volume
30h	15 h	40h	85 h

Coefficient :	ECTS credits :
2	3

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM21.27**	**Department :Electromechanical** **-Semester: 1** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This course will provide students basic knowledge about mechanical systems and structure vibration subjected to external loads or torques. They will learn about vibration isolation of a mechanical system and how to improve systems design by vibration analysis

1.2 Objectives

- Modelling of the dynamics of a mechanical system
- Vibration isolation of plant and machinery
- Mastery of the passive vibration isolation techniques

1.3 Prerequisites:

Upstream modules	Module taught	Downstream modules
M.GEM11.01	M.GEM21.27	M.GEM31.55

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	MODELLING OF DYNAMIC SYSTEMS	4 h	At the end of these chapters students will be able to model dynamic systems
Chapter 2	SYSTEMS WITH ONE DEGREE OF FREEDOM	9 h	Apply the concepts of rigid and deformable solid mechanics and continuum mechanics to model and analytically solve problems of dynamics of simple structural elements or mechanisms
Chapter 3	DISCRETE SYSTEMS WITH SEVERAL DEGREES OF FREEDOM	9 h	
Chapter 4	CONTINUOUS SYSTEMS	8 h	
Practical work	Lab activity 1: SYSTEMS WITH ONE DEGREE OF FREEDOM Lab activity 2: Resonance of a beam in transverse vibration Lab activity 3: Damped mechanical oscillator		To apply the concepts seen in the course:

2. METHODOLOGY

The course is based on a methodology combining lectures, tutorials, practical work and individual work.

The face-to-face sessions are of the integrated course type combining lectures and tutorials. Students are required to complete personal work in a non-classroom setting and to present it in class as a lecture. The practical work allows the application of the concepts studied during the course

Integrated courses (h)	30
Practical work (h)	15
Project (h)	40
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work	Chp1-Chp2	0.25
Continuous monitoring		0.25
Presentation		
Final Review	Chp1-Chp2 Chp3 and Chp4	0.5

4. Bibliographic References

R. J. GIBERT: VIBRATION OF STRUCTURES, CEA-EDF-INRIA. Summer School of Numerical Analysis. Publisher: EYROLLE

S. TIMOSHENKO and D. H. YOUNG: ADVANCED DYNAMICS, McGRAW-HILL BOOK COMPANY, INC. 1948

J. H. GINSBERG: MECHANICAL AND STRUCTURAL VIBRATIONS, Theory and Applications. JHON WILEY and SONS, INC. 2001 W.

T. THOMSON: THEORY OF VIBRATION WITH APPLICATIONS, Third Edition- Revised Printing. PRENTICE HALL. ISBN: 0-13-914532-X 025 H. CABANNES

SERIES. Mc-GRAW-HILL BOOK COMPANY- New York, St. Louis, San Francisco, Toronto, Sydney

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Robotics (Introduction to Robotics)

Code: M.GEM21.28

Module group: GM2-6

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
	X		

Teacher: Kais Jamoussi

Status: Associate

Professor

Mail: kais.jamoussi@yahoo.fr

Course	Practical work	Personal work	Total volume
24 h		**25 h**	**49 h**

Coefficient :	ECTS credits :
1,5	2

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

Robotics is the set of techniques for designing and building automatic machines or robots. Robots enable companies to improve their productivity and competitiveness.

1.2 Objectives

The students should distinguish between different types of robot (Cartesian robot, cylindrical robot, spherical robot etc.). They will be able to make a geometric and kinematic model of a manipulator robot with several degrees of freedom. They will be also able to elaborate a geometrical model to control a manipulator robot from an initial position to a final position in order to perform a specific task (drilling, milling,...)

1.3 Prerequisites

1. Basic knowledge of speed composition formulae.
2. Basic knowledge of displacement geometry.
3. Basic knowledge of some mathematical tools (matrix calculation, geometry, etc.)

Upstream modules	Module taught	Downstream modules
MGEM11.01	MGEM21.28	MGEM31.56

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Introduction to robotics	6h	- Components of a robot - Classification of robots according to their kinematic structure - Reminder on linkages - Degree Of Freedom - Architecture - Morphology of manipulative robots

Chapter 2	Geometry and kinematics of motion	9h	- Displacement geometry - Director cosines - Euler angles - Homogeneous transformations - Kinematics of movement - Rotating frame systems - Speed composition laws
Chapter 3	Robot modelling	9h	- Introduction to modelling - Methods to calculate the direct geometric model of a robot

2. METHODOLOGY

- The Contact Hours consist of the presentation of the training objectives and the programme.
- Directed and structured activation of students' prior knowledge using structuring methods.
- Concrete use of the resources prescribed to the students: treatment, deepening, exercise, application, consolidation of new knowledge

Integrated courses (h)	24h
Practical work (h)	0h
Project (h)	15h
Visits (h)	10h

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work		
Continuous monitoring	Chapter 1-2-3	0.25
Presentation		
Final Review	Chapter 1-2-3	0.75

4. Bibliographic References

1 -Denavit J and Hartenberg R.S. A Kinematic notation for lower pair mechanism based on matrices.Trans. of ACME, J. of Applied Mechanics, 22 :215-221, June 1955.

2 - Khalil W. and Creusot D. Symoro+: a system for the symbolic modeling of robots. Robotica, 15 :153-161.

3- J.-P. Lallemand, S. Zeghloul: Robotics. Aspects fondamentaux, Masson 1994, 312 pages

4- Modelling and control of robots, W. Khalil, G. Lebret, EI3 Automatique de l'ECN course 94/95

6- Robotics course, J.-L. Ferrier, DESS ASC

7- Robots. Principles and control, C. Vibet, Ellipses 1987, 207 pages

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Electrical Machines II (AC Electrical Machines)

Code: M.GEM21.29

Module group: GM2-1

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
	X	X	

Teacher : Rafik Neji

Status: Professor

Mail: rafik.neji@gmail.com

Course	Practical work	Personal work	Total volume
36 h	15 h	34h	85 h

Coefficient :	ECTS credits :
2,5	3

1. COURSE DESCRIPTION AND TARGET COMPETENCIES

1.1 Description

- Study and Analysis of the Iron Core Coil: Usefulness of iron, effects of saturation, effects of hysteresis, equivalent diagram, vector diagram, power balance.
- Study and analysis of the Single Phase Transformer: Operating principle, Main use of the transformer, No load operation of the transformer, Transformer ratio, Load operation of the transformer, Short circuit operation of the transformer, Equivalent diagrams, No load, load and short circuit power balances
- Study and control of the Synchronous Machine: components of the machine, Electromotive force, No-load operation, Load operation, Armature magnetic reaction, Equivalent diagram, Bhen-Eschumburg diagram, powers, losses, torques and efficiency, Operation of an alternator on an independent network, Operation of an alternator on a network of infinite power
- Study of the Asynchronous Machine: components and operation, Equation and equivalent diagram, Energy balance and electromagnetic torque, Testing of asynchronous motors, Starting of asynchronous motors.

1.2 Objectives

The student will be able to establish the general equations of electromechanical energy conversion applied to transformers, synchronous and asynchronous machines, and to determine and analyse their characteristics in static or variable regimes. It allows him to determine and analyse their characteristics in static or variable regimes taking into account their associations with static converters especially for applications related to electric and hybrid vehicles, renewable energies, wind turbines and photovoltaic panels.

1.3 Prerequisites

Upstream modules	Module taught	Downstream modules
-M.GEM12.16 -M.GEM12.17	M.GEM21.29	M.GEM22.44

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Iron core coil	12h	- Mastery of the study of the iron core coil, the importance and disadvantages of iron, the equation and the energy balance. - Analyse the phenomenon of saturation and hysteresis

Chapter 2	Single-phase transformer	12h	- To know the main use of the transformer in the field of long-distance energy distribution and transmission - Know how to equate and analyse its behaviour during no-load, short-load and full-load operation
Chapter 3	Synchronous machine	12h	- To know how to use this type of machine in alternator and motor operation and its application in the field of electric traction and wind turbines - Mastering its various functions in power plants
Chapter 4	Asynchronous machine	9h	- Study and analysis of the behaviour of the asynchronous machine when used as a motor - Equation and identification of its parameters for use in electric traction system
Practical work	- Presentation of test rig, safety procedures and equipment to be used - Lab activity 1: Single-phase transformer: different operating modes - Lab activity 2: Asynchronous machine: mechanical characteristics - Lab activity 3: Synchronous machine, alternator and motor operation - a balanced three-phase system	15h	- Mastering the reading of nameplates, the selection of measuring devices - Analysis and interpretation of the recorded characteristics

2. METHODOLOGY

- Presentation of the objectives of the module and the goals to be achieved.
- Directed and organised activation of students' knowledge using structuring methods.
- Use of the resources prescribed to the students: processing, deepening, consolidation of the required knowledge, exercises, industrial applications in the field of production, transport and distribution of electrical energy, as well as in electric power trains and wind turbines.
- The contact hours consist of presenting different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For individual activities, students have to do the exercises given as homework.

Integrated courses (h)	45h
Practical work (h)	15h
Project (h)	20h
Visits (h)	20h

3. EVALUATION

Designation	Chapter(s)	Weighting
Mini-project		
Practical work	2-3-4	25%
Continuous monitoring	1-2	25%
Presentation		
Final Review	1-2-3-4	50%

4. BIBLIOGRAPHIC REFERENCES

1. G. Seguier, F. Notelet, Electrotechnique Industrielle, 3rd ème edition, Lavoisier, 2006,
2. J. Chatelain, Machines Electriques, Volume X, Georgi edition, 1983,
3. Th. Wildi, Electrical Engineering, 3rd ème edition, 2000,
4. R. Bourgeois, D. Cogniel, MémotechElectrotechnique, Collection A. Capliez, 2002,
5. P. Arques, Conception et Construction des Moteurs Alternatifs, de la Théorie à la Conception, Ellipses, 1999,
6. S. Loutzky, Calcul Pratique des Alternateurs et des Moteurs Asynchrones, Eyrolles, 1969.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Electrical diagrams (Electrical diagrams and protection)

Code: M.GEM21.30

Module group: GM2-1

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
	X	X	

Teacher : Randa Kallel

Status : Assistant Professor

Mail: kallelranda1986@gmail.com

Course	Practical work	Personal work	Total volume
24 h	15 h	30h	69 h

Coefficient :	ECTS credits :
2	3

1. COURSE DESCRIPTION AND TARGET COMPETENCIES

1.1 Description

- Know the standards and symbols of the basic elements of electrical installations (domestic and industrial).
- Distinguish between electrical equipment according to its control, protection and safety functions.
- Be able to establish the lighting, control and power circuits of an electrical installation
- Study the starting and braking modes of asynchronous machines

1.2 Objectives

-Be able to design of electrical installations in the domestic and industrial fields

-Learn the different types of protection and control equipment as well as the dimensioning of electrical equipment for all types of applications.

- Put into practice the acquired knowledge during courses by building electrical circuits and apply them to control electric motor.

1.3 Prerequisites

Upstream modules	Module taught	Downstream modules
M.GEM21.31	M.GEM21.32	

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Standardisation and electrical diagrams	6h	- Mastery of the concept of electrical diagrams, their classification, their representation and the identification of device terminals. - Knowledge of the symbols of the various protective, control and load devices
Chapter 2	Domestic Installations - Lighting Circuits Lighting	9h	Master and know the different domestic lighting installations and their implementation
Chapter 3	Starting of asynchronous motors	9h	Learn how to build electrical circuits for the different starting and braking modes of

			induction motors
Practical work	Presentation of test rigs, safety procedures and equipment to be used - Lab activity 1: Two-way and remote switch ignition assembly - Lab activity 2: reversing the direction of rotation of an asynchronous motor - Lab activity 3: Star-delta starting of an asynchronous motor	15h	Master the selection of control and protection devices for practical implementations of various domestic lighting and asynchronous motor starting set- ups

2. METHODOLOGY

- Presentation of the objectives of the subject and the goals to be achieved.
- Directed and organised activation of students' knowledge using structuring methods.
- Use of the resources prescribed to the students: processing, deepening, consolidation of the required knowledge, application exercises.
- The contact hours consist of presenting different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For individual activities, students have to do the exercises given as homework.

Integrated courses (h)	24h
Practical work (h)	15h
Project (h)	20h
Visits (h)	20h

3. EVALUATION

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work	2-3	25%
Continuous monitoring	1-2	25%
Presentation		
Final Review	1-2-3	50%

4. BIBLIOGRAPHIC REFERENCES

1. H. Largeaud, Le Schéma Electrique, 3 ème edition, Eyrolles, 2006,
2. Guide NFC 15-100,
3. P. Brynert, J. Schmucki, Safety in Electrical Installations, Electro Suisse, 2013,
4. T. Gllauziaux, D. Fedullo, Mémento de Schémas électriques, Tome2, Eyrolles,
5. El. Azzaag, Electrical Safety, Dodax, 2018.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Programmable Logic Controllers

Code: M.GEM21.31

Module group: GM2-6

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
X	X		

Teacher : Fatma Hajtaieb

Status : Assistant Professor

Mail: fatma.hadjtaieb@takwin.atfp.tn

Course	Practical work	Personal work	Total volume
30 h	15 h	50h	95 h

Coefficient :	ECTS credits :
2,5	3.5

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION MGEM21.31**	**Department :Electromechanical** **-Semester: 1** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 : Description

The course intends to study **Programmable Logic Controllers (PLC) as a programmable** electronic device designed to automate processes such as the control of machines in a factory and the control of industrial robots.

1.2 Objectives

The students should be able to build Grafcet diagrams and translate them into different programming languages as well as how to connect sensors and pre-actuators to a PLC. They should be able to wire and program PLC controlled applications and to supervise automated systems using HMI.

1.3 Prerequisites

- Digital electronics
- Electrical diagram

Upstream modules	Module taught	Downstream modules
MGEM11.06	MGEM21.33	MGEM31.51

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	General Introduction	8h	- Structure of automated systems The different electric actuators and pre-actuators - The different pneumatic actuators and pre-actuators The different types of sensors
Chapter 2	*Grafcet*	6h	System Grafcet Grafcet control
Chapter 3	Programming of PLCs	16h	The architecture and operation of programmable logic controllers PLC wiring Programming Analogue inputs and outputs.
Practical work	Programming of programmable logic controllers	15h	Application to a pneumatic system Application to a DC motor. Application to a level control problem

2. METHODOLOGY

The Contact Hours consist of the presentation of different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For the individual activities, students have to do homework assignments.

Integrated courses (h)	30h
Practical work (h)	15h
Project (h)	35h
Visits (h)	15h

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work	Chapter 1-2-3	0.25
Continuous monitoring	Chapter 1-2-3	0.25
Presentation		
Final Review	Chapter 1-2-3	0.5

4. Bibliographic References

- William Bolton, Programmable Logic Controllers - 2nd edition, Dunod October 2019,
- Grafcet: Design, implementation in programmable controllers Paperback - 3 April 2009
- Programmable Logic Controllers, by asimon, 1997

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Numerical Analysis

Code: M.GEM21.32

Module group: GM2-4

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
X	X		

Teacher : Bassem ben Hamad

Status: Professor

Mail: bassem.benhamed@gmail.com

Course	Practical work	Personal work	Total volume
24 h		40h	64 h

Coefficient :	ECTS credits :
1,5	2.5

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM21.32**	**Department :Electromechanical** **-Semester: 1** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This course aims to :

- Develop basic skills in numerical analysis (convergence of algorithms, error analysis, and correct formulation of problems in mathematical form).
- Practice the implementation of these skills by making optimal use of all available resources (efficient programming, visualisation of results, etc.)

