الجمهورية الجزائرية الديمقراطية الشعبية
République Algérienne Démocratique et Populaire
وزارة التعليم العالي والبحث العلمي
Ministère de l'Enseignement Supérieur et de la Recherche Scientifique

اللجنة البيداغوجية الوطنية لميدان العلوم و التكنولوجيا

Comité Pédagogique National du Domaine Sciences et Technologies

TRAINING OFFER
L.M.D
TRAINING OFFER

PROFESSIONAL MASTER'S DEGREE

This Master's programme has been developed within the framework of the draft agreement between USTHB and SPBTU.

2025 - 2026

Institution	Faculty / Institute	Department
USTHB	**Mechanical and Process Engineering**	**Mechanical Engineering and Manufacturing**

Domain	Field	Speciality
Sciences and Technology	**Mechanical Engineering**	**Quality control in Mechanical Engineering**

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عرض تكوين
ماسترمهني

2025 - 2026

المؤسسة	الكلية/ المعهد	القسم
جامعة هواري بومدين للعلوم و التكنولوجيا	الهندسة الميكانيكية و هندسة الطرائق	البناءات الميكانيكية و الإنتاج

الميدان	الفرع	التخصص
علوم و تكنولوجيا	الهندسة الميكانيكية	مراقبة الجودة في الهندسة الميكانيكية

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I - Master's degree details

1 - Location of the training

Faculty: Mechanical Engineering and Process Engineering
Department: Mechanical Construction and Production

2- External partners

Other partner establishments

This Master is part of an ongoing cooperation project (2023 to 2028) called:

Therefore the universities USTHB and SPBTU are members of the Partner Project of this Master.

European Partners

PETER THE GREAT ST.PETERSBURG POLYTECHNIC

UNIVERSITY, RUSSIA

Businesses and other socio-economic partners

1. NATIONAL COMPANY OF INDUSTRIAL VEHICLES, SNVI, ROUIBA, ALGERIA.
2. GROUPE GICA.
3. OASIS TESTING SERVICE.
4. SONATRACH (DC-R, C).
5. SEAL ALGER.

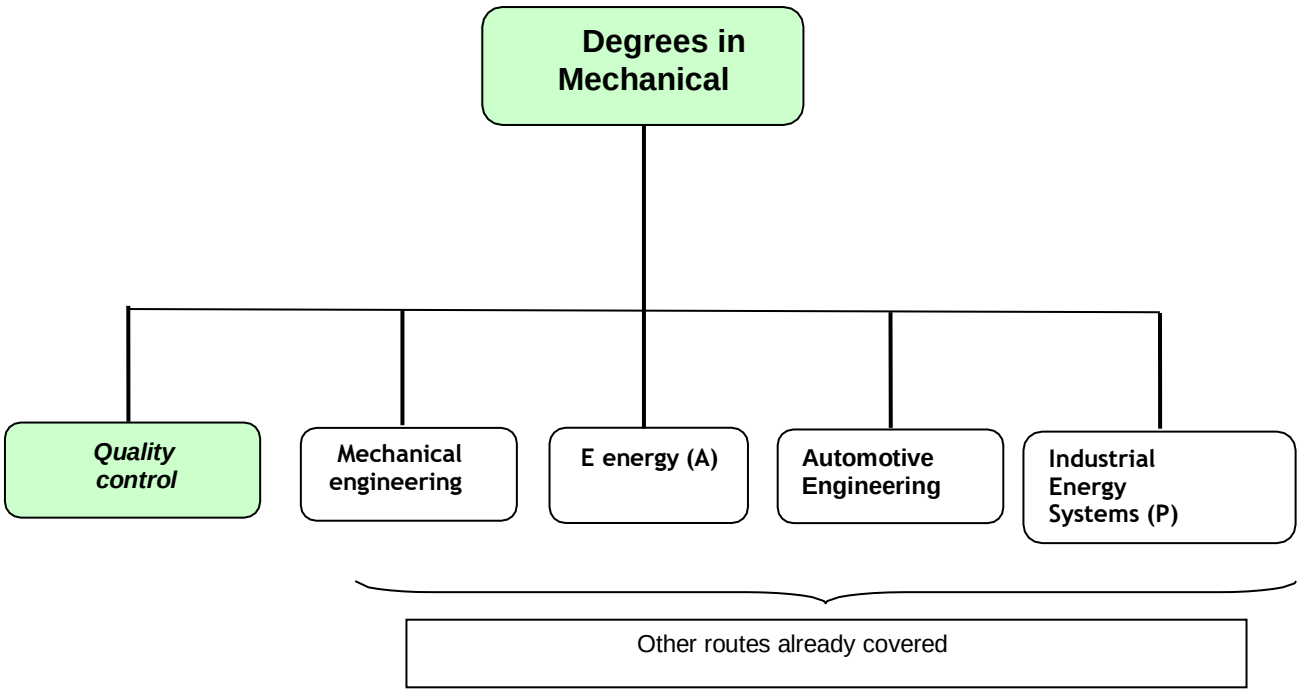
3 – Context and objectives of the course

A - General organisation of the programme: position of the project

If several Masters courses are offered or already offered by the establishment (same training team or other training teams), indicate in the following diagram the position of this project in relation to the other courses.

The Master's degree in quality control is housed in the Department of Mechanical Engineering, Faculty of Technology Sciences. The Department of Mechanical Engineering already has 3 academic bachelor's degrees and 2 professional bachelor's degrees to its credit, as well as 3 academic master's degrees and 2 professional master's degrees.

As part of its educational development policy, the quality control course is international in scope and meets a crucial and urgent need for skills in the industrial sector. Compared with the other courses currently being offered by the Mechanical Engineering Department, this Master's degree is designed to complement the various courses on offer, as shown below:



B – Admission requirements (indicate the typical degree courses that may give access to the proposed Master's course)

In view of its international dimension, the typical degree courses that may give access to the 'quality control' Master's course must be in fields related to design, construction, mechanical manufacturing and production engineering, industrial maintenance, metallurgy and materials engineering.

Admission requirements

(Indicate the bachelor's degree specialities that may give access to the Master's programme)

Field	Master	Degrees leading to a master's degree	Classification according to licence compatibility	Coefficient allocated to the licence
		Mechanical engineering	**1**	**1.00**
		Mechanical and production engineering	**1**	**1.00**
		Metallurgy	**2**	**0.80**
		Industrial Maintenance	**2**	**0.80**
		Materials engineering	**3**	**0.70**
		Electromechanics	**4**	**0.65**
		Other licences in the ST field	**5**	**0.60**

C - Objectives of the Master's Program in Quality Control

The Master's program in Quality Control aims to achieve the following objectives:

1. Comprehensive Understanding of Quality Principles: Equip students with a thorough understanding of quality management principles, methodologies, and standards applicable across various industries.

2. Development of Analytical Skills: Foster the ability to analyze and interpret data related to quality control processes, enabling students to make informed decisions based on statistical analysis.

3. Practical Application of Quality Tools: Provide hands-on experience with quality control tools and techniques, such as Six Sigma, Total Quality Management (TQM), and ISO standards, to enhance practical skills.

4. Risk Management Proficiency: Develop competencies in identifying, assessing, and mitigating risks associated with quality assurance and control processes.

5. Leadership and Teamwork: Cultivate leadership skills and the ability to work effectively in teams, preparing students to lead quality improvement initiatives within organizations.

6. Continuous Improvement Mindset: Instill a culture of continuous improvement, encouraging students to seek innovative solutions and enhancements in quality management practices.

7. Ethical and Professional Standards: Promote adherence to ethical standards and professional practices in quality control, ensuring that graduates are responsible and accountable in their roles.

8. Research and Development Skills: Encourage research capabilities that enable students to contribute to the advancement of knowledge in the field of quality control.

By achieving these objectives, the program prepares graduates to excel in various roles within quality management and to contribute significantly to their organizations' success.

D – Profiles and targeted skills

Quality control specialist Level 3: expert

E – Regional and national employability potential:

Regional oil and gas industries, The mechanical engineering industry
Sonatrach and Sonalegaz

F - Expected training performance indicators:

.

1. Evaluation of the training course

- Prior to the training

The number of applications for enrolment in the speciality

- During the course

Evaluation by students

- After the course

Employability: number of graduates and graduates recruited

Master's course offer sheet

Master Title: Quality control: USTHB

Overview:

The Master's program in Quality Control is designed to equip students with the knowledge and skills necessary to ensure the highest standards of quality in products and services across various industries. This program combines theoretical foundations with practical applications, preparing graduates to excel in quality management roles.

Program Objectives:

- To provide a comprehensive understanding of quality control principles and methodologies.

- To develop analytical and problem-solving skills essential for quality assurance.

- To familiarize students with industry standards and regulatory requirements.

- To enhance leadership and communication skills for effective team collaboration.

Curriculum Highlights:

- Quality Management Systems: Study of ISO standards, Six Sigma, and Total Quality Management (TQM).

- Statistical Quality Control: Application of statistical methods to monitor and improve processes.

- Quality Auditing: Techniques for conducting internal and external quality audits.

- Risk Management: Identifying and mitigating risks in quality processes.

- Continuous Improvement: Strategies for fostering a culture of continuous improvement within organizations.

Career Opportunities:

Graduates of the Master's program in Quality Control can pursue various career paths, including:

- Quality Control Manager

- Quality Assurance Specialist

- Compliance Officer

- Process Improvement Consultant
- Regulatory Affairs Manager

Employability: Potentially recruiting sectors: This Master opens the doors to different industrial fields: Mechanical Manufacturing, Automotive Industry, Hydrocarbons, etc…

Outlets:

1. Production
   1.1. Production sector manager
   1.2. Manufacturing and/or packaging manager
   1.3. Production Director
   1.4. Industrial purchasing manager
   1.5. Planning/scheduling manager
   1.6. Methods manager
   1.7. Industrial Director/Operations Director
2. Quality
   2.1. Quality assurance manager
   2.2. Quality auditor
   2.3. Validation-qualification manager
   2.4. Quality Director
   2.5. Purchasing manager
   2.6. Industrial buyer
3. Marketing-dissemination
   3.1. Sales administration professions
   3.2. Director of Operations
   3.3. Marketing Director
   3.4. Product Manager
4. Development
   4.2. Industrial development manager
5. Research
   5.1. Research development project manager

D : Overall summary of human resources mobilised for the speciality:

Grade	Internal workforce	External workforce	Total
Professors	**9**	**3**	**12**
Senior Lecturers (A)	**2**	**1**	**3**
Senior Lecturer (B)	**1**	**-**	**1**
Assistant Professor (A)	**-**	**-**	**-**
Assistant Professor (B)	**-**	**-**	**-**
Other (*)	**-**		
Total	**12**	**4**	**16**

(*)Technical and support staff

5- Moyens humains disponibles A : Capacité d'encadrement (exprimé en nombre d'étudiants qu'il est possible de prendre en charge) : (20 étudiants) B : Equipe d'encadrement de la formation

B-1 : Encadrement interne

Nom et Prénom	Diplôme	Grade	Dpt	Type d'intervention	Emargement
HAMOUDA KHALED	DOCORAT	Pr	CMP	Enseignement-Encadrement	
CHIKH SALAH	DOCORAT D'état	Pr	TE	Enseignement-Encadrement	
DJEMA MOHAMED A.	DOCORAT	Pr	CMP	Enseignement-Encadrement	
KAOUA SIDALI	DOCORAT	Pr	CMP	Enseignement-Encadrement	
DJERDJARE BOUBAKEUR	DOCORAT D'état	Pr	SDM	Enseignement-Encadrement	
ABDI SAID	DOCORAT D'état	Pr	SDM	Enseignement-Encadrement	
MESBAH AMAR	DOCORAT D'état	Pr	CMP	Enseignement-Encadrement	
BENTEBBICHE HALIM	DOCORAT D'état	Pr	TE	Enseignement-Encadrement	
BOUZOUANE BELAID	DOCORAT	Dr.	CMP	Enseignement-Encadrement	
BOUTI SAMIR	DOCORAT	Dr.	CMP	Enseignement-Encadrement	
CHERIFI ABDELKRIM	DOCORAT	Dr	CMP	Enseignement-Encadrement	
MIROUD DJAMEL	DOCORAT	Pr	SDM	Enseignement-Encadrement	
TATA MALIK	DOCORAT	Pr	SDM	Enseignement-Encadrement	
KENANE MOHAMED	DOCORAT D'état	Dr.	SDM	Enseignement-Encadrement	

Etablissement : **USTHB**
Année universitaire 2024/2025

Intitulé du master : Contrôle Qualité

5 - Equipment specific to the speciality

A- Teaching laboratories and equipment : List of existing teaching equipment for practical work in the proposed course (1 list per laboratory)

Laboratory name: Departmental teaching laboratories Student capacity: 15

N°	Equipment title	Equipment title	Equipment title
01	Universal lathes	Universal lathes	Universal lathes
02	Numerically controlled lathes	Numerically controlled lathes	Numerically controlled lathes
03	Universal milling machines	Universal milling machines	Universal milling machines
04	Numerically controlled milling machines	Numerically controlled milling machines	Numerically controlled milling machines
05	Drilling machine	Drilling machine	Drilling machine
06	Power saws	Power saws	Power saws
07	Workshop	Workshop	Workshop
08	Machine Mac Machine Mach Machine hine ine	**01**	Diamètre maximal des éprouvettes 12 mm
09	welding machine	welding machine	welding machine
10	Universal traction machine	Universal traction machine	Universal traction machine
11	Servohydraulic fatigue machine	Servohydraulic fatigue machine	Servohydraulic fatigue machine

Laboratory title LSGM FGM-GP USTHB
Student capacity: 20

N°	Equipment title	Number	Observations
01	**CAD/CAM room**	**20 postes**	
02	**3D printer**	**03**	
03	**Sample preparation laboratory**	**01**	
04	**Optical microscope equipped with a Camera**	**01**	

B- Work placements and in-company training: (see agreements/conventions)

Place of course	Number of students	Duration of course
SNVI	04	2 x 15 days on average

C- Documentation available at the institution specific to the proposed course (compulsory field)

- Works related to the proposed course and available in the two libraries: USTHB central library and library of the Mechanical Engineering and Production Engineering department.

The central library offers :

- A wide range of up-to-date documents

- Electronic databases available for consultation at the university: Proquest, Science Direct, Springer, Elsevier and Techniques de l'Ingénieur.

- HandBooks available in electronic format

- Internet

- Canvas platform of l6 institutes of the polytechnic university of pierre le grand in saint Petersburg, Russia

- Personal documents of the teachers involved in the course.

D- Personal work areas and ICT available at department and faculty level

- Central library of the Mechanical and Production Engineering Department

- Internet space

- Master's room

II - Semester organisation sheets for the speciality courses

Program Overview

The Master in Quality Control is a specialized program aimed at providing students with a deep understanding of quality management principles and practices. This program is designed for individuals seeking to advance their careers in quality assurance and control across various sectors, including manufacturing, healthcare, and service industries.

Key Learning Outcomes

Upon completion of the program, students will be able to:
- Understand and apply quality management systems and standards, such as ISO 9001 and Six Sigma.
- Utilize statistical methods for quality control and process improvement.
- Conduct effective quality audits and assessments.
- Implement risk management strategies to enhance product and service quality.
- Foster a culture of continuous improvement within organizations.

Curriculum Structure

The curriculum is structured to include both theoretical knowledge and practical applications. Key courses may include:
- Introduction to Quality Management
- Statistical Quality Control
- Quality Assurance Techniques
- Quality Auditing and Compliance
- Risk Management in Quality Control
- Continuous Improvement Strategies
- Project Management in Quality Control

Practical Experience:

Students will engage in hands-on projects, case studies, and internships to apply their learning in real-world settings. This practical experience is crucial for developing the skills needed to address quality challenges in various industries.

Career Prospects:

Graduates of the Master in Quality Control will be well-prepared for roles such as:
- Quality Control Manager
- Quality Assurance Analyst
- Compliance Officer
- Process Improvement Specialist
- Quality Consultant

The courses are organized into 17 Units of Study (UE), distributed across the semesters and composed of several modules. Semesters 3 and 4 will be taught in Saint Petersburg, Russia, and will culminate in a double defense. Each module is characterized by a title, a schedule divided into Lectures (CM), Directed Studies (TD), and Practical Work (TP), as well as objectives outlining the targeted competencies and content that specifies the topics covered.

5- Overall summary of the training

(indicate the separate global VH in progress, TD, for the 04 semesters of teaching, for the different types of EU)

UE VH	UEF	UEM	UET	Total
Lessons	337,5	0	90	427.5
TD	232.5	0	0	232.5
TP	112.5	195	0	307.5
Personal work	517.5	232.5	90	840
Other (please specify)				
Total	1200	427,5	180	1807.5
Credits	59	23	8	**90 ***
% in credits for each EU	65,56%	25.56%	8.88%	100%

* The total credit is calculated based on 30 credits per semester. The % in credits are determined for the first 3 semesters. The 4th semester being an end-of-studies semester including an internship in a company and personal work. In total the number of credits with semester 4 is equal to 90+30, i.e. 120 credits.

III - Teaching unit organisation sheet

Summary table of modules and units by semester

Semester 1 Master Title: Quality control in Mechanical Engineering **University: USTHB**

Teaching unit	Subjects Title	Credits	Coefficient	Hourly volume weekly Course	 TD	 TP	Semester Hours (15 weeks)	Assessment method Continuous assessment	 Exam
Foundation course **Code : UEF 1.2** **Credits : 12** **Coefficients : 6**	Introduction to Quality Management	6	3	1h30	1h30	1h30	67h30	40%	60%
	Statistical Process Control (SPC)	6	3	1h30	1h30	1h30	67h30	40%	60%
UE Methodology **Code : UEM 1.2** **Credits : 10** **Coefficients : 6**	Modern technologies for manufacturing parts on CNC machines	6	3	1h30	1h30	1h30	67h30	40%	60%
	Quality Assurance and Compliance	4	3	1h30	1h30	1h30	67h30	20% **TP**+20% **CC**	60%
UE Discovery **Code: UED 1.1** **Credits: 4** **Coefficients : 2**	Quality Improvement Methodologies	4	2	1h30	1h30		45h00	40%	60%
Transversal UE **Code: UET 1.3** **Credits: 3** **Coefficients: 3**	Measurement and Instrumentation	1	1	1h30			22h30		100%
	Digital Technologies in Quality Control	2	1	1h30			22h30		100%
	English/Russian in Professional Communication 1	1	1	1h30			22h30		100%
Total semester 1		**30**	**17**	**12h00**	**7h30**	**6h00**	**382h30**		

Semester 2 Master Title: Quality control in Mechanical Engineering **University: USTHB**

Teaching unit	Subjects	Credits	Coefficient	Hourly volume weekly			Semester Hours (15 weeks)	Assessment method	
	Title			Course	TD	TP		Continuous assessment	Exam
UE Fundamental Code : UEF 2.3 Credits : 18 Coefficients : 9	Root Cause Analysis and Problem Solving	6	3	1h30	1h30	1h30	67h30	20% **TP**+20% **CC**	60%
	Quality in Product Design and Development	6	3	1h30	1h30	1h30	67h30	40%	60%
	Technology in Quality Control	6	3	1h30	1h30	1h30	67h30	20% **TP**+20% **CC**	60%
UE Methodology Code : UEM 2.2 Credits : 8 Coefficients :5	Organization and planning of experiments	4	3	1h30	1h30	1h30	67h30	20% **TP**+20% **CC**	60%
	Supply Chain Quality Management	4	2	1h30		1h30	45h00	40%	60%
UE Discovery Code: UED 2.3 Credits: 4 Coefficients : 3	Artificial Intelligence in Quality Control	2	1	1h30			22h30		100%
	Quality Leadership and Culture	1	1	1h30			22h30		100%
	English/Russian in Professional Communication 2	1	1	1h30			22h30		100%
Total semester 2		**30**	**17**	**12h**	**6h00**	**7h30**	**382h30**		

Teaching unit	Subjects	Credits	Coefficien t	Hourly volume weekly			Semester Hours (15 weeks)	Assessment method	
	Title			Course	TD	TP		Continuous assessment	Exam
UE Fundamental Code : UEF 3.3 Credits : 16 Coefficients : 9	International standards and certifications.	6	3	1h30	1h30	1h30	67h30	20% **TP**+20% **CC**	60%
	Introduction to Automatic control system.	4	2	1h30		1h30	45h	40%	60%
	Management tools and methods and quality control	6	3	1h30	1h30	1h30	67h30	20% **TP**+20% **CC**	60%
UE Methodology Code : UEM 3.4 Credits :12 Coefficients : 7	Scientific research in mechanical engineering technology	4	2	1h30	1h30		45h00	40%	60%
	Digital resources in scientific research	4	2	1h30		1h30	45h00	40%	60%
	Audit and certification in quality management.	2	2	1h30		1h30	45h00	40%	60%
	Organization and production planning	2	1	1h30			22h30		100%
UE Discovery Code: UED 3.2 Credits: 2 Coefficients : 2	Entrepreneurship	1	1	1h30			22h30		100%
	English/Russian in Professional Communication 3	1	1	1h30			22h30		100%
Total semester 2		**30**	**17**	**13h30**	**4h30**	**7h30**	**382h30**		

Teaching unit	Subjects		Credits	Coefficient	Hourly volume weekly			Hourly volume Per UF	Semester Hours (15 weeks)
	Title								
UE Fundamental Code : UEF 4.1 Credits : 30 Coefficients : 10	Final year project	Laboratory work	10	8					**382h30**
		Personal work	20	9					
Total semester 4			**30**	**17**				**25h00**	**382h30**

- **Evaluation of the Master's Final Project**
  - Scientific Value (Jury Assessment) **/6**
  - Thesis Writing (Jury Assessment) **/4**
  - Presentation and Response to Questions (Jury Assessment) **/4**
  - Supervisor's Assessment **/3**
  - Presentation of the Internship Report (Jury Assessment) **/3**

III - Teaching unit organisation sheets
(Draw up one sheet for each TU)

Semester: 1
Teaching unit: UEF 1.1
Subject 1: Introduction to Quality Management
VHS: 67h30 (C: 1h30 TD: 1 h30 TP: 1 h30)
Credits: 6
Coefficient: 3

Module Overview

This module introduces students to the principles and practices of quality management. It covers the foundational concepts of quality, the evolution of quality management systems, and the critical role of quality in achieving business excellence. Students will learn about key quality management philosophies and methodologies, providing them with the essential knowledge for more advanced topics in quality control.

Learning Objectives

- Understand the definition of quality and its importance in business and industry.
- Identify the evolution of quality management systems and key contributors.
- Understand the core principles of quality management.
- Explain different quality management frameworks and standards.
- Recognize the role of continuous improvement in quality management.

Module Content

1. **Introduction to Quality**
   - Definition of quality
   - The importance of quality in business and industry
   - The relationship between quality, customer satisfaction, and business success
   - Quality costs: Prevention, Appraisal, Internal failure, External failure
2. **History and Evolution of Quality Management**
   - Early concepts of quality: Craftsmanship vs. mass production
   - Major figures in quality management: W. Edwards Deming, Joseph Juran, Philip Crosby
   - Evolution of quality management practices: From Inspection to Total Quality Management (TQM)
3. **Quality Management Principles**
   - The 8 principles of quality management:
     1. Customer focus
     2. Leadership
     3. Engagement of people
     4. Process approach
     5. Improvement
     6. Evidence-based decision making

7. Relationship management
   - The relationship between these principles and effective quality management
4. **Quality Management Systems (QMS)**
   - Definition and purpose of a QMS
   - Introduction to ISO 9001 and other quality standards
   - The Plan-Do-Check-Act (PDCA) Cycle
   - Key elements of a QMS: Documentation, Management review, Internal audits, and Corrective actions
5. **Quality Frameworks and Methodologies**
   - Total Quality Management (TQM)
   - Six Sigma: Introduction to DMAIC (Define, Measure, Analyze, Improve, Control)
   - Lean Management: Overview of Lean principles
   - Continuous improvement methodologies: Kaizen, PDCA
6. **Quality in Different Sectors**
   - The role of quality management in manufacturing, service, healthcare, and IT sectors
   - Examples of quality management applications in various industries
7. **The Role of a Quality Manager**
   - Responsibilities and skills required for quality management professionals
   - The role of leadership in promoting a quality culture within an organization
   - Importance of teamwork and communication in quality management

Assessment and Evaluation

- **Lecture-based quizzes:** To test understanding of key concepts.
- **Case studies:** Analysis of real-world examples of quality management implementation.
- **Group discussions and presentations:** Exploring quality management challenges and solutions.

Recommended Readings

- "Quality Management for Organizational Excellence" by David L. Goetsch and Stanley Davis
- "Total Quality Management" by Dale H. Besterfield

TP :Study: Analysis of real cases where companies have implemented international standards, such as ISO 9001 for quality management or ISO 14001 for environmental management.Simulations: Participation in simulations where students must develop a certification plan for a fictional company, taking into account the requirements of the relevant standards.

Practical Workshops: Sessions where students learn to write the necessary documents for certification, such as quality manuals or operational procedures.
Company Visits: If possible, visits to certified companies to observe how they apply the standards and manage the certification processes.
Presentations: Preparation and presentation of projects on specific standards, explaining their importance and impact on businesses at the international level.

Semester: 1
Teaching unit: UEF 1.2
Subject 2: Statistical Process Control (SPC)
VHS: 67h30 (C: 1h30 TD: 1 h30 TP: 1 h30)
Credits: 6
Coefficient: 3

Module Overview

This module introduces Statistical Process Control (SPC), a key quality management technique used to monitor, control, and improve process performance. Students will learn to apply statistical methods to evaluate process stability, detect variability, and identify areas for improvement. Emphasis will be placed on understanding control charts, process capability analysis, and the role of SPC in maintaining consistent quality levels.

Learning Objectives

By the end of this module, students should be able to:

- Understand the principles and concepts behind Statistical Process Control (SPC).
- Use control charts to monitor process stability.
- Analyze process data to detect variations and take corrective actions.
- Apply process capability analysis to assess how well a process meets specifications.
- Recognize the role of SPC in continuous improvement.

Module Content

1. **Introduction to Statistical Process Control**
    - Definition and importance of SPC in quality control
    - The role of variability in processes (common cause vs. special cause)
    - The relationship between SPC and process improvement
    - Benefits of SPC for reducing waste and improving consistency
2. **Basic Concepts of SPC**
    - Understanding variation: Common cause vs. special cause
    - Types of variation and their impact on quality
    - The concept of process stability and its significance in SPC
    - Introduction to data collection for SPC: Sampling methods and data types
3. **Control Charts**
    - What is a control chart and why is it used?
    - Types of control charts:
        - **X-bar and R charts** for continuous data
        - **p-chart** and **np-chart** for attribute data
        - **c-chart** and **u-chart** for defect data
    - How to construct and interpret control charts
    - Setting control limits and interpreting signals (out of control conditions)
    - Identifying patterns in control charts (e.g., runs, trends, shifts)

4. **Process Capability Analysis**
    - Definition and importance of process capability
    - Key indices for process capability:
5.
    -
        - **Cp, Cpk**: Understanding capability indices
        - **Pp, Ppk**: When to use these indices
    - How to calculate and interpret process capability
    - Process capability vs. process performance
    - The role of SPC in assessing whether a process can meet customer specifications
6. **Interpretation of Control Charts and Process Capability**
    - Case studies on interpreting control charts
    - Troubleshooting process issues based on control chart patterns
    - Calculating and evaluating process capability in real-world scenarios
    - Making decisions based on SPC analysis (e.g., adjusting processes, initiating corrective actions)
7. **SPC Software and Tools**
    - Introduction to software tools used for SPC (e.g., Minitab, JMP, Excel add-ons)
    - How to use SPC software for data collection, analysis, and visualization of control charts
    - Automation of SPC in modern manufacturing and service environments
8. **SPC in Continuous Improvement**
    - How SPC integrates with other quality management tools (e.g., Lean, Six Sigma)
    - Using SPC for root cause analysis and corrective actions
    - The role of SPC in sustaining improvements and ensuring long-term process control
9. **Real-World Applications of SPC**
    - Examples of SPC in various industries (manufacturing, healthcare, service, etc.)
    - Case studies of successful SPC implementations and the impact on quality improvement
    - Common challenges in implementing SPC and strategies for overcoming them

Assessment and Evaluation

- **Practical exercises:** Students will create and analyze control charts using sample data.
- **Case studies:** Real-world examples for interpreting control charts and making decisions.
- **Quizzes and tests:** To assess understanding of SPC concepts, control chart construction, and process capability analysis.
- **Group projects:** Collaborative work analyzing SPC in a hypothetical or real-life scenario, where students make recommendations for process improvements based on SPC data.