1.2 Objectives

The aim of this course is to provide an overview of the main elementary numerical methods and to cover the following topics in particular:

- Roots of an algebraic equation
- Systems of linear and non-linear equations
- Interpolation
- Equations and systems of differential equations

1.3 Prerequisites

Upstream modules	Module taught	Downstream modules
MGEM11.01	MGEM21.34	

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Interpolation	8h	Vandermonde matrix. Lagrange interpolation. Newton's polynomial. Interpolation error. Cubic splines.
Chapter 2	Differential equations and systems	8h	Euler's method. Taylor's method. Runge Kutta methods of order 2 and 4. Systems of differential equations. Higher order equation.
Chapter 3	Systems of algebraic equations	8h	Bisection method. Fixed point method: Convergence and Aitken extrapolation. Newton's method: Convergence and the case of multiple roots. Secant method.

2. METHODOLOGY

Integrated courses (h)	24h00
Practical work (h)	
Project (h)	40h00
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work		
Continuous monitoring	Chapters 1 and 2	0.25
Presentation		
Final Review	Chapters 2 and 3	0.75

4. Bibliographic References

[1] A. Fortin, Numerical analysis for engineers. 4th ème edition, Presses Internationales Polytechnique.

[2] J. Stoer, R. Bulirsch, Introduction to Numerical Analysis. Text in Applied Mathematics, Springer.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: English II

Code: M.GEM21.33

Module group: GM2-7

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
	X		X

Teacher : Mariem Feki

Status : Assistant Professor

Mail: fekimariem@gmail.com

Course	Practical work	Personal work	Total volume
24 h	- h	35h	59 h

Coefficient :	ECTS credits :
1,5	2

	MODULE DESCRIPTION	Department :Electromechanical
		-Semester: 1
		Version number: 02 Date: 15/10/2021

1.DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED :

1.1 Description

Students should have a knowledge about Electro- mechanical field. Vocabulary of mechanical and electrical plants and sites, as well as structures and expressions frequently used in the field.
Students should gain the skills of explaining a problem in the field of electromechanical engineering. They should also describe faults and their solutions. Finally, students should acquire the ability to communicate in English for specific purposes.
Students would be able to pronounce accurately. In addition, students would learn preliminary grammar rules and phonetics in order to be able to produce essays and talks.

1.2 Objectives:

Students should be able to understand talk and write properly in English in their electro-mechanical domain

Have students who are able to present new projects and systems in academic and professional contexts.

Have students who are able to transfer their communication skills in international contexts.

1.3 Prerequisites:

Students of Electro-mechanical engineering should have a level of A2 to B1 in written composition and reading. A level of B1 to B2 in speaking and reading. Levels are identified according to a placement test by the Common European Framework of Languages.

Upstream modules	Taught module	Downstream modules
	M.GEM21.34	

1.4 Learning outcomes:

Chapters	Title	Duration	Learning outcomes
Chapter 1	I- Placement Test	4 h	In this session, students should identify their level in written and spoken English, in order to build on the missing areas. Grammatical revision is done through the test.
Chapter 2	Electromechanical faults and repairs Language: describing a series of actions, giving a series of instructions Present simple and	6h	In this unit, students learn how to express any fault, leak or misuse of equipments and mechanical devices. Students should be able to express

	imperatives. talking about works in progress Vocabulary: maintenance and equipments 1- at a pit stop lane (fuel, wheel,) 2- robots (describing parts, functions, processes)		deliberately what happens on site. Presenting a project and using specific techniques of communication to describe the functioning of a mechanical tool or device.
Chapter3	Manufacturing plates 1- car assembly line 2- Tunnel drill Language: past simple and future forms Vocabulary: car assembly line, tools and devices, comparing items, dimensions and specifications. road signs.	6h	Students should be able to know the mechanics and systems of assembling and manufacturing, At the end of the unit, students are asked to present big projects or famous advances in the world of electro-mechanical engineering. Presentations should be conforming to the international standards of presentations in academic contexts.
Chapter4	How to read, summarize and paraphrase scientific articles. How to prepare a presentation. How to present.	4 h	At the end of this unit, students should be aware of the steps and parts of a research paper. They should be able to prepare a short presentation according to the basic formal and content requirements.
Practical works	Continuous presentations (at least one every session)	4 h	Assessing the skills of expressing ideas in English.

2.METHODOLOGY :

The Contact Hours consist of the presentation of different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For the individual activities, students have to do homework assignments.

Integrated courses (h)	24hrs
Practicalwork (h)	
Project (h)	
Visits (h)	

3. Assessment:

Designation	**Chapter(s)**	**Rating**
Mini-project		
Practical works		
Continuous assessment		10%
Presentation		10%
Final Review		80%

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Communication techniques

Code: M.GEM21.34

Module group: GM2-7

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
X			

Teacher : Jouda Ghorbel

Status : Assistant Professor

Mail: joudaghorbel@yahoo.fr

Course	Practical work	Personal work	Total volume
24 h		20h	44 h

Coefficient :	ECTS credits :
1,5	2

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM21.34**	**Department :Electromechanical** **-Semester: 1** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This module is a continuation of the module taught in the first year of the engineering cycle and deals with communication within the company. The course begins with a general chapter that explains the characteristics of communication within the company as well as the forms, types, issues and networks of this communication.

Professional writing will then be addressed, with a close study of all the characteristics of the memo, the information note, the circular and the e-mail.

The course ends with a chapter on oral presentation and public speaking.

This course aims to develop students' skills in oral and written communication techniques within the company.

1.2 Pre-requisite

French communication which encompasses the different elements of the language situation and the different language registers

Upstream modules	Module taught	Downstream modules
MGEM11.11	MGEM21.36	

1.3 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Communication within the company	6	The student masters the characteristics, forms, types and networks of communication within the company.
Chapter 2	The memorandum	3	The student is able to write a memo.
Chapter 3	The information note	3	The student is able to write a briefing note.
Chapter 4	The circular	3	The student is able to write a circular
Chapter 5	The email	3	The student is able to write a professional email
Chapter 6	The oral presentation	6	The student masters the techniques of

			public speaking.

2. METHODOLOGY

The Contact Hours consist of an introduction to the course. Practical applications are dealt with separately in the tutorials.
Active methods, brainstorming, simulations and group exercises are used in the applications.
For individual activities, students should complete the exercises given as homework.

3. Evaluation

Designation	Chapter(s)	Weighting
Continuous monitoring	1-2-3	0.5
Final Review	1-23-4-5	1

4. Bibliographic References

Bouquet, Brigitte. "Diversité et enjeux des écrits professionnels", *Vie sociale*, vol. 2, no. 2, 2009, pp. 81-93.
Joly, Bruno. "La communication en entreprise", *La communication.* Under the direction of Joly Bruno. De Boeck Supérieur, 2009, pp. 69-129.
Leibovitz, Annie. *La boîte à outils pour prendre la parole en public.* Dunod, 2020
Riffault, Jacques. "La formation aux écrits professionnels : présentation d'un dispositif pédagogique ouvert à la question du sens", *Vie sociale*, vol. 2, no. 2, 2009, pp. 71-80.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Computer Science I

Code: M.GEM21.35

Module group: GM2-7

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
	x		

Teacher: Salma Ksibi

Status : Assistant Professor

Mail: salmaksibi88@gmail.c

Course	Practical work	Personal work	Total volume
- h	30 h	25h	55 h

Coefficient :	ECTS credits :
1,5	2

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This module represents an introduction to the famous C programming language.

The C programming language is the basis of the operating systems nowadays and is the heart of these systems such as Unix/Linux. The C language was initially designed to develop an operating system (Unix) but over time, thanks to its power, it has been adopted by a large community of developers which has allowed the language to evolve and above all to be standardised. This language is multi-platform, which means that a program that you create for example under Linux could be recompiled under Windows, ... without having to change anything in the source code.

In this module, the student learns how to do data manipulations ("what") in pseudo-language and/or C language, transcribe algorithms ("how") in pseudo-language and/or C language, and code "console" programs with command line argument handling.

1.2 Objectives

This module aims to :

Discover the C programming environment;now how to react to a programming problem.

At the end of this module, the student will be able to :

Manage inputs/outputs.
Provide computer solutions written in C for problems to be solved by computer. Solving mathematical problems
Study all possible cases that can be considered to solve a specific problem Mastering control structures
Mastering iterative structures Browse, manipulate and sort tables.

1.3 Prerequisites

- The basics of computing
- C language

Upstream modules	Module taught	Downstream modules
Algorithms	MGEM21.35	MGEM22.45 :Automatic II

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Lab activity 1	Input/Output and variable manipulation	8h	the student is able to manipulate variables, allow user to enter their values, and display their values as well as the results of their manipulations.
Lab activity 2	Conditional structures	6h	the student is able to impose conditions and to deal with the different cases proposed by these conditions.
Lab activity 3	Repetitive structures	8h	The student manipulates the different repetitive structures in C, to make a block of instructions repeat a finite number of times.
Lab activity 4	The tables	8h	The student creates one- and two- dimensional arrays, can browse them and manipulate the data within them.

2. METHODOLOGY

The Contact Hours consist of the presentation of different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For the individual activities, students have to do homework assignments.

Integrated courses (h)	-
Practical work (h)	30h
Project (h)	-
Visits (h)	-

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project	-	-
Practical work	All chapters	100%
Continuous monitoring	-	-
Presentation	-	-
Final Review	-	-

4. Bibliographic References

1. http://www.isetjb.rnu.tn/docs/supports-cours/progc-aasses-mblaghgi.pdf
2. https://www.labri.fr/perso/chaumett/enseignement/matieres/langage-c/slides/rappels-et-complements-langage-c.pdf
3. https://c.developpez.com/cours/?page=langage-c

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: Power and Motion Transmission II

Code: M.GEM22.36

Module group: GM2-5

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
		x	x

Teacher: Georges Kantchev

Status: Professor

Mail: georges.kantechev@gmail.com

Course	Practical work	Personal work	Total volume
30 h	15 h	45h	90 h

Coefficient :	ECTS credits :
2,5	3.5

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM22.36**	**Department :Electromechanical** **-Semester: 2** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This module is a continuation of "Power and Motion Transmission 1" to complete the process of designing machines according to a specification.

1.2 . Objectives

Students should be familiar with belt, chain, planetary and epicyclic gear transmissions, deformable gear transmissions.

Students are able to select and calculate mechanical transmissions

1.3 Prerequisites

Knowledge of Strength of Materials

Upstream modules	Module taught	Downstream modules
MGEM10.02	MGEM22.38	

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	General information on transmission systems	6	General information on belt, chain and gear drives.
Chapter 2	belt drives.	7	Classification, characteristics and features of belt drives. Selection, calculation and tensioning of belts.
Chapter 3	deformable chain drive..	7	Classification and characteristics of deformable chain transmissions. (Harmonic Drive). Selection, calculation and maintenance of chain drives.
Chapter 5	Gearboxes	10	Parallel and epicyclic gear transmissions. Kinematic study. Geometric study of gear transmissions. Correction of gear teeth

			Ordinary and automatic gearboxes.
Practical work	Lab activity 1 Lab activity 2 Use of existing test benches in laboratories Lab activity 3	5 h 5h 5h	

2. METHODOLOGY

Integrated courses (h)	30 h
Practical work (h)	15 h
Project (h)	40 h
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work	From 1 to 7	0.25
Continuous monitoring	From 1 to 4	0.25
Presentation		
Final Review	From 1 to 9	0.5

4. Bibliographic References

- Mechanical Engineering - Volume 1, Volume 2, Volume 3 and Volume 4 - 4th ed. by David Coquard, FrancisEsnault Dunod edition

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: Metallurgy and metal processing

Code: M.GEM22.37

Module group: GM2-3

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
x		x	

Teacher : Chedly Bradai

Status: Professor

Mail: chedly,bradai@enis,tn

Course	Practical work	Personal work	Total volume
30 h	12 h	40h	82 h

Coefficient :	ECTS credits :
2	3

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 : Description

The mechanical engineer must have sufficient knowledge of materials to optimise the selection of a material and a thermal or thermochemical treatment for a specific application with specific loading conditions and environment

1.2 Objectives

This course will provide basic knowledge of materials engineering and familiarity with equilibrium diagrams, microstructures and mechanical characteristics of metals in order to understand and predict their behaviour in service. Steel will be selected as the main case study to introduce the influence of additives on hardenability and the concept of critical diameter. Surface treatments (thermochemical treatments) will be discussed

1.3 Prerequisites

In order to follow this course, the student will need to have information on the physics of materials and the means of analysis and control of physical parameters

Upstream modules	Module taught	Downstream modules
MGEM12.14	M.GEM22.37	MGEM31.57

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Introduction	3	- Crystal structures and defects - Defects in crystal lattices
Chapter 2	Steel (production and characteristics, iron ore, blast furnace)	7	Physical and mechanical properties of iron (Crystal structure and influence of temperature on iron)
Chapter 3	Iron-carbon alloys	7	Equilibrium, transient and non-equilibrium states of steel (transformation points) Iron alloys and the influence of additive elements (alphagenic and gamma elements)
Chapter 4	Heat treatments	7	- Austenitisation; Tempering; Annealing; soaking - Transformation diagrams - Balance diagrams (TTT, TRC.....)

			- Temperability and hardenability of steel (The Jominy Test) Concept of critical diameter (hardening severity)
Chapter 5	Surface treatments	6	Chemical and thermochemical treatments
Practical work	Lab activity 1 Heat treatment (Tramp revenue annealed) Lab activity 2 surface treatment (case hardening) Lab activity 3 Jominy tests	12 h	Apply the concepts seen in the course:

2. METHODOLOGY

Integrated courses (h)	30
Practical work (h)	12
Project (h)	40
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work		
Continuous monitoring		
Presentation		
Final Review		

4. bibliographical references

- Jean - Paul Bailon, Jean - Marie Dorlot " Materials " Presse Internationales Polytèchnique

- Heat treatments of steels:Consequence of heat treatments on themechanicalpropertiesof steels by Jalel Hsini | 1 October 2018

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: Manufacturing process

Code: M.GEM22.38

Module group: GM2-2

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
X		X	

Teacher : Jamel Louati

Status: Professor

Mail: jamel.louati@enis.rnu.tn

Course	Practical work	Personal work	Total volume
30 h	- h	30h	60 h

Coefficient :	ECTS credits :
1,5	2

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

In an industrialisation process, the preparation of a production requires a perfect link between the different departments involved in the production. The manufacturing preparation departments provide the links between the design departments and the manufacturing departments. Their main role consist in establishing a manufacturing process using all the company's resources.
The manufacturing process must respect, among other things: the quality prescribed for the products, a minimum cost price, the required deadline, and the best possible working conditions.