Recommended Readings

- "Introduction to Statistical Quality Control" by Douglas C. Montgomery
- "The Six Sigma Handbook" by Thomas Pyzdek and Paul A. Keller (for more on SPC in Six Sigma)
- "Statistical Process Control: A Practical Guide for Improved Quality" by John S. Oakland

This module would provide students with a solid foundation in SPC tools and techniques, helping them to apply statistical methods to improve processes effectively. Let me know if you'd like to add any specific areas or further refine the content!

TP:

"Introduction to Statistical Process Control: Concepts and Applications"

"Implementing SPC Techniques in Manufacturing: A Case Study"

"Analyzing Process Variability Using Control Charts"

"The Role of SPC in Quality Management Systems"

"Design of Experiments and SPC: A Synergistic Approach"

"Real-Time Monitoring and Control with SPC Tools"

"Statistical Process Control: Enhancing Operational Efficiency"

"Using SPC for Continuous Improvement in Production Processes"

"Understanding Control Limits: A Practical Guide to SPC"

"SPC Software Tools: A Comparative Analysis"

Semester: 1
Teaching unit: UEM 1.1
Subject 1 Modern Technologies for Manufacturing Parts on CNC Machines
VHS: 67 h30 (C: 1h30 TD: 1 h30 TP: 1 h30)
Crédits : 6
Coefficient: 3

Module Overview

Objectives of the Course: The primary objective of this course is to provide students with a comprehensive understanding of modern technologies utilized in the manufacturing of parts using Computer Numerical Control (CNC) machines. Students will learn about the principles of CNC machining, programming techniques, and the latest advancements in CNC technology. The course aims to develop practical skills in operating CNC machines, optimizing manufacturing processes, and ensuring quality control in production.

Recommended Prerequisites: Students are expected to have a foundational knowledge of manufacturing processes and basic engineering principles. Familiarity with computer-aided design (CAD) software and basic programming concepts is recommended. Prior coursework in mechanical engineering, manufacturing technology, or related fields will be beneficial for a deeper understanding of the course material.

Course Content:

1. Introduction to CNC Machining
   - Overview of CNC technology and its significance in modern manufacturing
   - Comparison of CNC machining with traditional machining methods
   - Types of CNC machines: milling, turning, and additive manufacturing
2. CNC Programming
   - Fundamentals of G-code and M-code programming
   - Introduction to CAD/CAM software for CNC programming
   - Techniques for writing and optimizing CNC programs
3. Tooling and Workholding
   - Selection of cutting tools and their characteristics
   - Workholding methods and fixtures for CNC machining
   - Tool path optimization for efficiency and precision
4. Advanced CNC Technologies
   - Introduction to multi-axis machining and its applications
   - Automation and robotics in CNC manufacturing
   - Emerging technologies: additive manufacturing and hybrid processes
5. Quality Control and Inspection
   - Techniques for ensuring quality in CNC machined parts
   - Measurement tools and methods for inspection
   - Statistical process control (SPC) in CNC manufacturing
6. Sustainability in CNC Manufacturing
   - Environmental considerations in CNC machining

- Strategies for reducing waste and energy consumption
- The role of CNC technology in sustainable manufacturing practices

Assessment Methods

Students will be evaluated through a combination of assessments, including:

- Practical assignments involving CNC programming and machining
- Written reports analyzing manufacturing processes and outcomes
- Quizzes and examinations to assess understanding of key concepts
- Participation in class discussions and group projects

Bibliographic References:

11. Groover, M. P. (2016). *Fundamentals of Modern Manufacturing: Materials, Processes, and Systems*. Wiley.
12. Tlusty, J., & Polacek, M. (2000). *Manufacturing Processes and Systems*. Prentice Hall.
13. Benard, J. (2018). *CNC Programming Handbook*. Industrial Press.
14. Koren, Y. (2010). *The International Journal of Advanced Manufacturing Technology*. Springer.
15. Shigley, J. E., & Mischke, C. R. (2011). *Mechanical Engineering Design*. McGraw-Hill.

This detailed program aims to equip students with the necessary knowledge and skills to excel in the field of CNC machining and modern manufacturing technologies, preparing them for careers in engineering and manufacturing industries.

TP:

"Exploring CNC Machining: Techniques and Applications"
"Advanced CNC Technologies: A Hands-On Approach"
"Precision Manufacturing: Utilizing CNC Machines in Modern Production"
"CNC Machining Fundamentals: From Design to Production"
"Innovations in CNC Technology: Enhancing Manufacturing Efficiency"
"Hands-On CNC Programming: Creating Complex Parts"
"The Future of Manufacturing: Integrating CNC Machines in Industry"
"CNC Machining Processes: A Practical Workshop"
"Understanding CNC Tools and Their Applications in Modern Manufacturing"
"From CAD to CNC: Transforming Designs into Reality"

Semester: 1
Teaching unit: UEM 1.2
Subject 1: Quality Assurance and Compliance
VHS: 67 h30 (C: 1h30 TD: 1h30 TP: 1h30)
Credits: 4
Coefficient: 3

Module Overview

This module focuses on Quality Assurance (QA) practices and compliance with standards and regulations in industry. It introduces the fundamental principles of quality assurance, the processes and systems used to ensure that products and services meet quality requirements, as well as legal and regulatory obligations. Emphasis is placed on the implementation of effective QA systems and compliance with international standards.

1. Learning Objectives

By the end of this module, students should be able to:

- Understand the fundamental principles of Quality Assurance (QA).
- Apply standards and compliance practices in various industry sectors.
- Identify the main standards and certifications used to ensure compliance.
- Develop and implement quality management systems.
- Understand the legal and regulatory requirements relating to quality and compliance.

Module Content

1. Introduction to Quality Assurance (QA)

o Definition of Quality Assurance and distinction between Quality Control (QC) and Quality Assurance.

o The role of quality assurance in the continuous improvement of processes and products.

o Differences between Quality Assurance, Quality Management and Quality Control.

o The main objectives of Quality Assurance: preventing defects, meeting customer requirements and complying with standards.**Les Systèmes de Gestion de la Qualité (SGQ)**

2. Quality Management Systems (QMS)

o The key principles of a Quality Management System: Leadership, Employee Commitment, Continuous Improvement.

o The stages involved in setting up an effective QMS: Planning, Execution, Checking and Action (PDCA).

o The role of documentation in QMS: Quality manual, procedures and work instructions.

o How to structure and integrate a QMS into an organisation.

3. Standards and Conformity Certifications

o Introduction to international standards: ISO 9001, ISO 13485 (medical devices), ISO/TS 16949 (automotive), ISO 14001 (environment).

o Certification and quality audit processes: ISO certification procedure, internal and external audits.

o Other industrial certifications: FDA (Food and Drug Administration), CE (Conformité Européenne), GMP (Good Manufacturing Practice).

o The implications of certification for the company and the market.

4. Legal and Regulatory Compliance Management

o The importance of complying with regulations in different sectors: health, pharmaceuticals, automotive, aeronautics.

o Regulations relating to product safety, the environment and consumer protection.

o The role of external audits and regulatory inspections.

o The consequences of non-compliance with standards (penalties, customer complaints, financial losses).

Quality Assurance Tools and Techniques

o Product and process validation and verification techniques.

o Use of risk analysis and conformity assessment to identify areas of non-conformity.

o Tools for continuous improvement in Quality Assurance: Pareto diagrams, cause and effect diagrams, quality audits.

o The importance of document management to ensure traceability and conformity of products and processes.

6.Implementing a Quality and Compliance Culture

o How to establish a quality culture within an organisation.

o The impact of leadership and internal communication on compliance and quality.

o Training and raising employee awareness of compliance and quality requirements.

o Managing non-conformities: identification, investigation and corrective action.

7.Risk Management and Quality Continuity Plan

o Risk assessment and management methods: FMEA (Failure Mode and Effects Analysis), HAZOP (Hazard and Operability Study).

o Compliance and product risk management: Identification of critical points and implementation of contingency plans.

o Continuity of quality processes in the event of crises (pandemic, product defect, etc.).

8. Case studies and practical applications

o Case studies of companies that have set up effective compliance and quality assurance systems.

o Analysis of real-life non-compliance situations and the corrective actions taken.

o Group discussions on the challenges of quality and compliance management in different sectors.

Assessment and Evaluation

- Practical case studies: Analysing a quality assurance system in an organisation and suggesting improvements.
- Written test: Assessment of knowledge of quality standards and compliance management.
- Group projects: Draw up a QMS implementation plan for a given organisation, including the certification and audit stages.
- Presentation: Present an analysis of a case of non-conformity and propose a corrective action plan.

Recommended Readings

- "Quality Assurance: A Guide to Planning, Implementation, and Review" by Peter J. Smith
- "ISO 9001:2015 in Plain English" by Craig Cochran
- "The ISO 9001:2015 Handbook for Small and Medium-Sized Businesses" by Dean T. Kashiwabara

Semester: 1
Teaching unit: UED 1.1
Subject 1: Quality Improvement Methodologies
VHS: 45 h00 (C: 1h30, TD: 1h30)
Credits: 4
Coefficient : 2

Module Overview

This module explores the key methodologies and approaches used for quality improvement in organizations. Students will learn about well-established improvement frameworks such as Six Sigma, Lean, and Total Quality Management (TQM), and how these approaches contribute to higher quality standards and process optimization. The module will provide practical tools for identifying improvement opportunities, analyzing data, and implementing change.

Learning Objectives

By the end of this module, students should be able to:

- Understand and apply the key principles of quality improvement methodologies.
- Implement Lean and Six Sigma tools to improve processes and reduce waste.
- Use statistical and analytical techniques to identify and address root causes of process inefficiencies.
- Develop and apply a structured problem-solving approach to quality improvement.
- Align quality improvement efforts with strategic organizational goals and customer satisfaction.

Module Content

1. **Introduction to Quality Improvement**
    - Definition and importance of quality improvement
    - Key objectives: Increasing efficiency, reducing variation, improving customer satisfaction
    - Relationship between quality improvement and organizational success
    - The role of leadership and culture in driving quality improvement initiatives
2. **Total Quality Management (TQM)**
    - Overview of TQM principles: Customer focus, continuous improvement, employee involvement, process approach
    - The TQM cycle: Plan-Do-Check-Act (PDCA)
    - Key TQM tools and techniques:
        - Fishbone diagram (Ishikawa diagram)
        - Flowcharts
        - Pareto analysis
        - Histogram and scatter plots
    - TQM implementation strategies: Leadership commitment, employee empowerment, and process standardization

- Examples of successful TQM implementation in organizations

3. **Six Sigma Methodology**
   - Introduction to Six Sigma: Origin, goals, and methodology
   - The DMAIC framework (Define, Measure, Analyze, Improve, Control)
     - Define the problem and project goals
     - Measure current process performance
     - Analyze data and identify root causes of defects
     - Improve the process by developing and implementing solutions
     - Control the new process to sustain improvements
   - Tools used in Six Sigma:
     - SIPOC diagram (Suppliers, Inputs, Process, Outputs, Customers)
     - Fishbone diagram for root cause analysis
     - Control charts for monitoring improvements
     - Process mapping
   - Six Sigma roles and certifications: Green Belt, Black Belt, Master Black Belt
4. **Lean Methodology**
   - Introduction to Lean principles: Elimination of waste (Muda), improving flow, and maximizing value
   - The 5 principles of Lean: Value, Value Stream, Flow, Pull, and Perfection
   - Types of waste in Lean (The 7 wastes: Overproduction, Waiting, Transport, Extra processing, Inventory, Motion, Defects)
   - Tools and techniques for Lean improvement:
     - Value Stream Mapping (VSM)
     - 5S (Sort, Set in order, Shine, Standardize, Sustain)
     - Kaizen (Continuous improvement)
     - Just-in-Time (JIT)
     - Kanban (Visual scheduling)
   - Lean and Six Sigma integration: Lean Six Sigma (LSS)
5. **Root Cause Analysis (RCA)**
   - Introduction to Root Cause Analysis: Importance in identifying underlying causes of problems
   - Techniques for RCA:
     - The "5 Whys" technique
     - Fishbone (Ishikawa) diagram
     - Failure Mode and Effects Analysis (FMEA)
   - Case studies of RCA in practice: Identifying and solving critical quality problems in manufacturing and services
6. **Benchmarking**
   - Definition and purpose of benchmarking in quality improvement
   - Types of benchmarking: Internal, competitive, functional, and generic
   - Steps in the benchmarking process:
     - Planning and defining the benchmark scope
     - Data collection and analysis
     - Identifying best practices

        - Implementing improvements based on findings
    - Benchmarking for continuous improvement and innovation
7. **Statistical Tools for Quality Improvement**
    - Overview of statistical methods in quality improvement
    - Key tools:
        - Descriptive statistics (mean, median, mode, standard deviation)
        - Control charts (for monitoring process stability)
        - Histograms and Pareto analysis (for identifying priority issues)
        - Regression analysis (for identifying relationships between variables)
    - Using data to drive decisions and continuous improvement
8. **Sustaining Quality Improvements**
    - Importance of monitoring and sustaining quality improvements over time
    - Strategies for embedding continuous improvement in organizational culture
    - Overcoming resistance to change: Leadership, communication, and employee involvement
    - The role of audits, reviews, and feedback loops in maintaining improvements
9. **Quality Improvement in Service and Manufacturing**
    - Case studies and examples from both service and manufacturing sectors
    - Adapting quality improvement methodologies to non-manufacturing industries (e.g., healthcare, finance)
    - Challenges specific to each sector in implementing quality improvement methods

Assessment and Evaluation

- **Group project:** Apply a quality improvement methodology (e.g., Lean, Six Sigma) to a real or hypothetical process and present the findings.
- **Quizzes:** Test knowledge on tools and principles of Lean, Six Sigma, and TQM.
- **Case study analysis:** Analyze a real-world case where quality improvement was successfully implemented, and propose further improvements.
- **Individual written report:** Focus on applying statistical methods to improve a specific process or problem.

Recommended Readings

- "The Lean Six Sigma Pocket Toolbook" by Michael L. George, David T. Rowlands, Mark Price, John Maxey
- "The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer" by Jeffrey Liker
- "The Six Sigma Handbook" by Thomas Pyzdek and Paul A. Keller
- "Total Quality Management" by Dale H. Besterfield

Semester: 1
Teaching unit: UET 1.2
Subject 1: Measurement and Instrumentation
VHS: 22 h30 (C: 1h30)
Credits: 1
Coefficient : 1

Module Overview

This module introduces students to the essential concepts of measurement and instrumentation used in quality control and assurance. It covers the principles of measurement systems, the types of instruments and tools used in various industries, and how to interpret measurement data effectively. Students will also explore calibration, accuracy, precision, and the role of measurement in process improvement.

Learning Objectives

By the end of this module, students should be able to:

- Understand the basic principles of measurement and its importance in quality control.
- Identify and use different types of measuring instruments and tools.
- Assess the accuracy, precision, and reliability of measurement systems.
- Implement measurement systems analysis (MSA) to evaluate measurement quality.
- Apply calibration techniques to ensure instrument accuracy and consistency.
- Interpret and analyze measurement data to drive quality improvements.

Module Content

1. **Introduction to Measurement and Instrumentation**
    - The role of measurement in quality control and improvement
    - Definition of measurement, instrumentation, and their relationship to process control
    - Importance of accurate and precise measurements in manufacturing, service, and product development
    - The concept of traceability in measurements (ensuring measurements can be traced back to national or international standards)
2. **Types of Measurement Systems and Instruments**
    - **Mechanical instruments**: Calipers, micrometers, gauges, and rulers
    - **Electrical instruments**: Multimeters, oscilloscopes, and power analyzers
    - **Optical instruments**: Microscopes, spectrometers, and laser measuring devices
    - **Digital instruments**: Digital calipers, automated measuring systems, and sensors
    - **Non-destructive testing (NDT) tools**: Ultrasonic, X-ray, and eddy current testing
    - **Environmental measurement tools**: Temperature, humidity, and pressure sensors
3. **Measurement Principles**
    - Key concepts: Accuracy, precision, reliability, and repeatability

- Differences between accuracy (closeness to true value) and precision (consistency of measurements)
- Systematic and random errors in measurement: Sources and solutions
- The importance of resolution, range, and sensitivity in choosing measurement instruments
- Units of measurement: SI (International System of Units) and other industry-specific units

4. **Measurement Systems Analysis (MSA)**
   - Introduction to MSA and its role in assessing measurement reliability and validity
   - Types of variation in measurement systems: Repeatability and reproducibility (R&R)
   - Conducting a Gage R&R study: Understanding the factors that affect measurement variation
   - Calibration and its impact on measurement system performance
   - The concept of bias and drift in measurement systems
   - Techniques for evaluating measurement uncertainty
5. **Calibration of Measuring Instruments**
   - Definition and importance of calibration in maintaining measurement accuracy
   - The calibration process: Steps involved, tools needed, and frequencies of calibration
   - Standards used in calibration: National Institute of Standards and Technology (NIST), ISO/IEC 17025
   - Understanding calibration certificates and documentation
   - Comparison between calibration and verification: When and why each is needed
   - The role of calibration in maintaining quality control and ensuring compliance
6. **Statistical Methods for Measurement Analysis**
   - Using statistical tools to analyze measurement data
   - Calculating mean, variance, standard deviation, and confidence intervals for measurement data
   - Control charts for monitoring measurement system performance
   - Using histograms and scatter plots to analyze measurement variability
   - The role of statistical process control (SPC) in ensuring the stability of measurement systems
7. **Instrument Selection and Usage**
   - Guidelines for selecting the right instrument for specific measurement tasks
   - Factors to consider in instrument selection: Range, resolution, accuracy, cost, and usability
   - Calibration intervals: How often instruments should be calibrated based on use and criticality
   - Instrument maintenance: Best practices for keeping measuring instruments in good working condition
   - Troubleshooting common measurement instrument problems (e.g., drift, failure to calibrate)
8. **Measurement in Different Industries**
   - Application of measurement systems in manufacturing, healthcare, pharmaceuticals, food production, and service industries
   - Specialized instruments for various sectors:
     - Automotive: Measuring tolerances and dimensions in vehicle parts
     - Electronics: Testing and measuring electrical parameters (voltage, current, resistance)
     - Pharmaceuticals: Measuring drug formulations and conducting stability tests

        - Food production: Ensuring food quality through temperature, moisture, and weight measurements
    - Case studies: Successful applications of measurement and instrumentation in various industries
9. **Emerging Technologies in Measurement**
    - Advances in digital instrumentation, wireless measurement systems, and IoT (Internet of Things) for real-time monitoring
    - The role of automation in measurement processes: Benefits and challenges
    - Innovations in sensor technologies for more accurate and efficient measurements
    - Machine learning and AI in enhancing measurement systems (e.g., predictive maintenance and real-time data analysis)

Assessment and Evaluation

- **Practical exercises:** Hands-on measurement tasks where students use various instruments to measure dimensions, weight, or other parameters.
- **Case study analysis:** Evaluate the application of measurement systems in a specific industry, such as automotive or healthcare.
- **Quizzes and exams:** Assess knowledge of measurement principles, MSA, and calibration techniques.
- **Group project:** Design a measurement system for a particular process, considering instrument selection, calibration, and MSA.

Recommended Readings

- "Measurement Systems: Application and Design" by Ernest O. Doebelin
- "Introduction to Measurement and Instrumentation" by R. K. Jain
- "The Metrology Handbook" by Jay L. Bucher

Semester: 1
Teaching unit: UET 1.3
Subject 1: Digital Technologies in Quality Control
VHS: 22 h30 (C: 1h30 TP: 1h30)
Credits: 1
Coefficient : 1

Module Overview

- o understand the impact of digital technologies on quality control processes.
- To learn how to utilize digital tools to enhance quality control practices.
- To develop skills in data analysis and quality management using specialized software.

Module Content:

1. Introduction to Digital Quality Control
    - Definition and significance of quality control in various industries.
    - Evolution of quality control methodologies with the advent of digital technologies.
2. Digital Tools and Technologies
    - Overview of quality management software (e.g., Minitab, QlikView, Tableau).
    - Utilization of sensors and IoT (Internet of Things) for real-time quality monitoring.
    - Introduction to automation and robotics in quality control processes.
3. Data Analysis and Statistical Methods
    - Techniques for data analysis relevant to quality control.
    - Application of predictive analytics to anticipate defects and improve processes.
    - Case studies demonstrating the use of data analysis in quality control.
4. Standards and Regulations
    - Understanding ISO standards related to quality control (e.g., ISO 9001, ISO 13485).
    - The impact of digital technologies on regulatory compliance.
5. Quality Management and Continuous Improvement
    - Quality management methodologies (e.g., Six Sigma, Lean Management) integrated with digital tools.
    - Strategies for fostering a culture of quality within organizations.
6. Practical Projects and Case Studies
    - Implementation of practical projects utilizing digital tools to address quality issues.
    - Analysis of real-world case studies from companies that have integrated digital solutions into their quality control processes.

TP:

"Harnessing Digital Resources for Enhanced Scientific Research"
"Exploring the Impact of Digital Tools on Scientific Inquiry"
"Digital Libraries: A Gateway to Scientific Knowledge"
"Utilizing Online Databases for Effective Research Methodologies"
"The Role of Digital Resources in Modern Scientific Collaboration"
"Navigating Digital Platforms for Research Data Management"
"Evaluating the Effectiveness of Digital Resources in Scientific Studies"
"Integrating Digital Technologies in Experimental Research"

Semester: 1
Teaching unit: UET 1.3
Subject 2: English/Russian in Professional Communication
VHS: 22 h30 (C: 1h30)
Credits: 1
Coefficient : 1

Module Overview

Teaching Objectives: The primary objective of this module is to enhance students' proficiency in a foreign language within the context of professional communication. Students will develop the ability to effectively engage in verbal and written communication in a professional setting, focusing on industry-specific vocabulary, cultural nuances, and communication strategies. The module aims to prepare students for real-world scenarios where they must navigate language barriers and communicate effectively with diverse audiences.

Recommended Prerequisites: Students are expected to have a foundational understanding of the foreign language being studied, ideally at an intermediate level. Familiarity with basic professional communication concepts and practices is also recommended to facilitate deeper engagement with the course material.

Course Content:

1. Introduction to Professional Communication in a Foreign Language
    - Importance of language skills in the workplace
    - Overview of communication styles across cultures
2. Vocabulary Development
    - Industry-specific terminology
    - Common phrases and expressions used in professional settings
3. Verbal Communication Skills
    - Effective speaking techniques
    - Presentation skills in a foreign language
    - Role-playing exercises to simulate professional interactions
4. Written Communication Skills
    - Business writing fundamentals (emails, reports, proposals)
    - Understanding tone and formality in written correspondence
5. Cross-Cultural Communication
    - Navigating cultural differences in professional contexts
    - Strategies for effective intercultural communication
6. Case Studies and Practical Applications
    - Analysis of real-world scenarios
    - Group projects to apply learned skills in simulated environments

Assessment Methods: Students will be evaluated through a combination of formative and summative assessments, including:

- Participation in class discussions and role-playing exercises
- Written assignments demonstrating proficiency in business writing
- Oral presentations on selected topics relevant to professional communication

- A final project that integrates course concepts and showcases language skills in a professional context

Bibliographic References:

1. Guffey, M. E., & Loewy, D. (2018). *Business Communication: Process and Product*. Cengage Learning.
2. Hall, E. T. (1976). *Beyond Culture*. Anchor Books.
3. Hinds, J. (1990). *Inductive and Deductive Reasoning in Writing*. In *Cohesion in English* (pp. 185-206). Longman.
4. Scollon, R., & Scollon, S. W. (2001). *Intercultural Communication: A Discourse Approach*. Blackwell Publishing.

Semester: 2
Teaching unit: UEF 2.1
Subject1: Root Cause Analysis and Problem Solving
VHS: 67h30 (C: 1h30, TD: 1h30, TP: 1h30)
Crédits: 6
Coefficient: 3

Module Overview

This module focuses on methods for identifying the root causes of quality problems and implementing effective problem-solving techniques. Students will learn to use structured approaches, tools, and techniques to analyze complex problems and determine their underlying causes. The module will explore practical applications of problem-solving in real-world scenarios and help students develop critical thinking skills for resolving issues effectively and sustainably.

Learning Objectives

By the end of this module, students should be able to:

- Apply various problem-solving techniques to identify and address quality issues.
- Use tools such as the 5 Whys, Fishbone diagram, and Failure Mode and Effect Analysis (FMEA) to conduct root cause analysis.
- Develop solutions based on a thorough understanding of the problem's root causes.
- Implement corrective and preventive actions to eliminate recurring issues.
- Understand the role of teamwork and communication in effective problem-solving.
- Apply problem-solving methodologies to enhance product and process quality in different industries.