1.2 Objectives

- For a preliminary draft manufacturing study or a provisional phase contract, the student should develop for each phase and sub-phase, the principles and means of positioning and holding the part in position which will ensure the positioning rules (support, orientation, clamping)
- To become able to compute manufacturing quotation and the specifications to be obtained for each phase or sub-phase.
- Mastering the chronological study of processes
- Develop a manufacturing process

1.3 Prerequisites :

Technical drawing; Manufacturing technology. Processing technology with material removal

Upstream modules	Module taught	Downstream modules
MGEM11.04	MGEM22.38	MGEM 31.51

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Analysis of manufactured parts	8	At the end of this chapter students will be able to analyse a machined part
Chapter 2	Manufacturing dimension	10H	By the end of this chapter students will be able to dimension and identify a part
Chapter 3	Chronological study of the processes	12	At the end of this chapter students will be able to develop a machining operations sequence

2. METHODOLOGY

Integrated courses (h)	30 h
Practical work (h)	
Project (h)	30 h
Visits (h)	

3. Evaluation

Designation	Chapter(s)	Weighting
Mini-project		0.25
Practical work		
Continuous monitoring	Chp1 -chp2	0.25
Presentation		
Final Review	Chp 1+2+3	0.5

4. Bibliographic References

Manufacturing quotation and metrology, Volume 3. Hermès, Lavoisier 2003
Optimization in manufacturing. Les éditions CEPADUES 2000.
Production Technician's Guide. HACHETTE Technique 1999.
Elements of manufacturing. Editions ELLIPSES 1995.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: Dynamic analysis of machines

Code: M.GEM22.39

Module group: GM2-4

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
x		x	

Teacher : Chaari Fakher

Status: Professor

Mail: fakher.chaari@gmail.com

Course	Practical work	Personal work	Total volume
30 h	12 h	40h	82 h

Coefficient :	ECTS credits :
2	3

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM22.39**	**Department :Electromechanical** **-Semester: 2** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

The Dynamic Machine Analysis course enables students to study problems related to balancing of mechanisms and machines, estimating power losses and dynamic modelling for machine design.

1.2 Objectives

- Be able to balance a rotating machine
- Calculate the mechanical efficiency of a machine
- Carry out a dynamic analysis of the machines

1.3 Prerequisites

Upstream modules	Module taught	Downstream modules
Power Transmission	Dynamic Machine Analysis	

1.3: Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Balancing of mechanisms and machines	10 h00	Study the different techniques for static and dynamic balancing of mechanisms and machines
Chapter 2	Mechanical efficiency of mechanisms and machines	7 h00	Calculate analytically the power losses in the elementary links and in the mechanisms
Chapter 3	Dynamic modelling of machines	7 h00	Carry out dynamic modelling of a mechanical assembly to size the driving motor power and torque
Chapter 4	Dynamic analysis of presses	6h00	Apply the concepts acquired in the previous chapters to the case of mechanical presses
Practical work	Balancing mechanisms Lab activity 1 :Balancing of a crank rod system - Lab activity 2: Balancing a hinged mechanism - Lab activity 3 : Study of inertial forces in a crank mechanism	1200	To apply the concepts seen in the course:

2. METHODOLOGY

The course is based on a methodology combining lectures, tutorials, practical work and personal work.

The face-to-face sessions are of the integrated course type combining lectures and tutorials. Students are required to complete personal work in a non-classroom setting and to present it in class as a lecture. The practical work allows the application of the concepts studied during the course

Integrated courses (h)	24 h00
Practical work (h)	8 h00
Project (h)	35h00
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work	Chapters 2	
Continuous monitoring	Chapters 1 and 2	
Presentation		
Final Review	Chapters 1 to 4	

4. bibliographical references

- Hamilton H. Mabie, Charles F. Reinholtz, Mechanisms and Dynamics of Machinery, John Wiley & Sons, 1987

- Georges Spinnler, Machine Design, Editions EPFL, 1987

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: Destructive and non-destructive testing of metals

Code: M.GEM22.40

Module group: GM2-3

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
		X	

Teacher : Trabelsi Chokri

Status : Assistant Professor

Mail: trabelsichokri2020@gmail.com

Course	Practical work	Personal work	Total volume
24 h	15 h	30h	69 h

Coefficient :	ECTS credits :
2	2

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

Non-destructive testing allows, while respecting the integrity of the objects :
- Direct examination of parts and detection of surface and/or internal defects,
- Monitoring the in-service evolution of detected defects.

1.2 Objectives

The implementation of non-destructive testing requires knowledge of :

- the possibilities and limits of the processes that can be used,
- the history of the piece (form and method of manufacture),
- the defects to be detected (type, position, dimensions, etc.),
- the physical properties of the controlled material.

1.3 Prerequisites

Upstream modules	Module taught	Downstream modules
- MGEM21.12	- MGEM22.40	

1.4 Learning outcomes

Knowledge of the laws of physics :

- Capillarity
- Magnetism
- Eddy current
- Wave physics

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Presentation of Non Destructive Testing (NDT)	3	Know the basics of Eddy current control
Chapter 2	Visual examination - Optical procedures	5	Understanding how to make a visual inspection.
Chapter 3	Penetrant inspection	5	Master the principle of Penetrant inspection.
Chapter 4	Magnetic particle inspection and ultrasound	5	To master the principle of magnetic particle inspection and the principle of propagation of ultrasonic waves.

Chapter 5	Eddy currents	5	Know the basic principle of eddy current testing.
Chapter 6	Industrial radiography and tomography	6	To know the basic principle of X-ray and tomography control
Practical work	Lab activity 1. Penetrant Testing Lab activity 2. Magnetic particle inspection and ultrasound Lab activity 3. Radiography and tomography	15 h	To apply the concepts seen in the course:

2. METHODOLOGY

The course is based on a methodology combining lectures, tutorials, practical work and personal work.

The face-to-face sessions are of the integrated course type combining lectures and tutorials. Students are required to complete personal work in a non-classroom setting and to present it in class as a lecture. The practical work allows the application of the concepts studied during the course

Integrated courses (h)	24 h
Practical work (h)	15 h
Project (h)	15 h
Visits (h)	15 h

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work		0.25
Continuous monitoring		0.25
Presentation		
Final Review		0.5

4. Bibliographic References

- MEC6405-Experimental Stress Analysis - Course 7 - 2009
- MEC-761 Mechanical Testing and Non-Destructive Testing - Martin Viens, prof.
- Non Destructive Testing (NDT), J. Dumont-Fillon, Edition Technique de l'Ingénieur, Mesures et Contrôle (R1400)
- Non-destructive testing, M. Lacroix, Edition Technique de l'Ingénieur, (M110)
- Ultrasound, J. Sapriel, Edition Technique de l'Ingénieur, Electronique (E1910)

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: Mechatronics

Code: M.GEM22.41

Module group: GM2-2

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
X		X	

Teacher : Ferdaws Masmoudi

Status : Expert

Mail: ferdaous.masmoudi@gmail.com

Course	Practical work	Personal work	Total volume
24 h	- h	30h	54 h

Coefficient :	ECTS credits :
2	2

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

The student will acquire through this course basics of mechatronics as the synergistic and systemic combination of mechanics, electronics, automation and real-time computing.

1.2 Objectives

This course aims to familiarise the student with systems that closely integrate electronics, control and computing. The student should be able to create increasingly intelligent components and solutions that communicate with each other, in order to meet the requirements of Industry 4.0.

1.3 Prerequisites

- General electronics
- Electrical engineering
- Electric machine
- Logic circuit
- Automatics

Upstream modules	Module taught	Downstream modules
MGEM22.46	MGEM22.41	MGEM31.56

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	General Introduction	3h	Definition of Mechatronics - Cybernetics and mechatronics - Dynamic systems
Chapter 2	Electronic components	6h	Analogue electronics - Signal processing - Digital electronics
Chapter 3	Sensors and Actuators	9h	- Temperature sensors - Light sensors - Presence/proximity sensors - Position sensors - Electric actuators

			- motion transmission
Chapter 4	Microprocessors	6h	- Architectures - Digital filtering - Applications

2. METHODOLOGY

The Contact Hours consist of the presentation of different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For the self-study activities, students have to do the exercises given as homework.

Integrated courses (h)	24h
Practical work (h)	0h
Project (h)	20h
Visits (h)	10h

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work		
Continuous monitoring	Chapter 1-2-3-4	0.25
Presentation		
Final Review	Chapter 1-2-3-4	0.75

4. Bibliographic References

1- Mechatronics by Lionel Birglen, Dunod, 2016 (1st edition)
2- Les systèmes mécatroniques embarqués, 2nd edition, AbdelkhalakEl Hami, PhilippePougnet, Iste 2020
3- Mechatronics EBook PDF, W. Bolton, 2015
4- Mechatronics and multiphysical systems, Tanneguy Redarce, 2006

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: Power Electronics I

Code: M.GEM22.42

Module group: GM2-1

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
X		X	

Teacher : Moez Ghariani

Status: Professor

Mail: moez.ghariani@gmail.com

Course	Practical work	Personal work	Total volume
30 h	15 h	40h	85 h

Coefficient :	ECTS credits :
2,5	3

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

Know the main Power Systems.

Identify the performance of power components and define their criteria.

Establish the characteristics and performance of power systems

Design, implement and test different static converter architectures.

Analyse and evaluate linear power supplies.

Analyse and evaluate variable speed drives for DC rotating machines.

1.2 Objectives

- Mastery of the methods and tools of power electronics engineering: identification, modelling and resolution of even unfamiliar and incompletely defined problems, use of computer tools, analysis and design of power systems
- The ability to design, implement, test and validate innovative solutions, methods, products, systems and services in power electronics, related to the supply of electrical systems and the speed variation of rotating electrical machines.
- The ability to carry out fundamental or applied research activities, to set up experimental devices, to be open to the practice of collaborative work in the field of industrial electronics.
- The ability to find, evaluate and use relevant information related to the power supply of electrical systems and the speed variation of rotating electrical machines.

Prerequisites:

Upstream modules	Module taught	Downstream modules
MGEM21.31 MGEM12.17 MGEM12.16 MGEM21.34	MGEM22.44	MGEM31.55 MGEM31.56 MGEM31.59 MGEM31.62 Association Machine converter

1.3 1.3 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Introduction to static converters	3	Identify static converters
Chapter 2	Examples of power electronics applications in the industrial and domestic fields	6	Know the main Power Systems, their application and performance
Chapter 3	Power components	3	Establish the characteristics and performance of Power components
Chapter 4	Study of uncontrolled rectifiers (linear power supply)	9	Analyse and evaluate linear power supplies
Chapter 5	Study of controlled rectifiers (Variable speed drive)	6	Analysing and evaluating variable speed drives
Chapter 6	Study of UPS (Uninterruptible Power Supply)	3	Analyse and evaluate uninterrupted power supplies
Practical work	Lab activity 1.Testing and validation of uncontrolled rectifiers Lab activity 2. Testing and validation of controlled rectifiers Lab activity 3. Testing and validation of rectifiers Mixed	15	To set up experimental devices, to be open to the practice of collaborative work in the field of power electronics.

2. METHODOLOGY

Integrated courses (h)	30
Practical work (h)	15
Project (h)	
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work	CHP4 and ChP5	
Continuous monitoring	CHP1, CHP2, CHP3, and ChP4	
Presentation		
Final Review	All Chapters	

4. Bibliographic References

[1] Power Electronics - 10th ed: Structures, controls, applications (Engineering Sciences),Guy Séguier, Philippe Delarue, Francis Labrique, Dunod, 19 August 2015.

[2] Les alimentations électroniques - 3e édition : Technique et ingénierie, Pierre Mayé, Dunod, June 2018.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: Diagnostics and maintenance Code:

M.GEM22.43

Module group: GM2-5

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
X		X	

Teacher : Chaari Fakher
Status: Professor
Mail: fakher.chaari@gmail.com

Course	Practical work	Personal work	Total volume
21 h	**9 h**	**30 h**	**60 h**

Coefficient :	ECTS credits :
2	2

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 : Description

The Diagnosis and Maintenance course introduces students to mechanical and electronic maintenance techniques for ICE engines. Particular emphasis is given to the different sensor-actuators used.

1.2 Objectives

- Master the tools and methods of mechanical diagnosis
- Identify the different sensors and actuators of ICE engines
- Master the tools and methods of electronic diagnosis of ICE engines

1.3 Prerequisites

Upstream modules	Module taught	Downstream modules
Thermal engines	Diagnosis and maintenance	

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Review on Maintenance methods	3 hours	Recall the different maintenance techniques and give an overview of the technical regulation of vehicles
Chapter 2	Mechanical diagnosis of thermal engines	7 hours	Mastery of the various mechanical maintenance operations for thermal engines and the tools used
Chapter 3	Sensors and actuators	7 hours	Identify and study the different sensors and actuators in a combustion engine
Chapter 4	Electronic diagnostics of combustion engines	7 hours	Mastery of the various electronic diagnostic operations for thermal engines and the tools used

Practical work	Mechanical and electronic diagnostics Lab activity 1: Characterisation of sensors and actuators Lab activity 2 :Mechanical diagnosis of a combustion engine Lab activity 3: Electronic diagnosis of a combustion engine	9 hours	To apply the concepts seen in the course:

2. METHODOLOGY

The course is based on a methodology combining lectures, tutorials, practical work and personal work.

The face-to-face sessions are of the integrated course type combining lectures and tutorials. Students are required to complete individual work in a non-classroom setting and to present it in class in the form of a lecture. The practical work allows the application of the concepts studied during the course

Integrated courses (h)	24 hours
Practical work (h)	9 hours
Project (h)	30
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work	Chapters 2 to 4	0.25
Continuous monitoring	Chapters 1 and 2	0.25
Presentation		
Final Review	Chapters 1 to 4	0.5

4. Bibliographic References

- Jack Erjavec, Internal Combustion Engine: Diagnosis and Repair, Editions Reynald Goulet, 2018
- Laurent Benoit, Electronic injection technology and engine performance, ETAI, 2016

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: Electronics II (Analogue Electronics)

Code: M.GEM22.44

Module group: GM2-1

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
X		X	

Teacher : Jihen Malek

Status : Assistant Professor

Mail: jihenemallek@yahoo.fr

Course	Practical work	Personal work	Total volume
30 h	15 h	40h	85 h

Coefficient :	ECTS credits :
2,5	3

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM22.44**	**Department :Electromechanical** **-Semester: 2** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

To study different types of power amplifier circuits that operate under different classes of amplification: classes A, B, AB and C.

Know the characteristics of specific circuits such as Darlington circuits and current mirrors.

Know how to apply circuit analysis based on the ideal operational amplifier.

1.2 Objectives

- Mastery of the methods and tools of modular electronics engineering: identification, modelling and resolution of even unfamiliar and incompletely defined problems, use of computer tools, analysis and design of power amplifier circuits.
- The ability to design specific electronic functions for data acquisition, control and display
- The ability to set up experimental devices, to be open to the practice of collaborative work in the field of modular electronics.

1.3 Prerequisites

Upstream modules	Module taught	Downstream modules
MGEM11.07 MGEM12.17 MGEM12.16 MGEM21.34	*M.GEM22.44*	MGEM31.55 MGEM31.56 M.GEM22.46 MGEM22.44

1.4 Learning outcome

Chapter	Heading	Duration	Learning outcomes
Chapter 1	The ideal operational amplifiers.	6	Know the principles of ideal operational amplifiers
Chapter 2	Study of first and second order active filters.	6	Know the characteristics of active filters.
Chapter 3	Study of differential amplifiers	6	Know about dipoles, quadrupoles and passive filters,
Chapter 4	Study of real amplifiers under different classes of amplification: classes A, B, AB and C.	9	Analysis and design of real amplifier circuits.
Chapter 5	Study of the Darlington circuit, current mirror circuits	3	The ability to design specific electronic functions

Practical work	Lab activity 1: Study of active filters Lab activity 2: differential amplifiers Lab activity 3: Study of oscillators and current mirror circuits Lab activity 4: Study of a class A amplifier and power balance	15	To set up experimental devices, to be open to the practice of collaborative work in the field of modular electronics.