Module Content

1. **Introduction to Problem Solving and Root Cause Analysis**
    - Definition of problem solving and the importance of root cause analysis (RCA) in quality management
    - Distinction between symptoms and root causes: Why solving only symptoms leads to temporary fixes
    - The value of identifying root causes: Long-term solutions vs. short-term fixes
    - The impact of problem-solving on continuous improvement and organizational performance
2. **Problem-Solving Methodologies**
    - Overview of systematic problem-solving approaches:
        - **PDCA (Plan-Do-Check-Act)**: Plan the solution, implement, check results, and act on findings

        - **DMAIC (Define, Measure, Analyze, Improve, Control)**: A structured Six Sigma approach
        - **A3 Problem Solving**: A lean approach focusing on a concise, data-driven process
    - Steps in a typical problem-solving process: Problem identification, analysis, solution development, implementation, and monitoring
3. **Root Cause Analysis (RCA) Tools and Techniques**
    - **The 5 Whys**: A simple but powerful tool to dig deep into the root cause by repeatedly asking "Why?"
        - Example: If a defect is found, ask "Why did this happen?" and keep asking "Why?" until the root cause is discovered.
    - **Fishbone diagram (Ishikawa diagram)**: A visual tool for identifying potential causes of a problem by categorizing them (e.g., Materials, Methods, Machines, Environment, People)
    - **Failure Mode and Effects Analysis (FMEA)**: A structured technique to evaluate potential failure modes in a process or product and their consequences
    - **Pareto Analysis**: Identifying the most significant problems by focusing on the "vital few" issues that cause the majority of the problems (80/20 rule)
4. **Data Collection and Analysis for Problem Solving**
    - Importance of accurate data collection in the problem-solving process
    - Types of data: Qualitative vs. quantitative
    - Tools for data collection: Surveys, check sheets, inspection logs, and process data
    - Using statistical tools for data analysis:
        - Descriptive statistics (mean, mode, median)
        - Control charts to monitor process stability
        - Histograms and scatter diagrams for pattern recognition
    - Interpreting data to identify trends, correlations, and root causes
5. **Corrective and Preventive Actions (CAPA)**
    - Difference between corrective actions (addressing current problems) and preventive actions (preventing future problems)
    - Steps for implementing CAPA:
        - Identify root cause(s)
        - Develop and implement solutions
        - Verify the effectiveness of the solution (follow-up)
    - Using CAPA as part of a continual improvement process
    - Tracking and documenting corrective actions for future reference
    - Best practices for CAPA in industries such as manufacturing, healthcare, and pharmaceuticals
6. **Problem-Solving in Cross-Functional Teams**
    - The role of teamwork in effective problem-solving: Engaging different perspectives from multiple functions (e.g., production, quality, engineering, maintenance)
    - Techniques for fostering collaboration and communication within teams
    - Structuring team problem-solving sessions (e.g., brainstorming, structured meetings)
    - Overcoming resistance and maintaining team focus during problem-solving efforts

7. **Risk Management and Problem Solving**
    - Understanding the relationship between problem solving and risk management
    - Evaluating risks when identifying root causes and potential solutions
    - Tools for assessing risk: FMEA (Failure Mode and Effects Analysis), Fault Tree Analysis (FTA)
    - Prioritizing problems based on their potential impact and likelihood
    - Preventive actions that reduce future risks and recurring problems
8. **Case Studies and Real-World Applications**
    - Real-world case studies of successful problem-solving in various industries (e.g., automotive, healthcare, food processing)
    - Identifying problems, conducting RCA, and applying solutions
9. **Sustaining and Monitoring Problem-Solving Efforts**
    - Importance of monitoring the effectiveness of implemented solutions
    - Key performance indicators (KPIs) for tracking success
    - Continuous improvement cycles: How to build a culture of problem-solving in the organization

Assessment and Evaluation

- **Group project:** Apply RCA and problem-solving techniques to a real or hypothetical scenario. Present findings, root causes, and proposed solutions.
- **Case study analysis:** Analyze a real-world example of a problem-solving initiative, evaluate its success, and suggest improvements.
- **Practical exams:** Use RCA tools such as the 5 Whys or Fishbone diagram to solve a quality problem presented in a controlled setting.
- **Quizzes:** Test knowledge of RCA tools, problem-solving methodologies, and the CAPA process.

Recommended Readings

- "The Root Cause Analysis Handbook: A Guide to Effectively Implementing RCA in Organizations" by David J. Schwinn
- "Problem Solving 101: A Simple Book for Smart People" by Ken Watanabe
- "The Certified Six Sigma Green Belt Handbook" by Roderick A. Munro, et

TP:

"Uncovering the Roots: A Practical Guide to Root Cause Analysis"
"Problem Solving Techniques: Identifying and Addressing Root Causes"
"From Symptoms to Solutions: Mastering Root Cause Analysis"
"The Art of Problem Solving: A Hands-On Approach to Root Cause Analysis"
"Root Cause Analysis in Action: Practical Exercises and Case Studies"
"Digging Deeper: Effective Strategies for Root Cause Identification"
"Solving Problems at Their Source: A Practical Workshop on Root Cause Analysis"
"Analyzing Problems: Techniques for Effective Root Cause Analysis"
"Root Cause Analysis: Tools and Techniques for Practical Application"

Semester: 2
Teaching unit: UEF 2.2
Subject 2: Quality in Product Design and Development
VHS: 67 h30 (C: 1h30, TD: 1h30, TP: 1h30)
Credits: 6
Coefficient: 3

Module Overview

This module emphasizes the importance of integrating quality management practices into the product design and development process. By focusing on methodologies that optimize product functionality, manufacturability, and reliability, students will learn how to build quality into products right from the design phase, minimizing defects, rework, and overall costs. The module also explores tools and techniques for managing product lifecycle quality from conceptualization to market launch.

Learning Objectives

By the end of this module, students should be able to:

- Apply quality management principles during the product design and development stages.
- Use tools such as Failure Mode and Effects Analysis (FMEA) and Design for Manufacturability (DFM) to ensure product quality.
- Develop quality plans for new product introductions.
- Analyze product designs to ensure they meet customer requirements and specifications.
- Implement cross-functional collaboration in the design process to address potential quality issues early.
- Evaluate the role of product testing, validation, and verification in ensuring quality.

Module Content

1. **Introduction to Quality in Product Design and Development**
    - The importance of quality in the early stages of product design
    - How design decisions affect cost, manufacturability, and product quality
    - The shift from reactive quality control to proactive quality design
    - The role of product lifecycle management (PLM) in maintaining quality throughout the product's life
2. **Design for Quality (DFQ)**
    - Definition and principles of Design for Quality (DFQ)
    - Ensuring quality by meeting customer requirements, reducing variability, and addressing potential risks
    - The role of voice of the customer (VOC) in defining quality requirements
    - Quality function deployment (QFD) as a tool for aligning design specifications with customer needs

- Examples of DFQ in practice: Building quality into products from the concept phase

3. **Design for Manufacturability (DFM)**
   - Introduction to Design for Manufacturability (DFM): Principles and benefits
   - How DFM helps improve product quality by reducing complexity and cost during production
   - Key DFM principles: Simplification of designs, standardization of parts, and ease of assembly
   - Collaboration between design and manufacturing teams: Early involvement of manufacturing engineers to optimize the design
   - Case studies on DFM in the automotive, electronics, and consumer products industries
4. **Design for Reliability (DFR)**
   - Introduction to Design for Reliability (DFR): Ensuring product longevity and durability
   - Techniques for ensuring reliability: Stress testing, fatigue testing, accelerated life testing, and failure analysis
   - The relationship between design and reliability: How design choices impact the product's ability to perform over time
   - Reliability-centered design (RCD): A systematic approach to designing products that meet reliability requirements
   - Using FMEA to predict and mitigate potential failure modes
5. **Failure Mode and Effects Analysis (FMEA) in Design**
   - Overview of FMEA: A structured approach for identifying potential failure modes in product designs and their effects
   - Steps involved in conducting a design FMEA:
     - Identifying potential failure modes
     - Analyzing the severity, occurrence, and detection of each failure mode
     - Prioritizing failure modes using risk priority numbers (RPNs)
     - Implementing corrective actions to address high-priority failure modes
   - The role of FMEA in improving design quality and reducing the risk of product failure
6. **Prototyping and Testing in Design**
   - The importance of prototyping in the design phase: Identifying issues early before mass production
   - Different types of prototypes: Conceptual, functional, and production prototypes
   - Testing and validation methods: Structural testing, performance testing, and environmental testing
   - Iterative design process: How testing feedback is integrated to refine the design
   - Statistical design of experiments (DOE) for testing and optimizing product designs
7. **Cross-Functional Collaboration for Quality**
   - The importance of cross-functional teams in the design and development of quality products
   - Collaboration between design engineers, quality engineers, manufacturing, marketing, and customer service teams
   - Techniques for effective communication and problem-solving across departments
   - Integrating different perspectives (e.g., design constraints, manufacturability, and customer needs) into the design process

8. **Quality Assurance and Control in Product Development**
    - Introduction to quality assurance (QA) and quality control (QC) in the product development process
    - QA activities during the design phase: Document control, design reviews, and inspections
    - Control plans and procedures for monitoring product quality during development
    - The role of statistical process control (SPC) in monitoring the quality of product design outputs
    - Design reviews and audits as part of the quality control process: Ensuring design meets requirements and standards
9. **Product Lifecycle Management (PLM) and Quality**
    - Definition of Product Lifecycle Management (PLM): Managing quality across the entire product lifecycle from design to end-of-life
    - How PLM integrates quality management processes, ensuring consistent quality throughout the product's development, production, and after-sales
    - Tools for managing quality in PLM: Digital twins, design tools, and simulation software
    - The impact of PLM on reducing time-to-market and improving product quality
    - Case study of PLM systems used in industries like aerospace, automotive, and consumer electronics
10. **Sustaining Quality in Product Design**
    - Building a culture of continuous improvement into the design process
    - Using feedback from customers, service teams, and manufacturing to refine designs post-launch
    - Lessons learned from product failures: How companies integrate post-launch insights to improve future product designs
    - The importance of maintaining quality standards and certifications (e.g., ISO 9001) throughout the product’s lifecycle

Assessment and Evaluation

- **Group project:** Design a new product or product component, applying DFQ, DFM, and DFR principles. Present the design process, including quality assessments and potential risks.
- **Case study analysis:** Analyze a case where poor design quality impacted a product’s market performance, and propose how quality could have been integrated into the design process.
- **Practical exams:** Conduct a design review using FMEA or other tools to evaluate potential risks in a product design.
- **Quizzes:** Test knowledge on key design for quality principles, tools, and techniques.

Recommended Readings

- "Design for Manufacturability and Concurrent Engineering" by James R. Evans
- "Design for Reliability" by Ofer R. Harel
- "The Toyota Product Development System" by James M. Morgan and Jeffrey K. Liker
- "Failure Mode and Effect Analysis" by D.H. Stamatis

TP:

"Ensuring Quality: Best Practices in Product Design"
"Quality Control Techniques in Product Development"
"Integrating Quality Assurance in the Design Process"
"Evaluating Product Quality: Methods and Metrics"
"The Role of User Feedback in Enhancing Product Quality"
"Design for Quality: Strategies for Successful Product Development"
"Quality Management Systems in Product Design"
"Prototyping for Quality: Testing and Iteration"
"Sustainable Design: Balancing Quality and Environmental Impact"
"Case Studies in Quality Improvement in Product Development"

Semester: 2
Teaching unit: UEF 2.3
Subject 3: Technology in Quality Control
VHS: 67 h30 (C: 1h30, TD: 1h30, TP: 1h30)
Credits : 6
Coefficient : 3

Module Overview

This module explores the role of technology in enhancing quality control processes across various industries. It examines modern tools, techniques, and methodologies that are employed to ensure product quality and compliance with standards. Students will learn how technology can improve efficiency, accuracy, and decision-making in quality control.

Learning Objectives

By the end of this module, students will be able to:

Understand the fundamental concepts of quality control and its importance in manufacturing and service industries.

Identify and evaluate various technologies used in quality control, including statistical process control (SPC), automation, and data analytics.

Apply quality control tools and techniques to real-world scenarios.

Analyze the impact of technology on quality management systems and continuous improvement processes.

Develop strategies for implementing technology-driven quality control solutions in organizations.

Module Content

Introduction to Quality Control

Course Content:

Definition and significance of quality control

Historical evolution of quality control practices

Quality Control Tools and Techniques

Statistical Process Control (SPC)

Control charts and process capability analysis

Six Sigma methodology

Technology in Quality Control

Automation in quality inspection and testing

Use of sensors and IoT in monitoring quality

Data analytics and machine learning applications in quality control

Quality Management Systems (QMS)

Overview of QMS standards (ISO 9001, etc.)

Role of technology in QMS implementation and maintenance

Case Studies and Applications

Real-world examples of technology in quality control
Best practices and lessons learned from industry leaders
Future Trends in Quality Control Technology

Emerging technologies (AI, blockchain, etc.)
The impact of Industry 4.0 on quality control practices

Assessment and Evaluation

Quizzes: Short quizzes to assess understanding of key concepts (20%).
Assignments: Practical assignments involving the application of quality control tools and technologies (30%).
Midterm Exam: A comprehensive exam covering the first half of the module (25%).
Final Project: A group project focused on developing a technology-driven quality control plan for a specific industry (25%).
Recommended Readings
Montgomery, D. C. (2019). Introduction to Statistical Quality Control. Wiley.
Juran, J. M., & Godfrey, A. B. (1999). Juran's Quality Handbook. McGraw-Hill.
Gitlow, H. S., Oppenheim, A. J., & Oppenheim, R. (2018). Quality Management. McGraw-Hill.
Online resources and case studies related to technology in quality control.

TP:

"Implementing AI in Quality Control Processes"
"The Role of Automation in Quality Assurance"
"Data Analytics for Enhanced Quality Control"
"Using IoT Devices for Real-Time Quality Monitoring"
"Quality Control: Integrating Machine Learning Techniques"
"Exploring the Impact of Robotics on Quality Management"
"Quality Control Systems: A Comparative Study of Traditional vs. Modern Technologies"
"Leveraging Big Data for Quality Improvement Strategies"
"The Future of Quality Control: Trends and Innovations"
"Case Study: Successful Implementation of Technology in Quality Control"

Semester: 2
Teaching unit: UEM 2.1
Subject 1: Organization and planning of experiments
VHS: 67 h30 (C: 1h30, TD: 1h30, TP: 1h30)
Credits: 5
Coefficient: 3

Module Overview

Objectives of the Course: The primary objective of this course is to provide students with a comprehensive understanding of the fundamental principles of scientific research, including the organization and planning of experiments. Students will learn to formulate research questions, design experiments, and analyze data effectively. The course aims to develop critical thinking and problem-solving skills essential for conducting rigorous scientific investigations and to instill an appreciation for ethical considerations in research.

Recommended Prerequisites: Students are expected to have a basic understanding of scientific principles and methodologies. Familiarity with statistics and data analysis is recommended, as it will facilitate engagement with the course material. Prior coursework in biology, chemistry, or related fields may also be beneficial.