2. METHODOLOGY

Integrated courses (h)	30
Practical work (h)	15
Project (h)	
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work	CHP2, ChP3and ChP5	
Continuous monitoring	CHP1 and ChP2	
Presentation		
Final Review	All Chapters	

4. Bibliographic References

[1] CIRCUITS FONDAMENTAUX DE L'ELECTRONIQUE ANALOGIQUE. 3rd edition 1996(Sciences de l'ingénieur),Tien-Lang Tran, Tec & Doc (Editions), ISBN 2-7430-0099-6.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: Programming of CNC machine tools

Code: M.GEM22.45

Module group: GM2-6

Specialty modules	Main module	Engineering Sciences and Techniques	Preparation for the practice of profession
X		X	X

Teacher : Jamel Louati
Status: Professor
Mail: jamel.louati@enis.rnu.tn

Course	Laboratory and Practical works	Individual work	Total volume
30 h	**24 h**	**40 h**	**94 h**

Coefficient :	ECTS credits :
2,5	**3.5**

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION M.GEM22.45**	**Department :Electromechanical** **-Semester: 2** **Version number: 02** **Date: 15/10/2021**

1. RSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This course provides the fundamental knowledge of setting up and programming numerically controlled machine tools for machining parts

1.2 Objectives

- Write an NC program in ISO language for machining a part on a CNC machine
- Use CAD/CAM software for tool path simulation and automatic NC program generation
- Setting up a NCM
- Machining on CNC

1.3 Prerequisite

Reading and understanding a definition drawing (morphology, functional specifications: roughness, dimensional, geometric position and shape tolerances, general tolerances and roughness) Selection of tools and machining operations. Preparation of machining ranges. Selection of part assembly and isostatism Choice of cutting parameters

Upstream modules	Module taught	Downstream modules
MGEM11.04 - MGEM21.28 - MGEM11.09	MGEM22.45	

1.4 Learning outcomes

Chapter	Title	Duration	Learning outcomes
Chapter 1	CNC Machine Tools: Definition, Structure and Characteristics	2h	Know the difference between conventional and CNC machine tools.
Chapter 2	Morphology of CNC Machine Tools	2h	Composition and role of each element.
Chapter 3	CNC Machine Tool Programming	10h	Complete a program in G code conversational language to machine a profile.
Chapter 4	The Fixed Shooting Cycles	8h	Complete a conversational language program with fixed cycles of turning.
Chapter 5	Fixed Cycles for Milling - Drilling, Boring and Tapping Cycles	8h	Complete a conversational language program with fixed milling cycles.

Practical work	Manual writing of a turning and milling program through the machine control panel. Program transfer through simulation software.	24h	Know how to handle a CNC Machine tool for milling and turning cases.

2. METHODOLOGY

Integrated courses (h)	24h00
Labs and Practical work (h)	30h00
Project (h)	40h00
Visits (h)	

3. Assessment

Activity	**Chapter(s)**	**Rating**
Mini-project		
Practical work		0.25
Proctored homework		0.25
Presentation		
Final Exam		0.5

4. Bibliographic References

[1] CAMERON R., Technology and CNC Machining, Elements of Computer Aided Manufacturing. Edition Saint-Martin, 1996.
[2] HAZARD C., La commande numérique des machines-outils. Edition Foucher, 1984.
[3] GONZALEZ P., La commande numérique par calculateur. Edition Casteilla Educalivre, 1993.
[4] RIMBAUD, LAYES, MOULIN, Guide Pratique de l'usinage, 1 Fraisage. Edition Hachette Technique, 1992.
[5] JACOB, MALESSON, RICQUE, Guide Pratique de l'usinage, 2 Tournage. Edition Hachette Technique, 1992.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **-Semester: 2** **Version number: 02** **Date: 15/10/2021**

Module: Mini project

Code: M.GEM22.46

Module group: GM2-4

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
			X

Teacher : Frikha Moez

Status : Assistant Professor

Mail: frmoez@gmail,com

Course	Practical work	Personal work	Total volume
- h	30 h	30h	60 h

Coefficient :	ECTS credits :
1	1,5

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

The mini-projects are an opportunity for the student to deepen and apply the concepts acquired during the courses. After the selection of a solution and the design, the student is asked to check the correct running and the resistance of its constitutive components.

1.2 Objectives

- Drawing up the specifications for a project according to requirements.
- Propose solutions and select the best one among the proposed solutions.
- Achieve the system design of the selected solution
- Sizing of the various system components by analytical procedures and finite element simulation
- Produce a prototype of the system by 3D printing and check that its proper work

1.3 Prerequisites

- Mechanical design

- Strength of materials

Upstream modules	Module taught	Downstream modules
MGEM11.02; MGEM11.03; MGEM11.09	MGEM22.46	MGEM22.49

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Practical work	- Study of the existing situation and problematic - Formulation of the specifications - Functional analysis and selection of solutions - Design with Solidworks - Sizing of the different components of the system - Prototyping of the designed system by 3D printing		- Understand the relationships between the system under study and the environment around it. - Define all the parameters to be taken into account for the proper running of the system. - Propose technological solutions to ensure system operation - Finite elements simulation and strength verification of all parts of the designed system - Creation of a reduced - prototype of the system by 3D

2. METHODOLOGY

Integrated courses (h)	—
Practical work (h)	30 H
Project (h)	20 H
Visits (h)	—

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project	————	
Practical work	————	0.5
Supervised Homework	————	
Presentation	————	0.5
Final Review	————	

4. Bibliographic References

- Guide de calcul en mécanique, *D. SPENLE & R. GOURHANT*, Hachette, edition n°3, 2001.

- Guide du dessinateur industriel, *A. CHEVALIER*, Hachette, 2004.

- Mémotech Productique: conception et dessin, *C. Barlier& R. Bourgeois*, Casteilla, edition n°3, 1995.

- Mémotech Génie Mécanique, C. Barlier& B. Poulet, Casteilla, edition n°3, 1995.

GEM3

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Production Management

Code: M.GEM31.48

Module group: GM3-1

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
		x	

Teacher : Monji Haddar

Status : Assistant Professor

Mail: mon.had@escs.rnu.tn

Course	Practical work	Personal work	Total volume
24 h	- h	30h	54 h

Coefficient :	ECTS credits :
1,5	2

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM31.48**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This course enables students to learn how to manage production within the industrialization process in the company.

1.2 Objectives

The course aims to enable the student to:

- Develop the skills and competencies needed to solve production management problems;
- Focus on the integration of functions such as production, planning, balancing and bottleneck optimisation into the production flow

1.3 Prerequisites

Management of the company

Upstream modules	Module taught	Downstream modules
Management of the company	Production management and scheduling	Design and performance of production systems

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Introduction to production management	15h	Know the technical words and lexicons of production management
Chapter 2	Typology of production systems	15h	Lear about production modes
Chapter 3	Capacity management	15h	Distinguish between load and output and methods to balance between them
Chapter 4	Production Resource Management MRP	15h	
Chapter 5	Workshop scheduling	15h	
Chapter 6	The OPT method or Bottleneck Management in the production flow	16h	

2. METHODOLOGY

Integrated courses (h)	21
Practical work (h)	
Project (h)	
Visits (h)	

3. Evaluation

Designation	Chapter(s)	Weighting
Mini-project		
Practical work		
Continuous monitoring		
Presentation		
Final Review	X	

5. Bibliographic References

- Alain Courtois, Chantal Martin-Bonnefous, Maurice Pillet, Pascal Bonnefous, "Gestion de production: les fondamentaux et les bonnes pratiques" fifth edition Publisher No.: 4247 ORGANISATION; ORGANISATION edition (May 27, 2011) No. of pages 476.
- Georges Javel " Organisation et gestion de la production " Dunod, Nb de page 432, science sup (2 ème édition) 01/04/2000

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Thermal engine

Code: M.GEM31.49

Module group:
GM3-2

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
X		X	

Teacher: Georges Kantchev
Status: Professor
Mail: georges.kantechev@gmail.com

Course	Practical work	Personal work	Total volume
30 h	- h	40 h	70 h

Coefficient :	ECTS credits :
2	2.5

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM31.49**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This course provides knowledge of the classification, characteristics and operation of different types of internal combustion engines. In addition, the course will present the technology of specific systems and components of internal combustion engines. The students will be able to complete their knowledge on the new trends and perspectives of these engines.

1.2 Objectives

- Understand how petrol and diesel engines work
- Mastering petrol and diesel injection systems
- Mastering the ignition circuit in an internal combustion engine
- Know the different lubrication and cooling circuits
- Mastering data acquisition networks in a thermal engine

1.3 Prerequisites:

Thermodynamics, knowledge of manufacturing technology

Upstream modules	Module taught	Downstream modules
MGEM11.05, M.GEM22.40	M.GEM31.49	MGEM31.60

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	*Introduction to thermal machines*	5 H	This first introductory chapter is devoted to a review on the basic concepts of thermodynamics and the classification of thermal machines
Chapter 2	*Rotating thermal engines (turbomachinery)*	13 H	Know the technology of rotary heat engines and master the corresponding thermodynamic cycles. - Turbines and hydraulic pumps Steam turbine and flame power plant Gas turbines and turbo-engines/reactors

Chapter 3	*Reciprocating engines*	12 H	Acquire knowledge on how reciprocating thermal engines work and master the methodology for determining efficiency. - External combustion engines: Stirling engine - Internal combustion engines

2. METHODOLOGY

Integrated courses (h)	30
Practical work (h)	
Project (h)	40
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work		
Continuous monitoring	CH1 Ch2	25%
Presentation		
Final Review	Ch1 Ch2 Ch3	75%

4. Bibliographic References

J. B. Heywood, Internal Combustion Engine Fundamentals, McGraw-Hill Education, 2018

E.Koller, Machines thermiques, Technique et ingénierie,Dunod, 2005

L. Borel, D. Favrat, Thermodynamique et énergétique, PPUR presses polytechniques, 2005

G. VanWylen, RSonntag, Applied Thermodynamics, PEARSON , 2002

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Modelling and calculation of structures

Code: M.GEM31.50

Module group:
GM3-4

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
x			

Teacher : Amir Chaker
Status : Master technologist
Mail: chaker.medamir@laposte.net

Course	Practical work	Personal work	Total volume
- h	24 h	30 h	54 h

Coefficient :	ECTS credits :
1	2

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

- Present the basic principles of FEM with Application to elementary problems: bars, beams and plates

- Know how to analyse/discuss the design of a structure, and identify the distribution of forces in a structure.

1.2 Objectives

Build a 2D or 3D model of a structure
- Understand the basics of the finite element method
- Select the relevant design quantities of stress, strain, displacement
- Know how to use structural design software with finite elements method. Applications to beams, plates and shells

1.3 Prerequisites

Mechanics of continuous deformable media, Structural Analysis

Upstream modules	Module taught	Downstream modules
MGEM21.26 MGEM12.12--	MGEM31.50	

1.4 Learning outcomes

Heading	Duration	Learning outcomes
Introduction - Review on modelling in structural mechanics	3 h	Build a 2D or 3D model of a structure
Basic principle of computer aided computation	3h	Understand the basics of the finite element method
Use of TEKLA ROBO calculation software Lab activity 1 Labactivity 2: Lab activity 3:	6h 6h 6h	Know how to use structural design software to build finite elements models for beams, plates and shells

2. METHODOLOGY

The lecture periods consist of theoretical lectures and case studies

Integrated courses (h)	
Practical work (h)	24h
Project (h)	
Visits (h)	

3. Evaluation

Designation	Chapter(s)	Weighting
Mini-project		
Practical work		1
Continuous monitoring		
Presentation		
Final Review		

4. bibliographical references

[1] D. V. Hutton, "Fundamentals of finite elements analysis", Published by McGraw-Hill, 2004.

[2] J. H. SAIAC, course in "Finite Element Method, Numerical Analysis of Partial Differential Equations", 2006.

[3] A. SEGHIR, Cours de " Méthode des Éléments Finis ", Université Abderrahmane Mira - Bejaia, Faculté de Technologie, 2014

[4] J. L. BATOZ, G. DHATT, "Modélisation des structures par éléments finis", Vol.1, solides élastiques. Hermes, 1995.

[5] L. SCHWARTZ, Cours de " Analyse II : Calcul différentiel et équations différentielles ". Hermann, 1992.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Industrial Hydraulics

Code: M.GEM31.51

Module group:GM3-2

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
X		X	

Teacher: Khlif Mohamed
Status : Assistant professor
Mail: mohamed.khlif@enis,tn

Course	Practical work	Personal work	Total volume
30 h	**- h**	**30 h**	**60 h**

Coefficient :	ECTS credits :
1,5	**2**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

The course intends to enable students understanding a hydraulic system in order to modify its specifications and give it additional functionality.

To enable students understanding a hydraulic system in order to restore it to the functionality for which it was designed, by changing or modifying elements that no longer perform their function or have a degraded operating mode.

1.2 Objectives

- Understand the operation of the main components of a hydraulic circuit (pumps, valves, pressure and flow control devices, motors).
- Identify these components on a hydraulic diagram
- Understand the operation of a simple hydraulic system from a diagram
- Dimension the components of these simple systems (e.g. calculation of the opening pressure of a pressure relief valve)

1.3 Prerequisites:

Fluid mechanics concepts

Computation of pressure losses

Upstream modules	Module taught	Downstream modules
MGEM21.14	MGEM31.51	

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Viscous fluid flow	3	At the end of this chapters students will be able to know the different types of flow
Chapter 2	Hydraulic components 1. Pumps and motors 2. Cylinders 3. Pressure control devices 4. 4. Flow control devices 5. Filtration	18	At the end of this chapters students will be able to identify the components of the hydraulic system

Chapter 3	Sizing of a hydraulic plant	10	At the end of this chapters students will be able to design a hydraulic plant

2. METHODOLOGY

Integrated courses (h)	30 h
Practical work (h)	
Project (h)	30 h
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work		
Continuous monitoring	1 and 2	0.25
Presentation		
Final Review	1 to 3	0.75

4. Bibliographic References

- Mannesmann Rexroth: The Hydraulics Course Volume 1 to 3
- Industries and Techniques: Hydraulic and Pneumatic Mechanisms DUNOD
- L'Usine Nouvelle : Aide Mémoire Industrial Hydraulics at DUNOD, J. Roldan Viloria
- Stages: Mechanical Engineering Industrial Automation at NATHAN, J.M. Bleux and J.L. Fanchon
- Industrial Sciences: Hydrostatics 1 at ELLIPSES, F. Esnault and P. Bénéteau
- Industrial Sciences: Hydrostatics 2 at ELLIPSE, F. Esnault and P. Bénéteau
- Hydraulics: Machines and components at EYROLLES , G. FAYET
- Bosh documentation

-

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULEDESCRIPTION**	**Department: Industrial engineering**
		Date: 10/18/2021
		N° version: 02
		Semester: 1

Module: RESEARCH METHODOLOGY

Code: MGEM31.52

Module group: GM3-5

Specialty modules	Main module	Engineering sciences and techniques	preparation for the profession
			x

Teacher: Noomen GUIRAT

Status: Assistant-Professor

E-mail: noomenguirat@gmail.com

Course	Practical work	Individual work	Total volume
30		**20**	**50**

Coefficient:	ECTS's credits:
2	2

	MODULE DESCRIPTION	Department: Industrial engineering
		Date: 11/10/2021
		N° version: 02
		Semester:

1. DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED:

1.1 Description:

1. Explain the engineer's science approach characteristics.
2. Define a research problem
3. Choose a research technique and method in connection with the define problem
4. Build a data gathering tool/instrument according to the previously chosen technique and method
5. Carry out/Execute the data gathering with the tool built
6. Analyze the collected data
7. Interpret the obtained results

1.2 Objectives

Overall course's goal: apply the scientific approach to empirical research
Specifics objectives:

- Master the constituting elements of the scientific approach
- Execute/Apply all the steps of scientific approach

1.3: Prerequisites

Upstream modules	Modules taught	Downstream modules
	MGEM31.52	

1.4: Learning Outcomes

Chapters	Title	Duration	Learning outcomes
Chapiter 1	Characteristics of the engineer's scientific approaches	6	Master characteristics of the engineer's scientific approaches
Chapiter 2	Steps of a scientific work	6	Know how to plan scientific research
Chapiter 3	Engineering research techniques in science	6	Have an idea on the tools and methods invested in the research
Chapiter 4	Data gathering tools	6	Be able to collect data where it is located
Chapiter 5	Results analysis and interpretation	6	Promote the research

2. METHODOLOGY

Contact hours consist to present the scientific research in the engineer's world. Chapters are organized as seminar and organized with real practical case in the scientific research world.

Integrated courses (h)	30
Practical work (h)	
Project (h)	30
Visits (h)	

3. Assessment

Name	Chapiter (s)	Weighting
Mini-project		
Practical work		
Continuous Assessment		0.25
Presentation		
Final Review		0.75

4. Bibliographical references

- HUBERMAN A.Michael. / MILLES Matthew B. : ANALYSE DES DONNEES QUALITATIVES. Editeurs : DE BOECK UNIVERSITE Collation : 626p.
-LARDY Jean Pierre, RECHERCHE D'INFORMATION SUR L'INTERNET : outils et méthode ADBS EDITIONS Collation : 118p
- LARAMEE Alain / VALLEE Bernard : LA RECHERCHE EN COMMUNICATION : Eléments de méthodologie Notice générale. Editeurs : PRESSES UNIVERSITAIRE DE QUEBEC. 377p.
- LENOBLE-PINSON Michèle LA REDACTION SCIENTIFIQUE : Conception, rédaction, présentation, signalétique Titre. DE BOECK UNIVERSITE Collation: 152p.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Design of industrial robots

Code: M.GEM31.53

Module group: GM3-3

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
	X		

Teacher : Rekik Chokri
Status: Senior Lecturer
Mail: chokri.rekik@enis.rnu.tn

Course	Practical work	Personal work	Total volume
24 h	- h	25 h	49 h

Coefficient :	ECTS credits :
1,5	2

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM31.53**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

Nowadays, robots allow the improvement of productivity and competitiveness of companies. robotics is the set of techniques allowing the design and the implementation of automatic machines or robots which help or replace the human being in several fields of activity.

1.2 Objectives

The students can distinguish between the different sensors used in robotics (sound sensor, infrared sensor, laser rangefinder, camera...).
The students can distinguish between the different robots used in industry (manipulator robot, mobile robot, parallel robot etc).
Students know how to use 2D and 3D visual s ervoing
The students know how to build geometrical model a multi-degree-of-freedom manipulator robot using several geometrical techniques.
Students are able to develop a dynamic model to control a robot manipulator from an initial position to a final position
Students are able to develop control laws based on PID controllers.

1.3 Prerequisites

1. Basic knowledge of displacement geometry.
2. Basic knowledge of mathematics (matrix calculation, geometry, etc.)
3. Basic knowledge of mechanical design
4. Introduction to robotics

Upstream modules	Module taught	Downstream modules
MGEM12.18	MGEM31.53	MGEM31.48

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Introduction to robotics	3h	Types of robot - Sensor types
Chapter 2	Visual servoing in robotics	6h	- Visual measurement - Types of robotic tasks

			- Visual servoing - Camera modelling - Consideration of distortions - Camera calibration
Chapter 3	Geometric and kinematic modelling of robots	15h	Introduction to modelling - Calculating the direct geometric model of a robot - Calculation of the inverse geometric model of a robot - Kinematic modelling - Dynamic modelling - Control of robotic manipulators

2. METHODOLOGY

- The Contact Hours consist of the presentation of the training objectives and the programme.
- Directed and structured activation of students' prior knowledge using structuring methods.
- Concrete use of the resources prescribed to the students: treatment, deepening, exercise, application, consolidation of new knowledge

Integrated courses (h)	24h
Practical work (h)	0h
Project (h)	15h
Visits (h)	10h

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work		
Continuous monitoring	Chapter 1-2-3	0.25
Presentation		
Final Review	Chapter 1-2-3	0.75

4. Bibliographic References

1 - Khalil W. and Creusot D. Symoro+: a system for the symbolic modeling of robots. Robotica, 15 :153-161.
2- J.-P. Lallemand, S. Zeghloul: Robotics. Aspects fondamentaux, Masson 1994, 312 pages
3- Modelling and control of robots, W. Khalil, G. Lebret, EI3 Automatique de l'ECN course 94/95
4- Robots. Principles and control, C. Vibet, Ellipses 1987, 207 pages
5 -Denavit J and Hartenberg R.S. A Kinematic notation for lower pair mechanism based on matrices.Trans. of ACME, J. of Applied Mechanics, 22 :215-221, June 1955.
6- Robotics course, J.-L. Ferrier, DESS ASC

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Serviceability of materials

Code: M.GEM31.54

Module group:GM3-4

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
X		X	

Teacher : Chedly Bradai
Status: Professor
Mail: chedly.bradai@enis,tn

Course	Practical work	Personal work	Total volume
27 h	**- h**	**25 h**	**52 h**

Coefficient :	ECTS credits :
2	2

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This course intends to initiate students with design and production of technical systems respecting high degree of safety during operations (for example, aerospace industry requires the determination of the lifetime of a material and the overall system).

In order to achieve this task and to have a precise life span, it is necessary to master all the material parameters and operating conditions

1.2 Objectives

The objective of the course is to provide methods of analysis and dimensioning of structures undergoing cyclic fatigue loading, which is the cause of the majority of mechanical damages.
The engineer will have a clear idea of :

- Fatigue parameters and phenomena
- The study of different types of fatigue loading
- Monitor the influence of geometry during the design phase and study their influence on durability.
- Study the occurrence and propagation of internal and external cracks and their impact on durability under monotonic and cyclic loading
- Master the concepts of residual stresses, durability of structures under cyclic loading.
- Master the methods of estimating the life span, the appearance and propagation of cracks
- Numerous examples of industrial applications will be studied to assess accidents in industry and particularly in the aerospace field.

1.3 Prerequisites

To be able to follow this course, the student will need to have knowledge of Physical Metallurgy, Metallurgy and Heat Treatment of Materials, Structural Design and Continuum Mechanics.

Upstream modules	Module taught	Downstream modules
MGEM12.12;MGEM11.03; MGEM21.26; MGEM22.37	M.GEM31.54	

1.4 Learning outcomes

Chapter	Heading	Durat	Learning outcomes
Chapter 1	fatigue behaviour of materials	10	- Description of fatigue phenomena in materials - Fatigue test parameters - fatigue tests protocol - Wohler curve

			- Micromechanical phenomena during fatigue cycles - Endurance diagrams - Damage laws - Estimation of the endurance limit, Estimation of the service life for variable loading amplitudes
Chapter 2	Factors that influence fatigue behaviour	10	- Mechanical parameters influencing fatigue behaviour. - Geometry, micro-geometry, residual stresses, microstructure - Fracture and crack growth mechanisms - Local approach: strain and stress fields; stress concentration; stress intensity factors; toughness
Chapter 3	Analysis and assessment of a fracture	7	- Fatigue crack initiation and propagation mechanism. - Interpretation of fatigue diagrams. - Introduction to fracture phenomena - Fracture under monotonic loading - Fracture under variable loading (fatigue failure)

1. METHODOLOGY

Integrated courses (h)	27
Practical work (h)	
Project (h)	25
Visits (h)	

2. valuation

Designation	Chapter(s)	Weighting
Mini-project		
Practical work		
Continuous monitoring		0.25
Presentation		
Final Review		0.75

3. Bibliographic References

- BATHIAS Claude, PINEAU André " Fatigue des matériaux et des structures : introduction, endurance, amorçage et propagation des fissures " édition hermès
- Jean-FrançoisFlavenot "Fatigue behaviour of metallic materials" CETIM edition

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Measurement and instrumentation of electrical systems

Code: M.GEM31.55

Module group: GM3-3

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
		x	x

Teacher : Mouna Krichen
Status : Assistant professor
Mail: mona.krichene@gmail.com

Course	Practical work	Personal work	Total volume
24 h	12 h	35 h	71 h

Coefficient :	ECTS credits :
2,5	2

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM31.55**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Descriptions

Study the industrial metrology of basic physical quantities: temperature, level, pressure and flow. Learn to wire and calibrate analogue and digital transmitters

1.2 Objectives

- Understand ISA standard for industrial instrumentation for reading IT plan-sheets
- Transmitter sensor for measuring various basic physical quantities: temperature, pressure, level and flow
- Calibration of an analogue and digital transmitter
- Pressure current converter, pressure current converter for transmission of standard signals in instrumentation

Research perspectives of the course :

- Industrial network of instruments and signal conditioners
- Intranet network
- iot (internet of things) sensors for industry 4.0

1.3 Pre-requisite

- Analogue electronics
- Fluid mechanics
- Basic electricity and preliminary knowledge of pneumatics
- Electrical and pneumatic cabling

Upstream modules	Module taught	Downstream modules
MGEM11.07 ; MGEM22.44 ; MGEM12.14	MGEM31.55	GEM31.59

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Introduction to metrology and the ISA standard	6	Know the different elements of a control loop and read an IT diagram (Piping and Instrumentation)

Chapter 2	Temperature measurement: (RTD Pt100 resistance thermometers, optical pyrometer) measurement chain	4 h	Converting the different temperature units Knowing the RTD law Read the RTD and PT100 tables
Chapter 3	Pressure measurement: relative, absolute, differential...) Installation of a pressure transmitter and wiring of transmitters.	6 h	Know the different types of pressure, units and conversions Wiring of different types of transmitters, installation conditions
Chapter 4	Level measurement: measurement technique and installation of level transmitters)	4 h	Level measurement principle (pressure, electrical, ultrasonic and radar)
Chapter 5	Volume flow measurement: (measurement technique and installation of flow transmitters)	4 h	Knowledge of linear flow measurement techniques (turbine, DEM, Ultrasonic) Know the technique of non-linear flow measurement (Depressors: Diaphragm nozzle, Venturi tube)
Practical work	Lab activity 1: Programming a temperature converter and testing its alarms Lab activity 2: Programming a voltage to current converter and calibrating the current to pressure and pressure to current converter Lab activity 3: Calibration of a level transmitter Lab activity 4: Calibration of a flow transmitter Lab activity 5: Calibrating a pressure transmitter	12h	Programming a converter or transmitter with programming software or a programming console or by keyboard. Wire the various sensors. Drawing up calibration tables

2. METHODOLOGY

The contact hours consist of presenting different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For individual activities, students have to do the exercises given as homework assignments.

Integrated courses (h)	24h
Practical work (h)	12h
Project (h)	
Visits (h)	

3. EVALUATION

Designation	Chapter(s)	Weighting
Mini-project		
Practical work		0.25
Continuous monitoring	Chapter1-Chapter2-Chapter	0.25
Presentation		
Final Review	Chapter1-Chapter2-Chapter3 Chapter4-Chapter5	0.5

4. BIBLIOGRAPHIC REFERENCES :

- Industrial transmitter sensors: Afpa course (Angers-Pompey vocational training agency)
- Industrial Instrumentation - Dunod
- Angers Professional Instrumentation
- http://www.audin.fr/pdf/documentations/sick/instrumentation-industrielle/instrumentation-industrielle.pdf
- Measurement and instrumentation course - enit http://www.enit.rnu.tn/fr/Minds/mes_instru/COURS_DE_MESURE_ET_INSTRUMENTATION.pdf

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Regulations and controls

Code: M.GEM31.56

Module group: GM3-3

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
x		x	

Teacher : Awatef Maatoug
Status : Assistant professor
Mail: awatef.maatoug@yahoo.fr

Course	Practical work	Personal work	Total volume
24 h	**12 h**	**35 h**	**71 h**

Coefficient :	ECTS credits :
2,5	2

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM31.56**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

The regulation of industrial processes includes all the material and technical means implemented to maintain a physical quantity to be regulated, equal to a desired value. The course will provide a wide overview on the main techniques for regulation and control.

1.2 Objectives

The student will master the techniques necessary for the selection and design of industrial controllers, primarily proportional, integral and derivative controllers.
The student knows the practical implementation techniques of industrial controllers.

1.3 Prerequisites

- Basic knowledge of automation.
- Methods of analysis and control of dynamic linear systems.

Upstream modules	Module taught	Downstream modules
MGEM22.44	MGEM31.56	MGEM31.60

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	General information on regulation	6h	- Principle of regulation - General diagram of a control loop - Examples of regulated processes - Different types of regulation - Application
Chapter 2	PID controllers	9h	- Hardware aspects of PID controllers - Functional aspects - Proportional action - Integral and proportional integral action - Derivative and proportional derivative action. - system with delay
Chapter 3	Setting PID controllers	9h	Step response methods Ziegler-Nichols method Cohn-Coon method Adjustment according to adjustability
			- In-line adjustment - Direct synthesis, pole compensation - Placement of poles

Practical work	Lab activity 1. level control problem Lab activity 2. Regulation of a first and second order system	12h	use of the proportional controller - use of the integral controller - use of the bypass regulator

2. METHODOLOGY

The Contact Hours consist of the presentation of different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For the individual activities, students have to do the exercises given as homework assignments.

Integrated courses (h)	24h
Practical work (h)	12h
Project (h)	20h
Visits (h)	15h

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work	Chapter 1-2-3	0.25
Continuous monitoring	Chapter 1-2-3	0.25
Presentation		
Final Review	Chapter 1-2-3	0.5

4. Bibliographic References

1- J, M. Flaus. (1994). La régulation industrielle, Editions Hermès, Paris
2- A, Kaya. and T.J, Scheib (1988). Tuning of PID controls of different structures, control engineering, 62-65, july, 1988.
3- K. Ogata (1992): Modern control engineering. Eastern EconomyEdition, second edition, India.
4- B. C. Kuo (1991): {``Automatic control systems"}. Prentice hall,englewood cliffs, sixth edition, new jersey 07632

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Project Management

Code: M.GEM31.57

Module group: GM3-1

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
		x	x

Teacher : Monji Haddar
Status : Assistant professor
Mail: mon.had@escs.rnu.tn

Course	Practical work	Personal work	Total volume
24 h	- h	30 h	54 h

Coefficient :	ECTS credits :
1,5	2

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM31.57**	**Department :Electromechanical** **3ème year Semester: 1** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 : Description

The search for performance, the imperatives of change, generate an increasing emergence of projects. This course provides the opportunity to acquire organizational and management techniques to effectively manage projects while respecting deadlines, budget and expected performance by the company.

1.2 Objectives

- Master the basic principles of project management, carry out a feasibility assessment and design the main stages of the project in accordance with the strategic and operational objectives defined by the company
- Design the project architecture and ensure its promotion. Optimise the financial, material and human resources available and take into account the constraints of the organisation in which they will be implemented
- Plan the operational progress of the project by deploying its organisational capacities, evaluating the actions implemented and implementing the methods for assessing the issues and making decisions

1.3 Prerequisites:

Upstream modules	Module taught	Downstream modules
- Production management - Management of the company - Graph	- Project management	

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Introduction to project management	5 h	Defining a project
Chapter 2	Project concept and project management	6h	Know the main phases of a project
Chapter 3	Project planning	6h	Determine more easily the
Chapter 4	Scheduling techniques	7h	different tasks to perform in order to complete a project. Monitoring the progress of the project within the framework of a steering committee

2. METHODOLOGY

The Contact Hours consist of the presentation of different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For the self-study activities, students have to do the exercises given as homework.

Integrated courses (h)	24
Practical work (h)	
Project (h)	24
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		10
Practical work		
Continuous monitoring		15
Presentation		
Final Review		75

4. Bibliographic References

- L'essentiel de la gestion de projet", Roger Aim, Gualino Editions, 11th ^{e}edition.