Course Content:

1. Introduction to Scientific Research
    - Definition and importance of scientific research
    - The scientific method and its application
    - Types of research: basic vs. applied research
2. Formulating Research Questions and Hypotheses
    - Identifying research gaps
    - Developing clear and testable hypotheses
    - Importance of literature review
3. Experimental Design
    - Key components of experimental design: variables, controls, and replicates
    - Types of experimental designs: randomized, factorial, and longitudinal designs
    - Sample size determination and power analysis
4. Organization of Experiments
    - Planning and scheduling experiments
    - Resource management: materials, equipment, and personnel
    - Data management and record-keeping
5. Data Collection and Analysis
    - Techniques for data collection: qualitative and quantitative methods
    - Statistical analysis and interpretation of results
    - Use of software tools for data analysis
6. Ethics in Scientific Research
    - Ethical considerations in research design and implementation
    - Responsible conduct of research: plagiarism, fabrication, and falsification
    - Institutional Review Boards (IRBs) and ethical approval processes

7. Communicating Research Findings
    - Writing research proposals and reports
    - Presenting research results: posters and oral presentations
    - Publication process and peer review

Assessment Methods:

Students will be evaluated through a combination of assessments, including:

- Written assignments and research proposals
- Laboratory reports detailing experimental design and findings
- Quizzes and examinations to assess understanding of key concepts
- Participation in class discussions and presentations

Bibliographic References:

1. Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Sage Publications.
2. Montgomery, D. C. (2017). *Design and Analysis of Experiments*. Wiley.
3. Peat, J. K., & Barton, B. (2008). *Medical Statistics: A Guide to Data Analysis and Critical Appraisal*. Wiley-Blackwell.
4. Day, R. A., & Gastel, B. (2012). *How to Write and Publish a Scientific Paper*. Cambridge University Press.
5. Resnik, D. B. (2015). *What is Ethics in Research & Why is it Important?* National Institute of Environmental Health Sciences.

Semester: 2
Teaching unit: UEM 2.2
Subject 2: Supply Chain Quality Management
VHS: 45 h00 (C: 1h30, TP: 1h30)
Credits: 4
Coefficient: 2

Module Overview

This module focuses on managing and improving the quality of products and processes across the entire supply chain. It covers the importance of quality assurance and control mechanisms when dealing with suppliers, subcontractors, and logistics partners, and how companies can implement strategies to ensure the quality of incoming materials, components, and finished products. Emphasizing supplier relationship management (SRM), quality audits, and continuous improvement, this module provides students with the skills to ensure supply chain quality is maintained at every stage.

Learning Objectives

By the end of this module, students should be able to:

- Understand the importance of managing quality throughout the supply chain.
- Implement supplier quality management systems (SQMS) and evaluate supplier performance.
- Use tools such as supplier audits, process capability analysis, and statistical control methods to assess and improve supply chain quality.
- Develop strategies for managing risks and ensuring quality in global and multi-tiered supply chains.
- Evaluate the role of collaboration, communication, and continuous improvement in maintaining supply chain quality.
- Understand the impact of external regulations and standards on supply chain quality, such as ISO, IATF 16949, or the Food Safety Modernization Act (FSMA).

Module Content

1. **Introduction to Supply Chain Quality Management**
    - Definition and scope of supply chain quality management (SCQM)
    - The role of quality management in global and multi-tier supply chains
    - Key challenges in managing supply chain quality: geographic distribution, multiple suppliers, and regulatory standards
    - How quality in the supply chain impacts the overall quality of the final product and customer satisfaction
    - Aligning quality management with supply chain objectives: Cost, time, flexibility, and quality
2. **Supplier Quality Management Systems (SQMS)**

- Overview of Supplier Quality Management Systems (SQMS): Standards and practices for maintaining supplier quality
- Supplier selection and qualification: Key criteria for selecting suppliers who can meet quality standards
- Developing and implementing supplier quality agreements: Setting expectations, performance metrics, and compliance requirements
- Supplier performance monitoring: Methods for evaluating supplier performance and ensuring they adhere to quality standards
- Use of Key Performance Indicators (KPIs) in supplier management

3. **Supplier Audits and Quality Inspections**
   - The importance of regular supplier audits to ensure quality compliance
   - Types of supplier audits: Supplier capability audits, quality system audits, process audits, and product audits
   - Planning and conducting an audit: Steps, documentation, and reporting
   - Analyzing audit results and implementing corrective actions based on findings
   - Supplier inspection processes: Incoming material inspections, pre-shipment inspections, and inspection frequency
4. **Statistical Tools for Supply Chain Quality**
   - Application of statistical process control (SPC) in monitoring supply chain quality
   - Process capability analysis: Assessing whether suppliers' processes can meet the required specifications
   - Control charts for tracking quality deviations and trends in raw materials or parts
   - Using statistical sampling methods for quality inspections and product testing
   - Applying regression analysis and hypothesis testing to improve supplier performance
5. **Managing Supply Chain Risks and Variability**
   - Identifying and managing risks in the supply chain that can affect product quality
   - Risk assessment tools and techniques: Failure Modes and Effects Analysis (FMEA), Fault Tree Analysis (FTA), and Risk Priority Number (RPN)
   - Managing variability in supplier processes and products: Ensuring consistency in quality even in complex, multi-tier supply chains
   - Strategies for mitigating risks related to supply disruptions, delays, or defects in supplied components
   - Best practices for managing lead time and ensuring on-time delivery of quality materials
6. **Supplier Collaboration and Continuous Improvement**
   - The role of collaboration between buyers and suppliers in ensuring supply chain quality
   - Developing long-term, strategic relationships with key suppliers: Moving from transactional to collaborative partnerships
   - Techniques for fostering collaboration: Joint problem-solving, training, and knowledge sharing
   - Implementing continuous improvement programs (e.g., Kaizen, Six Sigma, Lean) across the supply chain to enhance quality and performance
   - Establishing feedback loops: How to ensure feedback from quality inspections, audits, and audits leads to actionable improvements
7. **Quality Standards, Compliance, and Certifications**

- Overview of international and industry-specific quality standards that impact the supply chain:
  - ISO 9001: Quality management systems (QMS) for suppliers
  - IATF 16949: Automotive industry-specific requirements for quality management
  - ISO 13485: Quality management for medical devices
  - Food safety regulations (FSMA) for the food industry
- The importance of certification and ensuring supplier compliance with quality standards
- Auditing suppliers for adherence to standards and certifications
- Navigating regulatory challenges in global supply chains and ensuring quality compliance across borders

8. **Supply Chain Visibility and Quality Data Management**
   - The role of supply chain visibility in maintaining quality: Tracking products and materials from suppliers to customers
   - Using technology for data management: Supply chain management software (e.g., ERP, SCM systems) for monitoring and ensuring quality
   - The importance of data-driven decision-making in managing supply chain quality
   - Real-time data collection, monitoring, and quality tracking for early detection of issues
   - Benefits of end-to-end visibility: Reducing errors, improving traceability, and ensuring accountability across the supply chain
9. **Sustainability and Ethics in Supply Chain Quality**
   - The growing importance of sustainability and ethical sourcing in modern supply chains
   - Integrating environmental, social, and governance (ESG) factors into supply chain quality management
   - Ensuring suppliers adhere to sustainability standards and ethical practices while maintaining quality
   - How quality management systems can contribute to sustainable supply chains: Waste reduction, energy efficiency, and eco-friendly packaging
   - Case studies on companies successfully integrating sustainability and ethical considerations into their supply chain quality practices
10. **Case Studies and Real-World Applications**
    - Case studies of companies that have successfully implemented Supply Chain Quality Management programs
    - Analyzing common supply chain quality failures and how they were addressed
    - Best practices from industries like automotive, electronics, food, and pharmaceuticals
    - Group discussions on real-world supply chain quality challenges and proposed solutions

Assessment and Evaluation

- **Group project:** Analyze a company's supply chain quality management strategy and propose improvements for supplier collaboration, risk management, and quality assurance.
- **Case study analysis:** Examine a situation where poor supply chain quality led to product failures or customer dissatisfaction and identify corrective actions.
- **Practical exams:** Perform an audit on a supplier or evaluate a company's supplier quality management system and suggest improvements.

- **Quizzes:** Test knowledge on supplier management, audit procedures, risk management, and quality standards in the supply chain.

Recommended Readings

- "Supply Chain Quality Control: From Concept to Practice" by Adam J. O'Brien
- "The Supplier Management Handbook" by Michael D. Loughrin
- "Managing Supplier Quality: A Practical Guide to Implementing Supplier Quality Assurance" by David M. M. Cook
- "The Essentials of Supply Chain Management" by Hokey Min

TP :

1. "Enhancing Supply Chain Quality: Best Practices and Strategies"
2. "Quality Control Techniques in Supply Chain Management"
3. "The Role of Quality Management Systems in Supply Chains"
4. "Assessing Supplier Quality: Tools and Methodologies"
5. "Implementing Total Quality Management in Supply Chains"
6. "Risk Management and Quality Assurance in Supply Chain Operations"
7. "Lean Principles and Quality Improvement in Supply Chains"
8. "The Impact of Quality on Supply Chain Performance"
9. "Case Studies in Supply Chain Quality Management"
10. "Innovations in Quality Management for Supply Chain Excellence"

Semester: 2
Teaching unit: UED 2.1
Subject 1: Artificial Intelligence in Quality Control
VHS: 22 h30
Credits: 2
Coefficient : 1

- To develop skills in implementing AI techniques for quality improvement and defect detection.
- To analyze case studies demonstrating the successful integration of AI in quality management systems.

Module Content:

1. Introduction to Artificial Intelligence
    - Definition and history of artificial intelligence.
    - Overview of AI technologies: machine learning, deep learning, natural language processing, and computer vision.
    - The role of AI in modern industries and its impact on quality control.
2. **Fundamentals of Machine Learning**
    - Introduction to machine learning concepts: supervised, unsupervised, and reinforcement learning.
    - Key algorithms used in quality control applications (e.g., regression, classification, clustering).
    - Data preprocessing techniques and feature selection.
3. **Deep Learning Techniques**
    - Overview of neural networks and their architecture.
    - Applications of deep learning in image recognition and defect detection.
    - Case studies of deep learning implementations in quality control.
4. **Data Analytics and Quality Improvement**
    - Importance of data in quality control: data collection, management, and analysis.
    - Techniques for analyzing quality data using AI tools.
    - Predictive analytics for forecasting quality issues and improving processes.
5. **AI in Process Automation**
    - Automation of quality control processes using AI technologies.
    - Integration of AI with IoT for real-time monitoring and feedback.
    - Benefits and challenges of implementing AI-driven automation in quality management.
6. **Quality Management Systems and AI Integration**
    - Overview of quality management systems (QMS) and their components.
    - Strategies for integrating AI into existing QMS frameworks.
    - Regulatory considerations and compliance issues related to AI in quality control.
7. Ethical Considerations and Challenges
    - Ethical implications of using AI in quality control.
    - Addressing bias in AI algorithms and ensuring fairness.
    - Challenges in data privacy and security in AI applications.
8. **Practical Applications and Case Studies**
    - Hands-on projects utilizing AI tools for quality control applications.
    - Analysis of real-world case studies where AI has improved quality managememant.
    - Group presentations on selected case studies and their outcomes.

Semester: 2
Teaching unit: UED 2.2
Subject 1: Quality Leadership and Culture
VHS: 22h30 (C: 1h30)
Credits: 1
Coefficient: 1

Module Overview

In this module, students will explore how leadership plays a crucial role in embedding a culture of quality within organizations. It will cover strategies for fostering a mindset that prioritizes quality across all levels of the organization and the leadership skills necessary to manage change, inspire teams, and drive quality initiatives. Students will also learn about different leadership styles, approaches to building strong teams, and the alignment of organizational culture with the goals of quality management.

Learning Objectives

By the end of this module, students should be able to:

- Understand the concept of quality leadership and its importance in organizational success.
- Identify different leadership styles and their impact on quality management and culture.
- Develop strategies to create and sustain a culture of quality in an organization.
- Apply principles of change management to lead quality improvement initiatives.
- Recognize the role of leadership in motivating employees and driving engagement in quality activities.
- Evaluate the relationship between organizational culture and quality outcomes.