- Pratiques de management de projet - 46 outils et techniques pour prendre la bonne décision", Vincent Drecq, Dunod, 2nd ^{e}edition.

- Project Management", Robert Buttrick, 5th ^{e}edition.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Computer-aided maintenance management

Code: M.GEM31.58

Module group: GM3-1

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
		x	

Teacher: Wissem Zghal

Status : Assistant professor

Mail: zghal_wissem@yahoo.fr

Course	Practical work	Personal work	Total volume
21 h	12 h	40 h	73 h

Coefficient :	ECTS credits :
2	2.5

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM31.58**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 : Description

Maintenance is an essential function in every industrial process. It is becoming an increasingly sensitive component of company's performance. It is therefore important to master this activity and to be familiar with the various tools and methods of its management.

1.2 Objectives

- Mastery of the basic concepts of maintenance (mastery of the normative concepts related to maintenance);
- Determination of maintenance management tools ;
- Use of maintenance management methods ;
- Implementation of these methods through practical applications.

1.3 Prerequisites

Knowledge of industry, production concepts, industrial systems, etc.

Upstream modules	Module taught	Downstream modules
	CMMS	

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	General presentation of Maintenance	4h	Presentation of the different basic concepts of maintenance: mastery of the normative notions related to maintenance
Chapter 2	FMD Concept of Maintenance	4h	Implement the concept of Reliability, Maintainability and Availability (control, calculation and synthesis)
Chapter 3	Dashboard in Maintenance	4h	Presentation, identification and exploitation of the different ratios and the concept of maintenance efficiency
Chapter 4	Economic Approach to Maintenance	4h	Presentation and implementation of methods for determining and analysing maintenance costs

Chapter 5	Quantitative Decision Support Tools for Maintenance Management	5h	Mastery of the various quantitative analysis methods for maintenance management.
Practical work	CMMS	12h	Use of a CMMS software to implement the various elements presented in the course through practical case studies based on the creation of the various CMMS modules: equipment management, stock management, work management and analysis.

2. METHODOLOGY

The Contact Hours consist of the presentation of different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For the individual activities, students have to do the exercises given as homework assignments

Integrated courses (h)	21h
Practical work (h)	12h
Project (h)	
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project	-	
Practical work Continuous monitoring	All Chapters Chapters 1, 2 and 3	50%
Presentation	-	
Final Review	Chapters 3, 4 and 5	50%

4. bibliographical references

[1] BSI Standards Publication, Maintenance-Maintenance terminology, EN 13306:2017.

[2] François Monchy, Maintenance: methods and organisations, published by DUNOD, Paris, 2000.

[3] Marc Frédéric, Mettre en œuvre une GMAO (maintenance industrielle service après-vente maintenance immobilière), Dunod, Paris, 2003.

[4] *Maintenance*, methods and organisations, François Monchy, published by DUNOD,

[5] Jean Héng, Pratique de la maintenance préventive, published by DUNOD, 2002.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Renewable energy

Code: M.GEM31.59

Module group: GM3-2

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
		x	

Teacher : Taher Hmida
Status : Assistant professor
Mail: tahar.hamida@gmail.com

Course	Practical work	Personal work	Total volume
30 h	- h	30 h	60 h

Coefficient :	ECTS credits :
2	2

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM31.59**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 : Description

This course intends to give students a better understanding of the major challenges of the 21st century in terms of energy transition as well as the means of exploiting the various sources of renewable energy (sun, wind, water, geothermal, biomass).

The course will provide also an overview on nuclear applications in general and nuclear power generation in particular.

1.2 Prerequisites

Basic knowledge in scientific fields (Maths, Physics, Chemistry..), engineering fields (mechanical, electrical, civil, geology...), heat transfer

Upstream modules	Module taught	Downstream modules
M.GEM12.14 -22.42	M.GEM31.59	

1.3 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Classification of renewable energies	6 H	This chapter provides knowledge on the classification and characteristics of the different types of renewable energy (wind, solar, geothermal, hydraulic, biomass...)
Chapter 2	*Solar Energy*	12 H	To gain knowledge of the technical and economic characteristics and parameters of solar energy in both applications: - Solar thermal energy - Photovoltaic solar energy
Chapter 3	*Nuclear Energy*	12 H	- Understand the advantages and disadvantages of using nuclear power reactors. - Describe and explain the different components of a nuclear power plant and associated applications

2. METHODOLOGY

Integrated courses (h)	30
Practical work (h)	
Project (h)	30
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work		
Continuous monitoring	CH1 Ch2	25%
Presentation		
Final Review	Ch1 Ch2 Ch3	75%

4. Bibliographic References

D.LLeGourières, Wind energy: Theory, design and practical calculation of installations, Paris: Eyrolles; 1980
L. Freris, D. Infield, Les Energie Renouvelable Pour La Production De L'électricité, DUNOD, Paris 2009
C. Laughton, Solar Hot Water: Design And Installation Of Solar Water Heaters, DUNOD, Paris 2012. J.Percebois, Solar Energy: Economic Perspectives (Energy and Society), 1975
Z. Chen, F. Blaabjerg, Wind Energy - The World's Fastest Growing Energy Sourc, IEEE Power Electronics Society Newsletter, 3, 15-18, 2006.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Project design and approach

Code: M.GEM31.60

Module group: GM3-5

Specialty modules	**Basic module**	**Engineering Sciences and Techniques**	**Preparation for the profession**
		x	

Teacher : Moez Frikha
Status : Assistant professor
Mail: frmoez@gmail.com

Course	Practical work	Personal work	Total volume
- h	24 h	30 h	54 h

Coefficient :	ECTS credits :
1	2

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **M.GEM31.60**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 : Description

The "design and process of a project" encompasses all the steps and actions necessary to meet an expressed need or solve a problem identified in an industrial process. These steps start with the analysis of the requirements and the writing of the specifications and end with the final delivery of the product. Between these two extreme stages, there is the division of the overall system into subsystems, the proposal and selection of solutions, the design and dimensioning and finally the establishment of the technical documentation and the manufacturing of the product.

1.2 Objectives:

- *Designing a mechanical system*

- Establish the technical documentation to move on to the production of manufacturing plans, after having made the choice of technological solutions that provide an answer to the specifications

1.3 Prerequisites

- *Mechanical design*

- *Strength of materials*

Upstream modules	Module taught	Downstream modules
MGEM11.03; MGEM12.17; MGEM22.38	MGEM31.60	——

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Mechanical system and subsystems	5h	Division of a mechanical system into subsystems
Chapter 2	Technologica solutions	7h	Selection of technological solutions respecting the functions for each sub-system

Chapter 3	Design using software Solidworks	12h	Establish the overall system design Selection of dimensional tolerances and geometric conditions for the proper running of the mechanical system Provide the definition drawings of all the parts of the system

2. METHODOLOGY

Integrated courses (h)	—
Practical work (h)	24 h00
Project (h)	30 h00
Visits (h)	—

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work		
Supervised Homework		
Presentation		
Final Review		

4. Bibliographic References

- Guide de calcul en mécanique, D. SPENLE & R. GOURHANT, Hachette, edition n°3, 2001.

- Solidworks User Manual

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical Engineering Engineering**
		Date : 10/18/2021
		Version N° : 02
		Semester: 1

Module: Industry 4.0 Advanced Operator

Code: MGEM31.61

Module group: GM3-5

Speciality modules	Main module	Engineering Sciences and Techniques	Preparation for the profession
		x	

Teacher: Sameh CHTOUROU

Status : sameh.chtourou@isgis.usf.tn

Mail : Assistant-Professor

Courses	Practical works	Individual work	Total volume
30		**20**	**50 H**

Coefficient :	Credits ECTS :
2	2

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical Engineering Engineering**
		Date : 10/18/2021
		Version N° : 02
		Semester: 1

1. DESCRIPTION OF THE COURSE AND COMPETENCES TO BE ACHIEVED:

1.1 Description

Definition, tools, technologies and concepts of Industry 4.0 for the implementation of the digital transformation of companies' business processes in the context of the 4th industrial revolution. Application of technologies: internet of things (IOT), Big data, cloud computing et cloud manufacturing cyber physical system (CPS), artificial intelligence. Challenges: strategic positioning, development of new processes, Products and services; implementation of new monitoring capabilities, control, optimization and autonomy. Key principles: interoperability, decentralization of decision-making, real timing, integration, agility. Deployment strategies. Information system for industry 4.0.

1.2 Objectives

-To provide students with the knowledge enabling them to understand the challenges of new technologies, to master the concepts and finally to deploy and manage Industry 4.0 in their company.
- Analyze the situation of a company in order to determine the strategic, operational and organizational requirements and challenges necessary for the implementation of the new Industry 4.0 tools.
- Identify industrial transformation actions in the development, production and value proposition functions that can be profitably deployed in an industrial company.
- Oversee the deployment of Industry 4.0 throughout the company while managing the change management aspect, and assess the human, managerial and decision-making impacts in the company.

1.3 Prerequisites

General knowledge of the fundamentals of strategy, industrial management, production systems, logistics, marketing, controlling et R & D

1.4 Learning Outcomes

Chapters	Title	Duration	Learning Outcomes
Chapter 1	General introduction to Industry 4.0: the principles and perspectives of concepts	7	Mastery of concepts
Chapter 2	Innovation and impact on Industry 4.0: challenge or opportunities?	9	Control of the impact of innovation on Industry 4.0
Chapter 3	Lean, six sigmas and industry 4.0: successful transformation	9	Knowing how to combine quality methods with Industry 4.0
Chapter 4	Product development 4.0: the new frontier of competition	5	Understand the relationship between competition and industry 4.0
Chapter 5	Manufacturing 4.0: towards more operational efficiency	5	Know the role of manufacturing 4.0
Chapter 6	Offer value 4.0: transform to create and capture more value	5	Being able to create value with Industry 4.0
Chapter 7	Artificial intelligence and predictive analytics	5	Master the tools leading to artificial intelligence
Chapter 8	Industry4.0 Roadmap	5	Mastering the Industry 4.0

			Roadmap

2. METHODOLOGY :

The Contact Hours consist of the presentation of different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For the self-study activities, students have to do the exercises given as homework.

Integrated courses (h)	30
Practicalwork (h)	
Project (h)	20
Visits (h)	

3. Assessment:

Designation	**Chapter(s)**	**Rating**
Mini-project		
Practical works		
Continuous assessment		25%
Presentation		
Final Review		75%

5. Bibliographic references :

- Dorothée Kohler, Jean-Daniel Weisz, Industrie 4.0 : comment caractériser cette quatrième révolution industrielle et ses enjeux ? Annales des Mines - Réalités industrielles 2016/4 (Novembre 2016), pages 51 à 56.
- Jean-Claude André. Industrie 4.0 : paradoxes et conflits. ISTE ed. 2019.
- Marcus Kahmann. L'Industrie 4.0 : vers la digitalisation concertée de l'industrie manufacturière ? Ed. IRES, 2021.
- Xavier Comtesse. Industrie 4.0: The Shapers, Georg éditeur, 2019 - 159 pages

- Ulrich Sendler. The Internet of things : industrie 4.0 unleashed. Spring ed. 2018.

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module: Modelling and Simulation of Production Systems

Code: M.GEM31.62

Module group: GM3-4

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
		x	

Teacher : Norhen Yousfi
Status : assistant Proffesor
Mail: nourhainegem@gmail.com

Course	Practical work	Personal work	Total volume
24 h	**9 h**	**40 h**	**73 h**

Coefficient :	ECTS credits :
2	2

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This course provide different simulation approach of industrial systems. Starting with the basics of industrial systems and their components, the course develops the skills of future engineers from the problem formulation stage to decision making based on simulation results. The corresponding modelling concepts and the use of simulation software (Arena) are also studied.

Objectives

The objective of this course is to understand and control the evolution over time of real industrial process (analyse, model and study the behaviour of a real system (production or service)) and to simulate the operation of a production system in order to evaluate its performance.

Simulation-based flow analysis is a method that allows the student to predict the final performance of production systems. It also allows him to cover a wide range of research problems: sizing of production systems (PS), workshop management, new product launches, production increase, planning, etc.

1.2 Prerequisites

1. Production Management
2. Production flow
3. Design of CWS and evaluation of their performance
4. Statistical analysis

Upstream modules	Module taught	Downstream modules
MGEM22-46	MGEM31-62	

1.3 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Modelling process	7,5 h	- Definitions: Model, Modelling - Modelling prerequisites - Typology of models / Classification of models - Usefulness of modelling - Different types of models used - Resolution methods: Limitations and advantages of each method - Case studies from the literature

Chapter 2	Simulation process	7,5 h	- Definition of simulation - Discrete event simulation - Areas of application of simulation - Advantages and disadvantages of simulation - Transient and steady state cases - Statistical aspects of the results - Selecting a simulator - Examples of simulators
Chapter 3	Conducting a Simulation Project	6 h	- Steps of a simulation project - Collection of simulation results - Case of finite system models - Case of infinite system models - SIMAN/Arena simulation software - Case study
Practical work	Use of SIMAN/Arena simulation software	15 h	- Familiarisation with the ARENA modules - Development of a model - Simulation of the model's operation - Analysis of the results

2. METHODOLOGY

The Contact Hours consist of the presentation of different concepts, rules and diagrams. Practical applications are dealt with separately in tutorials and assignments. For the individual activities, students have to do the exercises given as homework assignments.

Integrated courses (h)	24 h
Practical work (h)	9 h
Project (h)	
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work		
Continuous monitoring		
Presentation		
Final Review		

4. Bibliographic References

1. Ait Hssain A., (2000), "Optimisation des flux de production", méthodes et simulation, édition DUNOD, Paris.

2. Habchi, G. (2001). Conceptualisation and Modelling for Production Systems Simulation. Report of hab

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION** **MGEM31-63 option 1**	**Department :Electromechanical** **3rd year Semester: 1** **Version number: 02** **Date: 15/10/2021**

Module : Modelling the behaviour of materials

Code: MGEM31-63 option 1

GM3-4

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
X			

Teacher: Khlif Mohamed

Status : Assistant Master

Mail: mohamed.khlif@enis.tn

Course	Practical work	Personal work	Total volume
24h	12	40h	76h

Coefficient :	ECTS credits :
2	2

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This course is devoted to the study of non-linear behaviour of materials subjected to small deformations. Viscoelasticity, plasticity and viscoplasticity will be studied by following this appraoch

- A description of the main underlying physical phenomena (micro-mesoscopic scale),
- Phenomenological modelling in a purely mechanical framework (macroscopic scale of the "material") and the introduction of a more general thermomechanical framework,
- Characterisation tests allowing identification of models parameters,
- An introduction to the numerical implementation of these behaviour laws (with a practical implementation with a software).

1.2 Objectives

AT the end of this course the studenst will acquire the following knowledge:

- An overview on materials behaviour: physical phenomena,
- phenomenological modelling, characterisation tests,
- introduction to numerical implementation and applications.