Module Content

1. **Introduction to Quality Leadership**
    - Definition and significance of quality leadership in an organization
    - The link between leadership and quality outcomes: How leadership drives quality performance
    - The role of leadership in setting quality standards and aligning organizational goals with quality objectives
    - The impact of leadership on employee engagement, morale, and commitment to quality
    - Leadership in the context of continuous improvement: Ensuring long-term sustainability of quality initiatives
2. **Leadership Styles and Their Impact on Quality**
    - Overview of different leadership styles: Autocratic, democratic, transformational, and transactional
    - The effect of leadership styles on quality initiatives and decision-making

- How different leadership styles influence employee behavior, motivation, and commitment to quality
- Choosing the right leadership style for fostering a quality-driven environment
- Case studies of successful leaders in quality management and their leadership approaches

3. **Building a Culture of Quality**
   - Defining organizational culture and its influence on quality performance
   - The importance of embedding quality values into the core organizational culture
   - Strategies for creating a culture of quality: Vision, values, and behaviors that prioritize quality
   - The role of communication in promoting a culture of quality: Transparency, feedback, and recognition
   - Overcoming barriers to establishing a quality culture: Resistance to change, lack of support, and siloed thinking
   - Leading by example: How leaders must model quality behaviors and decision-making
4. **Change Management in Quality Leadership**
   - The role of leadership in guiding organizational change to improve quality
   - Key principles of change management and how they apply to quality initiatives
   - Developing a roadmap for successful change: Setting goals, managing resistance, and ensuring buy-in from employees
   - Techniques for leading teams through quality-related change processes (e.g., Lean transformations, Six Sigma initiatives)
   - Monitoring and sustaining quality improvements: Ensuring that changes are embedded and sustained long-term
5. **Motivating and Engaging Employees in Quality**
   - The importance of employee involvement in quality management processes
   - How leadership can foster a sense of ownership and accountability in quality activities
   - Motivation theories and their application to quality management: Maslow's hierarchy of needs, Herzberg's two-factor theory, and intrinsic vs. extrinsic motivation
   - Techniques for creating a work environment where employees feel empowered to contribute to quality improvement
   - Best practices for recognizing and rewarding quality achievements and contributions
6. **The Role of Teams in Quality Leadership**
   - Building and leading cross-functional teams to address quality challenges
   - The dynamics of high-performing quality teams: Communication, collaboration, and problem-solving
   - Leadership techniques for facilitating teamwork and managing conflicts within teams
   - Training and developing team members in quality tools and methodologies (e.g., root cause analysis, process mapping, FMEA)
   - Case studies of successful quality teams and leadership practices that supported their success
7. **Leadership and Ethical Responsibility in Quality**
   - The importance of ethical leadership in maintaining quality standards and integrity
   - Ethical decision-making in quality management: Balancing quality goals with business objectives

- Preventing and addressing unethical behavior in quality control, such as falsifying data or cutting corners
- Building a culture of accountability and trust: Encouraging transparency, ethical conduct, and whistleblowing
- Aligning quality leadership with corporate social responsibility (CSR) and sustainability goals

8. **Measuring Leadership Effectiveness in Quality Management**
   - Key performance indicators (KPIs) for evaluating leadership effectiveness in quality control
   - Methods for assessing leadership impact on quality outcomes: Employee satisfaction surveys, quality audits, and performance reviews
   - Feedback mechanisms for leadership improvement: 360-degree reviews, leadership coaching, and mentoring
   - Using data to track the success of quality initiatives and leadership performance
   - Adjusting leadership strategies based on performance and feedback
9. **Leadership Development in Quality Management**
   - Developing leadership competencies in quality management
   - Training programs for enhancing leadership skills in quality-related functions
   - Identifying and nurturing future quality leaders within the organization
   - Creating a leadership pipeline: Mentorship and succession planning for quality management roles
   - Leadership training tools: Workshops, seminars, e-learning, and coaching for quality leaders
10. **Case Studies and Real-World Applications**
    - Examining case studies of organizations that have successfully built a culture of quality through effective leadership
    - Analysis of leadership failures in quality management and the lessons learned
    - Group discussions on leadership challenges in quality control and proposed solutions
    - Best practices for leading quality initiatives across different industries (e.g., healthcare, manufacturing, services)
    - Real-world examples of quality leadership in action: Success stories from top companies known for their quality culture

Assessment and Evaluation

- **Group project:** Develop a quality leadership strategy for a hypothetical company, including plans for building a culture of quality and motivating employees.
- **Case study analysis:** Evaluate the leadership approach in a real-world case where quality improvement efforts were successful or failed, and propose alternative strategies.
- **Practical exams:** Role-play a leadership scenario where students must manage a quality crisis or drive a quality initiative.
- **Quizzes:** Test knowledge on leadership styles, change management principles, and strategies for fostering a quality culture.

Recommended Readings

- "The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer" by Jeffrey Liker
- "Leaders Eat Last: Why Some Teams Pull Together and Others Don't" by Simon Sinek
- "Creating a Lean Culture: Tools to Sustain Lean Conversions" by David Mann
- "The Five Dysfunctions of a Team: A Leadership Fable" by Patrick Lencioni
- "Leading Change" by John P. Kotter

Semester: 2
Teaching unit: UED 2.3
Subject 2: English/Russian in Professional Communication
VHS: 22 h30 (C: 1h30)
Credits: 1
Coefficient : 1

Module Overview

The primary objective of this module is to enhance students' proficiency in a foreign language within the context of professional communication. Students will develop the ability to effectively engage in verbal and written communication in a professional setting, focusing on industry-specific vocabulary, cultural nuances, and communication strategies. The module aims to prepare students for real-world scenarios where they must navigate language barriers and communicate effectively with diverse audiences.

Recommended Prerequisites: Students are expected to have a foundational understanding of the foreign language being studied, ideally at an intermediate level. Familiarity with basic professional communication concepts and practices is also recommended to facilitate deeper engagement with the course material.

Course Content:

7. Introduction to Professional Communication in a Foreign Language
    - Importance of language skills in the workplace
    - Overview of communication styles across cultures
8. Vocabulary Development
    - Industry-specific terminology
    - Common phrases and expressions used in professional settings
9. Verbal Communication Skills
    - Effective speaking techniques
    - Presentation skills in a foreign language
    - Role-playing exercises to simulate professional interactions
10. Written Communication Skills
    - Business writing fundamentals (emails, reports, proposals)
    - Understanding tone and formality in written correspondence
11. Cross-Cultural Communication
    - Navigating cultural differences in professional contexts
    - Strategies for effective intercultural communication
12. Case Studies and Practical Applications
    - Analysis of real-world scenarios
    - Group projects to apply learned skills in simulated environments

Assessment Methods: Students will be evaluated through a combination of formative and summative assessments, including:

- Participation in class discussions and role-playing exercises
- Written assignments demonstrating proficiency in business writing
- Oral presentations on selected topics relevant to professional communication

- A final project that integrates course concepts and showcases language skills in a professional context

Bibliographic References:

5. Guffey, M. E., & Loewy, D. (2018). *Business Communication: Process and Product*. Cengage Learning.
6. Hall, E. T. (1976). *Beyond Culture*. Anchor Books.
7. Hinds, J. (1990). *Inductive and Deductive Reasoning in Writing*. In *Cohesion in English* (pp. 185-206). Longman.
8. Scollon, R., & Scollon, S. W. (2001). *Intercultural Communication: A Discourse Approach*. Blackwell Publishing.

Semester: 3
Teaching unit: UEF 3.1
Subject 1: International standards and certifications.
VHS: 67 h30 (C 1h30; TD: 1h30, TP: 1h30)
Credits: 6
Coefficient: 3

Module Overview

In this module, students will learn about the various international standards that shape quality management systems (QMS) and ensure that products, services, and processes meet global quality expectations. This module will also cover the benefits and challenges of obtaining and maintaining quality certifications, such as ISO 9001, and explore the role of regulatory bodies and certifying organizations in the certification process. Additionally, students will gain insight into the audit and compliance processes that ensure standards are consistently met.

Learning Objectives

By the end of this module, students should be able to:

- Understand the importance of international standards in quality management.
- Identify and describe key international quality standards and their requirements.
- Explain the process of obtaining and maintaining certifications such as ISO 9001 and others.
- Understand the role of audits and continuous improvement in maintaining certifications.
- Evaluate the impact of certifications on organizational reputation, competitiveness, and market access.
- Analyze the relationship between certification and regulatory compliance in various industries.

Module Content

1. **Introduction to International Standards**
    - Definition and purpose of international standards in quality management
    - The role of international standards in ensuring consistency, safety, and efficiency in global markets
    - Key organizations that develop and maintain standards: International Organization for Standardization (ISO), International Electrotechnical Commission (IEC), and others
    - How international standards facilitate global trade by ensuring compatibility and reducing barriers
    - The significance of harmonization and alignment between regional and international standards
2. **ISO 9001: Quality Management Systems (QMS)**
    - Overview of ISO 9001: History, scope, and importance of the standard
    - Key principles of ISO 9001: Customer focus, leadership, engagement of people, process approach, improvement, evidence-based decision-making, relationship management
    - Detailed breakdown of ISO 9001 requirements: Context of the organization, leadership, planning, support, operation, performance evaluation, and improvement

- How to implement an ISO 9001 QMS: Step-by-step process from planning to certification
- Case studies of organizations successfully implementing ISO 9001

3. **ISO 14001: Environmental Management Systems**
   - Overview of ISO 14001 and its relationship with ISO 9001
   - Key principles of ISO 14001: Environmental policy, planning, implementation and operation, checking and corrective action, management review
   - Benefits of ISO 14001 certification: Improved environmental performance, reduced waste, compliance with regulations
   - Implementation strategies for ISO 14001: How organizations integrate environmental management into their quality systems
   - Case studies on organizations that have successfully achieved ISO 14001 certification
4. **ISO 45001: Occupational Health and Safety Management Systems**
   - Overview of ISO 45001: Importance of health and safety in the workplace
   - Key principles of ISO 45001: Risk assessment, leadership, employee involvement, performance evaluation, and continuous improvement
   - Benefits of ISO 45001: Reducing workplace accidents, improving employee well-being, and ensuring legal compliance
   - Steps to certification: From hazard identification to establishing controls and maintaining documentation
   - Case studies and examples of organizations achieving ISO 45001 certification
5. **Algerian Standards and the label TEDJ (IANOR)**
6. **Industry-Specific Certifications**
   - Overview of certifications that apply to specific industries, such as automotive (IATF 16949), food safety (ISO 22000), aerospace (AS 9100), and healthcare (ISO 13485)
   - Key requirements and differences between industry-specific standards and general quality standards like ISO 9001
   - The role of these certifications in improving product quality, safety, and regulatory compliance
   - How to achieve and maintain industry-specific certifications: Process, documentation, and audit considerations
   - Case studies from industries like automotive, food production, and aerospace to demonstrate the value of these certifications
7. **Certification Process: From Application to Maintenance**
   - Steps involved in obtaining a certification: Planning, documentation, gap analysis, implementation, internal audit, and external audit
   - The role of certifying bodies: Choosing the right certifying organization, understanding their audit process, and ensuring impartiality
   - What happens during an audit: The different stages of an audit (Stage 1: Documentation review, Stage 2: On-site audit)
   - Maintaining certification: Ongoing monitoring, internal audits, corrective actions, and re-certification audits
   - Understanding the certification cycle and the importance of continuous improvement in maintaining certification
8. **The Role of Audits in Quality Certification**
   - Overview of internal audits: Purpose, frequency, and how to prepare for them
   - External audits: What to expect, how to prepare, and what auditors look for during the certification process
   - How to conduct a successful audit: Preparing audit plans, selecting audit teams, and documenting findings

- The importance of non-conformity reports and corrective actions
- Follow-up and ensuring compliance with audit findings and recommendations

9. **Regulatory Compliance and Quality Certifications**
   - How regulatory bodies (e.g., FDA, OSHA, CE, etc.) influence the certification process
   - The relationship between quality certifications and regulatory compliance in various sectors such as pharmaceuticals, healthcare, and food industries
   - Examples of how quality certifications like ISO 9001 help companies meet legal and regulatory requirements
   - Consequences of non-compliance with quality standards and the importance of staying updated with regulatory changes
   - Global regulatory trends and their impact on certification practices
10. **The Benefits of Certification**
   - Enhanced organizational reputation: How certifications improve trust with customers, stakeholders, and regulators
   - Competitive advantage: The role of certification in differentiating a company in the marketplace
   - Operational efficiency: How implementing and maintaining standards improves productivity and reduces waste
   - Legal and regulatory compliance: Certification helps companies stay compliant with local and international laws
   - Customer satisfaction and loyalty: How certifications drive consistent quality and enhance customer experience
11. **Challenges and Costs of Certification**
   - The costs involved in obtaining and maintaining certification: Application fees, audit fees, staff training, and infrastructure changes
   - Challenges faced by organizations in achieving certification: Resistance to change, resource allocation, documentation and process changes
   - Overcoming common barriers: Strategies for successful implementation and ensuring stakeholder buy-in
   - The impact of maintaining certification on long-term business operations and sustainability

Assessment and Evaluation

- **Group project:** Research and present a case study of a company that successfully achieved an international certification (e.g., ISO 9001, ISO 14001), detailing the challenges, benefits, and certification process.
- **Quizzes:** Test understanding of various standards (ISO 9001, ISO 14001, ISO 45001) and the certification process.
- **Practical exams:** Simulate a certification audit process, where students role-play as auditors or auditees.
- **Written assignment:** Evaluate the impact of obtaining industry-specific certifications (e.g., IATF 16949 for automotive or ISO 22000 for food safety) on an organization's quality performance.

Recommended Readings

- "ISO 9001:2015 Explained" by Nicholas Walliman
- "The ISO 14001:2015 Implementation Handbook" by Milton P. Dentch
- "ISO 45001:2018: A Complete Guide" by Ian P. D. Kinchin
- "The Certified Quality Auditor Handbook" by Connie M. Borror
- "IATF 16949:2016 Automotive Quality Management System" by Chad Kymal

Semester: 3
Teaching unit: UEF 3.2
Subject 2: Introduction to Automatic control system
VHS: 45h00 (C: 1h30; TP1h30)
Credits: 4
Coefficient: 2

Module Overview

This module provides a comprehensive introduction to the principles and applications of automatic control systems. It covers the fundamental concepts, mathematical models, and techniques used in the design and analysis of control systems. Students will gain an understanding of how automatic control systems are implemented in various engineering fields.

Learning Objectives

- By the end of this module, students will be able to:
-
- Understand the basic concepts and terminology of automatic control systems.
- Analyze and model dynamic systems using differential equations and transfer functions.
- Design and evaluate control systems using various control strategies (e.g., PID control).
- Apply stability criteria and performance measures to assess control system behavior.
- Utilize simulation tools to model and analyze control systems.

Module Content

Introduction to Control Systems

Definition and importance of control systems

Types of control systems: open-loop vs closed-loop

Mathematical Modeling of Dynamic Systems

Differential equations and their applications

Transfer functions and state-space representation

System Response Analysis

Time-domain analysis: step response, impulse response

Frequency-domain analysis: Bode plots, Nyquist plots

Control System Design

PID controllers: principles and tuning methods

Root locus and frequency response methods

Stability Analysis

Routh-Hurwitz criterion

Nyquist stability criterion

Simulation and Implementation

Introduction to simulation tools (e.g., MATLAB/Simulink)

applicationsAssessment and Evaluation

- **Group project:** Develop a proposal for integrating an automated quality control system in a hypothetical company, detailing the technologies, processes, and benefits.
- **Practical exam:** Simulate an automated inspection or testing process using a case study, demonstrating how automation can improve accuracy and efficiency.
- **Case study analysis:** Analyze a case where automation was implemented in a quality control system, evaluating the challenges, benefits, and overall impact.
- **Quizzes:** Test understanding of automation technologies, control systems, and their applications in quality control.