1.3 Prerequisites

Upstream modules	Module taught	Downstream modules
	MGEM31-63	

1.4: Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Introduction to non-linear behaviour	3h	At the end of this chapter students will be able to identify the nonlinear behaviour of materials
Chapter 2	Viscoelasticity	3h	Viscoplastic behaviour
Chapter 3	Elasto-plasticity: plasticity criteria and work hardening	3h	Plasticity criteria and work hardening
Chapter 4	Viscoplasticity	3h	Viscoplastics behaviour

Chapter 5	Thermodynamics of irreversible processes	6h	At the end of this chapter students will be able to model the behaviour of materials
Chapter 6	Numerical implementation of behavioural laws	6h	
Practical work	**Lab activity 1-** Elastoplastic Modelling (Abaqus) **Lab activity 2-** Visco-elastic modelling (Abaqus) **Lab activity 3-** Visco-plastic modelling (Abaqus)	9h	Modelling and simulation with Abaqus

2. METHODOLOGY

The course is based on a methodology combining lectures, tutorials, practical work and personal work.The face-to-face sessions are of the integrated course type combining lectures and tutorials. Students are required to complete individual work in a non-classroom setting and to present it in class in the form of a lecture. The practical work allows the application of the concepts studied during the course

Integrated courses (h)	24h
Practical work (h)	12h
Project (h)	
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work		0.25
Continuous monitoring	Chapter 1-Chapter 2-Chapter 3	0.25
Presentation		
Final Review	Chapter 1-Chapter 2-Chapter 3-Chapter 4-Chapter 5-Chapter 6	0.5

4. Bibliographic References

Finite element method - Practical approach to structural mechanics, Michel Cazenave, *DUNOD*

Finite Element Modelling, 3rd edition Jean-Charles Craveur

Simulation and Modeling: Current Technologies and Applications, As m Abdel Rahman El She kh, IGI PublIShInG

- Manual *for* Abaqus/CAE

Université Privée Du Sud POLYTECHNIQUE DES SCIENCES AVANCÉES SFAX - TUNISIE	**MODULE DESCRIPTION**	**Department: Electromechanical Engineering**
		Date: 15/10/2021
		Version number: 02
		Semester: S1

Moudule: Mechanics and development of composite materials

Code: **MGEM31-63 option 2**
GM3-4

Specialty modules	Basic module	Engineering Sciences and Techniques	Preparation for the profession
X			

Teacher : Chedly Bradai

Status: Professor

Mail:
chedly.bradai@enis.tn

Course	Practical work	Personal work	Total volume
24h	12	40h	76h

Coefficient :	ECTS credits :
2	2

	MODULE DESCRIPTION	*Department: Industrial Engineering*
		Date: 11/10/2021
		Version number: 02
	MGEM31-63 option 2	*Semester :1*

1. COURSE DESCRIPTION AND COMPETENCIES :

1.1 Description

This course presents the different methods of elaboration of polymer and composite materials and explainns how means of shaping are selected according to the requirements and how to establish the balance of the quantities of movement and determine the flow parameters in terms of flow, pressure, power, torque etc.

1.2 Objectives

Knowledge of polymer production (thermoplastics, thermosets and elastomers)
Mastery of the mechanical processes of shaping polymers
Be able to carry out mechanical calculations for the shaping of polymers
Know how to associate rheological behaviour with a composite material and a pure polymer

1.3 Prerequisites

Upstream modules	Module taught	Downstream modules
	MGEM31-63 Option	

1.4 Learning outcomes

Chapter	Heading	Duration	Learning outcomes
Chapter 1	Materials Development o Polymers o Composite materials and their shaping o Shaping of thermoplastics o Wood and modified wood o Powder metallurgy (sintering)	12h	At the end of this chapter students will be able to identify the techniques of materials elaboration
Chapter 2	Mechanics of Materials Chapter: Modelling in plastics processing Applications	12h	Polymer and composite processing
Practical work	**Lab activity 1-** Elaboration of the composite **Lab activity 2 -** Thermogravimetric study of the polymer ATG ATD DC **Labactivity 3 -** Characterisation of the composite	12h	Elaboration and characterisation of composites

2. METHODOLOGY

The course is based on a methodology combining lectures, tutorials, practical work and personal work.

The face-to-face sessions are of the integrated course type combining lectures and tutorials. Students are required to complete individual work in a non-classroom setting and to present it in class in the form of a lecture. The practical work allows the application of the concepts studied during the course

Integrated courses (h)	24h
Practical work (h)	12h
Project (h)	
Visits (h)	

3. Evaluation

Designation	**Chapter(s)**	**Weighting**
Mini-project		
Practical work		0.25
Continuous monitoring	Chapter 1-Chapter 2-Chapter 3	0.25
Presentation		
Final Review	Chapter 1-Chapter 2-Chapter 3-Chapter 4-Chapter 5-Chapter 6	0.5

4. Bibliographic References

- Techniques de l'Ingénieur, Plastics and Composites Treaty

-J.F. Agassant, P. Avenas & J.-Ph. Sergent, "La mise en forme des matières plastiques", 2nd edition, Lavoisier Tec
& Doc, 2014

-N. P. Cheremisinoff, "Rheology and non-newtonian flows", Encyclopedia of Fluid Mechanics, volume 7, 1988.

10. Regulations

Annex 9

Exams regulations

IPSAS EXAMS REGULATION BOOK

Preface

The purpose of this document is tointroducethe framework of regulatory provisions, the organization and validation of examinations within the Private Polytechnic Institute of Advanced Sciences of Sfax, here in after referred to as IPSAS. It applies to all IPSAS training courses. This document sets out the exam charter established in October 2018 and the general exam regulations.

1- PREPARATION AND ORGANIZATION OF EXAMINATIONS

1-1 Summons of student to pass exams:

Every student regularly registered with IPSAS and have paid his tuition fees is automatically registered for the exams.

The exam schedules are communicated to students by posting on the institution's notice boards and by email at least 07 days before the scheduled date to sit for the exams.

Every student whohave accumulated more than three absences in a module is subject to the non-authorization to sit for the exam relating to this module in the main- session exam.

Instead, he will be able to sit for the exam in the re- sit exam session. The lists of eliminations by module are displayed at least 7 days before the scheduled exam start dates.

1-2 Exam schedules:

The exam calendars including the date, time and place of each exam are brought to the attention of students by publishing on closed panels reserved for this purpose, at least 10 days before the outset of the exams and should no longer be modified, except in cases of force majeure duly noted.

The publishing of the written and oral exam calendars constitutes an individual invitation to the exams except for students eliminated for various reasons.

1-3 Special conditions for students with disabilities:

Students recognized as having temporary or permanent disabilities, who have previously obtained specific authorization from the competent service, benefit from special conditions within the framework of the examinations.

These conditions are as follows:

- The one third (1/3) of the overtime organized by the service in charge of examinations, in compliance with regulatory texts;

- It is urgently needed to get applicable, a special examination room and educational assistance (a person having been authorized by the administration to help him in composing andwriting in his place).

1-4 Exam subjects:

Each teacher has, alone and personally, the educational responsibility for the subject he delivers and its confidentiality until it is sent to the service responsible for the duplication. Indeed, he ensures the duplication in the strictest confidence with the printing service and ensures that a sufficient number of sealed envelopes are placed with the service in charge of examinations. Exceptionally, in case of impediment, he designates a replacement (necessarily a teacher) and gives his contact details in order to be reachable in case of emergency or need.

The subject must necessarily be proportional to the provided content and correspondent with the duration of the test.

The subject must recall the title and duration of the test and specify the scale of questions according to the test and the list of authorized documents or materials. In the absence of an intentional indication to the contrary, no document or material is authorized throughout the duration of the event.

The procedure for duplicating and submitting subjects to the service in charge of examinations is determined by each component according to its specialty, while respecting strict confidentiality.

The submission and printing of the subject must be made at least one week in advance, the date of the test or exam.

The teacher can propose an additional subject which will be adopted in the absence of confidentiality of the main subject as a substitute.

1-5 Materialpreparation for exams :

Administrative and / or personal services involved in the organization of exams:

- Prepare, in conjunction with teachers, the exam schedule.
- Convenestudents and supervisors .
- Plan and prepare the examination rooms and equipment necessary for the running of the tests.

- Receive the envelopes containing the examination papers and keep them in a safe and arrangethem to be sent to the site (s) of the test.
- Prepare the enrollment lists and examination inspection reports.
- Distribute the envelopes containing the tests on the day of the exam.
- Implement the logistical means necessary for the smooth running of the exams (according to the capacities and resources of the institution).
- Implement the necessary and adapted provisions for students with disabilities and inform supervisors of the special conditions from which these students would benefit from.
- Providestudentswith:
    - The number of perfectly legible copies of the subject.
    - Anonymous copies.
    - Easily identifiable draft papers (color, and stamp)
- Implement the means guaranteeing the anonymity of the copies to ascertain that it is anonymous.
- Ensure that material not used at the end of a test is recovered and returned to the service in charge of the exams.
- Keep the copies as well as the jury observations after the deliberations.

1-6 Anonymity of copies :

Anonymity of copies is mandatory regardless of the medium used. If necessary, the competent pedagogical secretariat is empowered to hand over anonymity when entering grades which will be validated by the responsible lecturer throughout a well-defined platform.

2- Examination process and realization :

2-1 Conditions of access for candidates to the examination room :

The student must be present in front of the examination room at least 15 minutes before the outset of the examination. First to remember, access to the examination room is prohibited before the arrival of supervising teachers.

It must be remembered, if a candidate presents himself after opening the envelopes containing the subject, the supervisor responsible for the examination room may, exceptionally (when the delay is due to a case of force majeure) subject to an entry authorization issued by the

examination center, authorize him to compose provided that the delay does not exceed 15 minutes after the outset of the test. In particular, no additional time will be given to this candidate, the indication of the delay and its reasons will be entered in the examination report.

2-2 Student's rights and duties regarding the exam :

The student must:

- Be present in front of the examination room at least a quarter of an hour before the outset of the test.
- Do not disturb the tranquil running of the exams, including in the immediate environment of the examination room.
- Respect all of the supervisor's instructions and commands and do not disturb the smooth running of the exam, in particular the change of seat and to stop writing instructionsby the end of the exam.
- Be provided with all the necessary documents for identification (the student card and the invitation to the exam are obligatory to bring with).
- Sign the entry and exit list.
- Sit in the seat reserved for him when a numbered assignment has been notified.
- Use the stamped exam papers and drafts made available by the administration.
- Each student is not allowed to possess any documents not expressly authorized for the test (course, manual, dictionary, etc.);
- Submit your copy at the time indicated for the end of the tests, even if it is a white copy, in which case do not forget to write your name.
- Be equipped with the school supplies authorized to sit for their exam and cannot exchange it between peers throughout the course of the exam.
- Not be in possession of any gadgets for storing and transmitting information such as electronic diary and mobile phone (even for clock use) which must be turned off and placed on the supervising teacher's table.
- Do not smoke in the examination room and it will under no circumstances be allowed to leave the examination room except in cases of absolute necessity.

2-3 Identification:

Another key to realize, to be admitted to the test, students must be in possession of their student cards and their invitation to the exams. In the hope that, they must be able to present an identity document with a photo (national identity card, passport, driving license).

When place numbers have been assigned, the student must first check his place number, by consulting the exhibited lists in the schooling data.

2-4 The instructions:

The student must under no circumstances be in possession of documents not expressly authorized for the examination.

Equally important, the student's personal belongings, including mobile phones and devices for storing and distributing information that must be turned off, must be left at the entrance to the examination room or at the place indicated by the supervisors.

2-5 Regulation of entry and exit to examination rooms:

Access to the examination rooms remains possible for any unpunctual student for a maximum of 30 minutes following the outset of the exams. After 30 minutes the late student will no longer have the right to enter the examination room and he would automatically be deprived to sit for the exam and maybe he would recapitulate it in the re-sit exam if not validated.

It is immediate that students make sure before entering the examination room that they take the necessary steps to remain in the examination room without leaving until after they have finished their composition work. Certainly, except for justified medical reasons or for urgent cases that student can leave the examination room to go to the toilet.

Equally important, no candidate may temporarily or definitively leave the examination room (even in the event that a white copy is handed over) before the elapse of 45 minutes from the outset of the examination.

Correspondingly, candidates who wish to temporarily leave the examination room will be allowed only for an emergency and those for one time only and must be accompanied, if

possible, by one of the supervisors. They must necessarily give their copies to the supervisor, who will give back copies to them on their return.

In any case, the student must not leave the examination room before having checked the identity and without having signed in front of his name for the delivery of a copy even if it is a unwritten copy (white copy: without wording). An unwritten copy must be identified by the student by writing his name and last name.

Once he left the examination room he is no longer authorized to go back to it once his copy has been delivered. Surely, the student must then even leave the environment of the examination rooms.

2-6 The monitoring mission:

The supervision of the examinations constitutes an educational act which constitutes part of the statutory obligations of the lecturers in the same way as the preparation of the subjects and the correction of the exams.

The lecturer responsible for the subject, even if he is not a proctor of his test, is required to be present at the examination room for assistance or to be reachable throughout the duration of the test. In the event of major impediment, he appoints a qualified representative and indicates to the service in charge of examinations the contact details allowing him to be reached.

The supervisors go before the start of the exams to the schooling service, which specifies their supervisory tasks and gives them all the documents necessary for maintaining of the exam.

Students have indeed the right to ask the supervisor to call on their course teachers for clarification whenever a crucial problem arises. By all means, the course teacher has the right to a single entry into the examination room and must clarify unclear points without, however, directing the student to the solution.

Supervisors will clearly be informed of the special examination conditions from which certain candidates benefit (1/3 additional composition time and / or any special provision in favor of students with disabilities).

Supervisors must be present at least 15 minutes before the outset of the exam and ensure that the material preparation of the examination room (places, copies, drafts ...) are properly organized and arranged in advance. They have full authority to determine the place of the students.

Add to this, supervisors verify obligatorily the identity of candidates. Only students who are concerned for the exams' call have the right to compose after their legal enrollment. With attention to, any candidate who cannot prove his identity will not be authorized to compose or deliver his copy.

Before the outset of the exam, the supervisors remind the candidates of the conditions under which they must compose.

Any candidate has sat to compose an exam must necessarily return a copy, even a blank one.

2-7 Exam report :

For eachexam , an examination report is drawn up including the date, nature and times of the exam , the name and signature of the supervisors.

At the end of the exam, the candidate hands on his copy to the supervisor by signing on the attendance list. By the same token, the responsible supervisor completes the examination report specifying:

- The number of students who attended the exam and notified as present, the number of absent ones, the identity of those present not appearing on the call list and authorized to dial subject to effective registration for the exam.
- The number of copies which were submitted.
- The observations or incidents observed during the test.

The responsible supervisor takes into charge for retrieving the copies, the attendance list, the exam report and their submission to the pedagogical secretariat concerned.

3- EXAM FRAUD

Any fraudster will be subject to the provisions of the already setregulations. And then, the finding of fraud can be made during or outside the exams. As a preventive measure, active and continuous surveillance constitutes an effective means of deterrence.

Any fraud committed during an examination may lead to a disciplinary sanction for the culprit, which may go as far as a definitive ban on taking any registration and undergoing any examination leading to a diploma or title issued by IPSAS.

In the event of fraud or attempted fraud, the responsiblesupervisor for the examination room must:

- Take all necessary measures to put an end to the fraud without interrupting the student's participation in the test (except in special cases: in the presence of substitution of person or disturbances affecting the course of the test, expulsion from the examination room may be spoken by the responsible supervisor)
- Seize immediately the document (s) or material used to subsequently establish the reality of the facts.
- Draw up a report about the fraud's type or way (precise and detailed report).
- Report the fraud to the attention of the Examinations Coordinator, the Secretary General and the Director of the Institution who may submit it to the disciplinary section of the Institution's Disciplinary Board.

In the most frequent cases where the candidate is not excluded from the examination room, the jury will deliberate on his grades and results under the same conditions as for any other ordinary candidate. Equally important, no certificate of achievement or transcript may be handed to him before the scientific Council delivers its sanction and punishment.

The disciplinary decision may touch the annul disputed test, the subject, the teaching unit, the semester or even the academic year if the trickery is of great significance.

Note: Any blatant distinguishing marks appearing on the student's copy will be considered an attempt at fraud and will be reported to the exams department.

4- CORRECTIONS, DELIBERATIONS AND COMMUNICATION OF RESULTS

4-1 The correction:

For the purpose to guarantee equity between the students a sufficient correction period which does not exceed 10 days is left to the correctors, taking into account the type of examination and the number of copies to be corrected.

Copies are corrected markedly under the authority of the teacher responsible for the teaching of the unit being examined. Specifically, in case of multiple correctors, the person in charge ensures the unity of the correction and the compliance of the marks while respecting the

principle of egalitarianism between the students. Again, the issue of correction respects compulsorily the anonymity of the copies.

The deadlines and modalities for the transmission of marks are fixed in advance by each department.

The General secretary of IPSAS is charged of transmitting the information about: online platform of marks, deadlines, regulations and dates of deliberations for each department where attendance is obligatory for all the tutors concerned by each department by forwarding an informative e-mail for all the responsible teachers who would ultimately respond to his instructions and commands promptly.

4-2 The Jury's Deliberation:

The jury is made up of teachers concerned by the teaching units evaluated. It includes the teachers of the Teaching Units and the qualified personalities who have contributed to the teachings. The composition of the juries as well as the name of the President of the jury are displayed before the start of deliberations. Participation in juries constitutes for the teaching staff an educational act included in the service. Therefore, attendance at deliberations is an obligation for lecturers.The jury deliberates sovereignly on the basis of all the results obtained by the student, in compliance with the procedures for checking knowledge.

It is highlyrecommended that students bring to the attention of the exam coordinator and / or director of the establishment, within 48 hours of the end of the exams, any information or event likely to have had an impact on the progress of their studies or exams results.

The juries remain sovereign in their decisions.

The various elements (copies, reports, briefs, etc.) used for the ratings must be made available to the jury during the deliberation as well as the attendance lists.

The jury ensures that the anonymity of copies is quietly respected and that anonymity is lifted and that the entry of marks and the validation of teaching units are checked.

The President of the jury ensures the regularity of the deliberation (presence of half of the members). At the end of the deliberation, the present members of the jury sign the minute the document where results are already displayed.

4-3 Communication of results:

At the end of the jury's deliberation, no further modification can be made to the meeting minutes except in the event of a material error in the postponement or calculation duly noted by the Chairman of the jury. In this case, the latter must immediately inform the other members of the jury. The marks and the “admitted” or “adjourned” results are communicated to the students by posting and the application of IPSAS intended to communicate with students.

4-4 Consultation of copies or works:

Students have the right, on their request and within 3 days of the results being displayed, to the communication of their copies and / or to an interview with the teacher (or teachers) responsible for teaching.

The teachers responsible for the examinations must organize a consultation session for the copies which will be clearly indicated by posting.

4-5 Issuance of certificates and diplomas:

The issuance of transcripts, certificates of achievement and diplomas can only be made to the concernedstudent, on presentation of an official identity document (national identity card, passport) or to a representative provided with a power of attorney given for this purpose, his own official identity document, and a photocopy of both sides of an identity document of the student giving the power of attorney.

The diploma is issued after deliberation by the jury.

5- General notes:

5-1 For lecturers :

The convening of teachers for exam supervision sessions includes the following instructions:

"In the event of a planned absence, you are requested to notify the Head of the Education Department in good time and inform him of the name of the colleague who will substitute you.

On the one hand, in order to optimize the course of exams:

• An "exam papers office" has been set up to accommodate supervising teachers.

• You are kindly requested to report to the exams office 15 minutes before the scheduled time for the exam.

• The exam papers will be given to you on your arrival by one of the members of the Examinations Committee who will indicate to you the examination room where the surveillance will take place.

• Any incident occurring during the exams must be reported to the members of the Examinations Committee present and will appear in the examination report.

On the other hand, the following instructions are worth remembering and must be scrupulously applied:

Before the start of the event:

• In the event of the absence of one or more students at the time scheduled for the exam, respect the regulatory 10 minutes granted to latecomers before opening the envelopes containing the exam papers.

• No student is allowed to enter the examination room after opening the envelopes containing the examinations, without being authorized by the examination committee.

• Remind students before the outset of the test of the need to respect the place number assigned to them.

• Remind students before the outset of the test of the regulatory points, concerning penalties in the event of fraud.

5-2 For students:

The general examination regulations are made known to all students and are posted on the boards and in front of all examination rooms. It comprises 12 articles :

- Article 1: Students must comply with the provisions of these regulations as well as the measures and decisions taken by the teacher responsible for the examination room.
- Article 2: Each student must, upon entering the examination room, bring his student card and / or his national identity card and his individual summons.

- Article 3: The candidate must deposit at the entrance to the examination room all documents and objects such as handbags and suitcase and especially duly closed cell phones.
- Article 4: The candidate is not authorized to carry any document with him.
- Article 5: The candidate must equip himself with everything necessary to face the exam.
- Article 6: The candidate is required to sign the enrollment list at the beginning and at the end of the examination session. The second signature must take place after the examination copy has been handed over directly to the teacher in charge of the examination room.
- Article 7: No student will be admitted to the examination room after the start of the test if he is not authorized by the examination committee.
- Article 8: No student will be allowed to leave the examination room before the end of the first half hour of each session and during the last quarter of an hour of said session.
- Article 9: No student is allowed to temporarily leave the examination room for any reason. In the event of force majeure, he must be accompanied by an administrative officer, in this case the liaison officer placed in front of the examination rooms.
- Article 10: Any fraud or attempted fraud exposes its perpetrator (s) to regulatory sanctions, the following acts are considered as such: possession of an unauthorized document, discussion or exchange of objects with another student whatever either the pattern, the throwing of documents, scrap paper or other on the ground or elsewhere.
- Article 11: When a student commits fraud or attempted fraud or any breach of the discipline of exams, he may be excluded from the examination room by the teacher in charge.
- Article 12: The use of the mobile phone during the examination session is considered an act of fraud which results in the immediate exclusion of the candidate.
- Important: Students must take the tests in their examination room and at their assigned place. Otherwise, they will be considered absent and will be assigned a grade of zero.

6- Conditions for success and passage from one level to another:

6-1 For licenses and bachelor degree:

During the deliberation of the main session, is declared admitted, any student with an overall average of at least 10/20 and having validated a minimum of 45 credits.

Any student who has not met these two conditions is declared adjourned. The adjourned student has the right to take the tests of all modules in which he or she has not obtained the general average of the subject.

6-2 For preparatory cycles:

During the deliberation of the main session, is declared admitted, any student with an overall average of at least 10/20.

Students who have been postponed will retake the exams for the subjects they have not passed.

The bar is set at a minimum average of 09/20.

6-3 For engineering cycles programs:

Examination regulation for engineering programs is summarized on the table below:

Main Session	**OverallAverage**	**Average of the groups of modules**
Passed	≥ 10/20	≥ 08/20
Control Session .Situation (1)	≥ 10/20	1G.M. or more have an average of less than 08/20. In this situation, the student can only take the exams of the non-validated subjects of this (these) group(s) of modules.
Control session .Situation (2)	≤ 10/20	The student can sit for the exams of all non-validated subjects.
Control session		
Admitted	≥ 10/20	≥ 08/20
Redemption (1)	9.5≥Average <10	≥ 08/20
Redemption (2)	≥ 10/20	A single group of modules averaging between 7.5 and 7.99
Admittedwithcredit	≥ 10/20	Only one group of modules averaging between 7 and 7.49

6-4 Redundancy and Granted Credits:

Any repeating student, whether he or she is an IPSAS student or from another institution, retains his or her validated credits. In other words, he retains the grades for subjects with an average of 10/20 or higher. They must attend classes in non-validated subjects and pass all tests (Continuous Assessment and Examination)

6-5 Average calculation:

PrivatePolytechnic Institute of Advanced Sciences of Sfax (IPSAS)

Direction of Studies on 02/09/2020

Calculation of Averages, for the Engineering Specialties :

- **Main Session**

  oSubject Mixed system (Continuousassessment (DCC)+Examination (E) : Average = ((0.5 x DCC)+(1 x E)) / 1.5

  oSubject Mixed system (Continuousassessment +Practicalwork(PW) +Examination (E) : Average = ((0.5xDCC)+(0.5xPW)+(1xE)) / 2

  o Workshop or Mini Project (PW, practicalwork) : Average = score of PW

- **Control Session**

  oSubject Mixed regime (DCC+E) : Average = ((0.5xDS)+ (1 x Superior score(E of main or control session)) / 1.5

  o Subject Mixed regime (DCC+PW+E) : Average = ((0.5xDCC)+(0.5xTP)+ (1 x Superior score(E of main or control session)) /2

  o Workshop or Mini Project (TP) : Average = Score PW

Calculation of Averages, Preparatory Cycle :

- **Main Session**

  oSubject Mixed system (Continuousassessment +E) :Average = ((0.5 x DCC)+(1 x E)) /1.5

  oSubject Mixed system (Continuousassessment +Practicalwork +Examination) :Average = ((0.5xDCC)+ (0.5xTP)+ (1xExamen)) /2

- **Control Session**

  oSubject Mixed regime (DCC+Exam) :Average = ((0.5xDS)+ (1 x superior score (E of main or control session)) /1.5

  oSubject Mixed regime (DCC+TP+Exam) : Average= ((0.5xDCC) +(0.5xTP) +(1x superior score (E of main or control session)) /2

Overall average: OV

OV= ∑ ((Each module average x correspondent module coefficient)) / (∑ Coefficients)

11. The student`s chart

CHARTER

of the IPSAS students

Article 1: Purpose

The CHARTER presents the internal regulations for the students of IPSAS. It determines the fundamental rules that are strictly obligatory to be respected by each student during his/her administrative membership of this university institution. It presents a personal contract of the student with the IPSAS Administration, which aims at the good progress of the education and mutual respect between all

Article 2: Commitment of the student:

I, the undersigned, ... …….

CIN (Passport) ..... Tel: .....

E-mail : .....

Student in the following course: ..... A.U.: .....

(to be specified)

I undertake and confirm by signing this CHARTER that :

2.1. I accept and will comply fully and correctly with all the rules described in this CHARTER during the period of my administrative membership of the ULS (IPSAS),

2.2 In case of non-compliance or violation of my commitments described in this CHARTER I will suffer all the administrative, financial and legal consequences provided for.

Article 3: Registration of students:

Training at IPSAS is not free of charge and enrolment is compulsory within the stipulated deadlines. The tuition fees are fixed by the Administration and are payable in instalments as follows: the first instalment is required at registration, the second instalment must be paid before the end of December and the third instalment is to be paid at the latest before the end of April during the academic year.

Article 4: Organisation of teaching

4.1 Teaching

Teaching at IPSAS is carried out according to the study plans approved by the Tunisian Ministry of Higher Education and specific for each speciality. The organisation of the curricula and the annual calendar are ensured by the IPSAS Administration. An academic year is divided into two semesters, each of which lasts 15 weeks of teaching plus one week reserved for examinations.

Students are required to attend all courses (lectures, practical work, seminars and company visits). It is controlled by the teachers and the Administration. When absences in a unit or element exceed 20% of the module's hourly volume, the student concerned is not allowed to attend the main examination session.

Attendance at all examinations (tests, assignments, examinations, viva voce, etc.) is compulsory. Any absence from a test will result in a zero mark.

It should be noted that medical certificates do not necessarily constitute a justification for absences.

Students are obliged to keep themselves informed through the IPSAS websites (www.uls-ens.net or www.ipsas-ens.net) about all announcements concerning the organisation of studies, timetables, assignments and exams, internships and cultural and social life. For students in their final year of study, the course includes the preparation of a professional final year project.

Article 5: Internships

During their university education at IPSAS, each student must complete two internships:

a) An internship in the 1st year (working internship) lasting one month, the host structure of which may be a company, an association or .....

b) An internship in the 2nd year (technician internship) lasting one month, which must be carried out in a company.

At the end of each internship, the student must present an internship diary and a report which are evaluated by a jury. The host organisation gives an assessment of the trainee at the end of the placement.

If a traineeship is declared inconclusive by the jury, a replacement traineeship must be carried out and evaluated under the same conditions.

Article 6: Final projects

Upon successful completion of the final year exams, each student must prepare a 5-month Final Year Project (FWP).

The PFE is defended before a Jury appointed by IPSAS.

Students are allowed to defend the FDP in the following cases:

* all validated GM,
* all internships validated,
* compliance with all conditions required by the IPSAS Administration (payment of tuition fees, etc.)
* submission of the necessary documents (dissertation, technical file, postcard, CD, written authorisation for the defence, ...) within the deadlines set by the IPSAS Administration.

Note: All documents presented by students for the PFE defence must be checked and signed by the academic supervisor.

Article 7: Students' rights :

The student registered at IPSAS and signatory of this CHARTER has the right to :

a) All information from the IPSAS Administration that concerns him/her,
b) Access to classrooms and practical training rooms according to the posted timetable,
c) Access to rooms authorised for preparation during revision periods.
d) Pedagogical consultations with the teachers,
e) For any problem concerning courses or practical work, the student must contact the Coordinator of the speciality,
f) Participation in IPSAS clubs according to the rules of the desired club,
g) Participation in the sports and cultural life of IPSAS students,
h) Participation in applied industrial research teams within IPSAS for the development of industrial projects
i) Participation in the different training courses and/or events provided for in the Conventions between IPSAS and its national and international partners.

Article 8: Obligations of the student :

The student, registered at IPSAS, undertakes to respect the following rules:

a) Attendance during the course and practical sessions:

Late arrivals at the beginning of the sessions are to be avoided. In case of repeated lateness, the IPSAS Disciplinary In case of repeated lateness, the IPSAS Disciplinary Board will take action. Absences are counted and are taken into account for the continuous assessment grade,

b) Telephone calls and cigarette breaks are strictly forbidden during class sessions and exams.

c) Entrance and exit from the rooms are signalled by a bell that must be respected.

d)The duration of breaks must be respected and teachers will be asked not to accept latecomers,

e) The student is obliged to have for each session of class, practical work, homework or exam

f) The student is obliged to have the material required by the teacher (course notes, calculators, etc.). In case of non-compliance with these obligations the teacher has the right to take appropriate measures.

g) The use of unauthorised equipment and documents by students during tests is the use of unauthorised equipment and documents by students during tests is forbidden,

h) The student's participation in the course, his/her attendance, the execution of personal work required by the teacher, arerequired by the teacher are taken into account in the marking of the continuous assessment.

i) Attempts to cheat in any test will be severely punished.

Article 9: Appearance before the Disciplinary Board:

The IPSAS Disciplinary Board is chaired by the Director of the institution. A student is summoned to appear before the IPSAS Disciplinary Board in the following cases

a) Having been the subject of a report of disrespect towards a teacher or an agent of the Administration,

b) After an attempt to cheat during the tests (exam, homework or continuous assessment). This situation leads to the exclusion of the student from the examination room. A mark of zero is automatically awarded and the student's file is submitted to the Disciplinary Board. The student is called to appear before the Discipline Council in writing and must be informed of the facts of which he or she is accused. The student has the right to defend himself.

The Discipline Council deliberates on one of the following sanctions:

- Warning,

- Ban on taking examinations for one or two sessions,
- Exclusion from the institution for a maximum period of one academic year,
- Permanent exclusion from the institution.

Note: In the last two cases, the student is not entitled to a refund of tuition fees.

Article 10: Validity of the Charter

10.1. This CHARTER is valid after its signature by the Director of IPSAS and the student, until the student's final departure.

10.2. The CHARTER is made in two signed copies: one for the IPSAS Administration one for the IPSAS Administration and one for the student.

Done in Sfax, on .....

Student: Director of IPSAS:

....