Recommended Readings

Ogata, K. (2010). Modern Control Engineering. Prentice Hall.
Nise, N. S. (2015). Control Systems Engineering. Wiley.
Franklin, G. F., Powell, J. D., & Emami-Naeini, A. (2014). Feedback Control of Dynamic Systems. Pearson.
MATLAB Documentation and User Guides for Simulink.

Semester: 3
Teaching unit: UEF 3.3
Subject 3: Management tools and methods and quality control
VHS: 67 h30 (C: 1h30 TD: 1h30 TP: 1h30)
Credits:6
Coefficient: 3

Module Overview

This module provides a comprehensive overview of the management tools and methods used in quality control to support continuous improvement and effective decision-making. It focuses on tools such as Six Sigma, Total Quality Management (TQM), Lean, and various statistical techniques. The module will explore how these methodologies can be applied to optimize processes, reduce waste, improve efficiency, and enhance product quality. It will also highlight the importance of data-driven decision-making and how management tools can facilitate strategic planning and problem-solving in quality control.

Learning Objectives

By the end of this module, students should be able to:

- Understand the various management tools and methods used in quality control.
- Apply tools like Six Sigma, Lean, and TQM to solve quality-related problems.
- Analyze and interpret quality data using statistical methods.
- Use decision-making tools to optimize processes and improve quality.
- Implement continuous improvement strategies using various quality management methodologies.
- Develop problem-solving strategies for quality control challenges using appropriate management tools.

Module Content

1. **Introduction to Management Tools in Quality Control**
    - Overview of management tools and methods in quality control.
    - The importance of a structured approach to managing quality: Efficiency, waste reduction, process optimization, and customer satisfaction.
    - Key principles of quality management: Customer focus, continuous improvement, and data-driven decision-making.
    - How management tools support the implementation of quality strategies and systems within an organization.
2. **Six Sigma Methodology**
    - Overview of Six Sigma: A data-driven methodology focused on reducing defects and variations in processes.

- The DMAIC process (Define, Measure, Analyze, Improve, Control): How each phase is applied to quality control.
- Tools used in Six Sigma: Statistical Process Control (SPC), Fishbone diagrams, Pareto analysis, Control charts, and Failure Mode and Effects Analysis (FMEA).
- Benefits of Six Sigma: Enhanced product quality, reduced variation, cost savings, and improved customer satisfaction.
- Real-world examples of Six Sigma implementation in different industries.

3. **Total Quality Management (TQM)**
   - Overview of TQM: A comprehensive approach that emphasizes long-term success through customer satisfaction and continuous improvement.
   - Key principles of TQM: Customer focus, continuous improvement, employee involvement, and process approach.
   - The role of leadership in TQM: Creating a quality-oriented culture, establishing a vision, and fostering communication across departments.
   - Tools and techniques in TQM: Quality Function Deployment (QFD), benchmarking, quality circles, and the PDCA (Plan-Do-Check-Act) cycle.
   - Benefits of TQM: Improved quality, reduced costs, better customer relationships, and enhanced employee engagement.
4. **Lean Management and Quality Control**
   - Introduction to Lean: A methodology aimed at maximizing value by eliminating waste and improving flow in processes.
   - The 5S methodology: Sort, Set in order, Shine, Standardize, Sustain.
   - Value Stream Mapping (VSM): A tool used to visualize the flow of materials and information, identifying areas for improvement.
   - The role of Lean in quality control: Reducing cycle time, improving process efficiency, and eliminating non-value-added activities.
   - Lean tools: Kanban, Kaizen, Just-In-Time (JIT), and Poka-yoke (mistake-proofing).
   - Case studies of Lean applications in manufacturing and service industries.
5. **Statistical Quality Control (SQC)**
   - Introduction to statistical methods in quality control: How data analysis supports quality improvement.
   - Key SQC tools: Control charts, histograms, scatter diagrams, and Pareto analysis.
   - The role of control charts in monitoring process stability and performance over time.
   - Statistical techniques for process optimization: Regression analysis, hypothesis testing, and sampling.
   - Using SQC to make data-driven decisions and improve process capability.
6. **Root Cause Analysis (RCA) and Problem Solving Methods**
   - Overview of Root Cause Analysis (RCA): A systematic approach to identifying the underlying causes of quality issues.
   - RCA tools: Fishbone diagram (Ishikawa), 5 Whys, and Fault Tree Analysis (FTA).
   - Problem-solving techniques: Brainstorming, Affinity diagrams, and Pareto analysis.
   - The role of RCA in continuous improvement: Identifying areas for corrective and preventive actions.

- Applying RCA in real-world quality control challenges to drive permanent solutions.

7. **Decision-Making Tools in Quality Control**
   - Introduction to decision-making tools: How to make informed choices based on data and quality objectives.
   - Tools for decision-making: Decision matrices, cost-benefit analysis, SWOT analysis (Strengths, Weaknesses, Opportunities, Threats), and risk analysis.
   - The role of decision-making in improving product quality and optimizing processes.
   - How decision-making tools help in selecting the best corrective actions, process improvements, or supplier choices.
8. **Benchmarking for Quality Improvement**
   - Introduction to benchmarking: A process of comparing an organization's quality performance with best practices or competitors.
   - Types of benchmarking: Internal, competitive, functional, and generic benchmarking.
   - How benchmarking helps identify quality gaps and improvement opportunities.
   - The process of benchmarking: Planning, data collection, analysis, and implementation.
   - Benefits of benchmarking: Enhanced quality performance, continuous learning, and maintaining competitive advantage.
9. **The Role of Leadership in Quality Management Tools**
   - The importance of leadership in implementing quality management tools: Setting goals, promoting a quality culture, and ensuring alignment with organizational objectives.
   - Leadership commitment to continuous improvement: Encouraging innovation, supporting employee involvement, and fostering a learning environment.
   - Creating an organizational structure that supports the effective use of quality management tools: Cross-functional teams, communication channels, and employee empowerment.
10. **Continuous Improvement: PDCA Cycle**
    - The PDCA (Plan-Do-Check-Act) cycle: A systematic approach to continuous improvement in quality management.
    - Applying the PDCA cycle to quality control: Planning for quality improvements, implementing changes, checking the results, and acting on findings.
    - The role of PDCA in fostering a culture of ongoing improvement and responsiveness to customer needs.
    - How PDCA integrates with other methodologies such as TQM, Lean, and Six Sigma to drive quality enhancements.
11. **Case Studies and Applications of Management Tools in Quality Control**
    - Analyzing case studies where management tools and methodologies were successfully applied to solve quality problems and enhance performance.
    - Real-world examples from industries like manufacturing, healthcare, automotive, and service sectors.
    - Group discussions on applying these tools to hypothetical quality control scenarios: Identifying the right methodology, applying the tools, and measuring success.

Assessment and Evaluation

- **Group project:** Analyze a quality issue within a company, propose solutions using appropriate management tools (e.g., Six Sigma, Lean, TQM), and present a detailed improvement plan.
- **Case study analysis:** Review and discuss a real-world case where management tools were implemented to improve quality in a specific industry.
- **Practical exam:** Use statistical methods and problem-solving techniques to address a quality challenge, such as performing root cause analysis or applying the PDCA cycle.
- **Quizzes:** Test knowledge of key management tools, methodologies, and their applications in quality control.

Recommended Readings

- "The Lean Six Sigma Pocket Toolbook" by Michael L. George, David T. Rowlands, Mark Price, and John Maxey
- "Total Quality Management: Key Concepts and Case Studies" by D.R. Kiran
- "The Six Sigma Handbook" by Thomas Pyzdek and Paul A. Keller
- "Lean Thinking: Banish Waste and Create Wealth in Your Corporation" by James P. Womack and Daniel T. Jones
- "Statistical Methods for Quality Improvement" by Thomas P. Rya

TP :

1. "Effective Management Tools for Enhanced Team Performance"
2. "Quality Control Techniques: Ensuring Excellence in Production"
3. "Implementing Lean Management: Tools and Strategies"
4. "The Role of Six Sigma in Quality Improvement"
5. "Project Management Tools: A Practical Approach"
6. "Quality Assurance Methods: Best Practices for Success"
7. "Agile Management: Tools for Dynamic Project Execution"
8. "Total Quality Management: Principles and Applications"
9. "Data-Driven Decision Making in Quality Control"
10. "Exploring the Impact of Management Tools on Organizational Efficiency"

Semester: 3
Teaching unit: UEM 3.1
Subject : Scientific research in mechanical engineering technology
VHS: 45 h00 (C: 1h30 TD: 1h30)
Credits: 4
Coefficient: 2

Module Overview

Objectives of the Course:

The primary objective of this course is to provide students with a comprehensive understanding of the principles and methodologies of scientific research within the field of mechanical engineering technology. Students will learn to formulate research questions, design experiments, and analyze data relevant to mechanical engineering applications. The course aims to develop critical thinking, problem-solving skills, and the ability to conduct independent research, while also emphasizing the importance of ethical considerations in engineering research.

Recommended Prerequisites:

Students are expected to have a foundational knowledge of mechanical engineering principles, including mechanics, thermodynamics, and materials science. Familiarity with research methodologies and basic statistical analysis is recommended. Prior coursework in engineering design, CAD software, and laboratory practices will be beneficial for a deeper understanding of the course material.

Course Content:

1. **Introduction to Research in Mechanical Engineering**
    - Overview of the role of research in mechanical engineering technology
    - Types of research: experimental, theoretical, and computational
    - The scientific method and its application in engineering research
2. **Formulating Research Questions and Hypotheses**
    - Identifying research gaps in mechanical engineering
    - Developing clear and testable hypotheses
    - Conducting literature reviews to support research proposals
3. **Experimental Design and Methodology**
    - Key components of experimental design: variables, controls, and replicates
    - Techniques for designing experiments in mechanical engineering contexts
    - Use of simulation tools and software in research
4. **Data Collection and Analysis**
    - Methods for data collection in mechanical experiments
    - Statistical analysis techniques relevant to engineering research
    - Interpretation of results and drawing conclusions
5. **Ethics in Engineering Research**
    - Ethical considerations in conducting research
    - Responsible conduct of research: integrity, transparency, and accountability
    - Institutional Review Boards (IRBs) and ethical approval processes

6. **Communicating Research Findings**
    - Writing research proposals and technical reports
    - Presenting research results: posters, presentations, and publications
    - Understanding the peer review process and publication ethics
7. **Emerging Trends in Mechanical Engineering Research**
    - Current trends and innovations in mechanical engineering technology
    - The impact of Industry 4.0 and automation on research
    - Sustainability and environmental considerations in engineering research

Assessment Methods:

Students will be evaluated through a combination of assessments, including:

- Written research proposals and project reports
- Laboratory reports detailing experimental design and findings
- Quizzes and examinations to assess understanding of key concepts
- Participation in class discussions and presentations

Bibliographic References:

1. Budynas, R. G., & Nisbett, J. (2015). *Shigley's Mechanical Engineering Design*. McGraw-Hill.
2. Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Sage Publications.
3. Montgomery, D. C. (2017). *Design and Analysis of Experiments*. Wiley.
4. Raghavan, V. (2018). *Research Methodology in Mechanical Engineering*. Springer.

Semester: 3
Teaching unit: UEM 3.2
Subject2: Digital resources in scientific research.
VHS: 45 h00 (C: 1h30 TP: 1h30)
Credits: 4
Coefficient: 2

Module Overview: The primary objective of this module is to equip students with the necessary skills and knowledge to effectively utilize digital resources in scientific research. Students will learn to identify, evaluate, and apply various digital tools and platforms that enhance research productivity and collaboration. Additionally, the module aims to foster critical thinking regarding the ethical use of digital resources in the research process.

Recommended Prerequisites: Students are expected to have a foundational understanding of research methodologies and basic computer literacy. Familiarity with academic writing and citation practices is also recommended to facilitate engagement with the course material.

Course Content:

1. Introduction to Digital Resources in Research
    - Overview of digital tools and their significance in scientific research
    - Types of digital resources: databases, online journals, and research networks
2. Information Literacy
    - Techniques for effective searching and retrieving information
    - Evaluating the credibility and relevance of digital sources
3. Data Management and Sharing
    - Best practices for data organization and storage
    - Understanding data sharing platforms and their implications for collaboration
4. Ethical Considerations
    - Copyright, plagiarism, and the ethical use of digital resources
    - Open access and the impact on scientific communication
5. Emerging Technologies in Research
    - Introduction to tools such as data visualization software, reference management tools, and collaborative platforms
    - The role of artificial intelligence and machine learning in research

Assessment Method: Students will be evaluated through a combination of assignments, including a research project utilizing digital resources, participation in discussions, and a final examination that assesses their understanding of the course material.

Bibliographic References:

1. Rowlands, I., & Nicholas, D. (2006). The impact of digital resources on research practices: A study of the UK academic community. *Journal of Information Science*, 32(6), 563-573.
2. Tenopir, C., & King, D. W. (2004). *Communication Patterns of Engineers*. Wiley.
3. Borgman, C. L. (2007). *Scholarship in the Digital Age: Information, Infrastructure, and the Internet*. MIT Press.
4. McNaught, C., & Lam, P. (2010). *Using Digital Resources for Research: A Guide for Researchers*. Routledge.

TP :

1. "Harnessing Digital Tools for Scientific Research: A Practical Approach"
2. "Exploring Online Databases: A Hands-On Guide for Researchers"
3. "The Role of Digital Resources in Modern Scientific Inquiry"
4. "Utilizing Open Access Journals: Strategies for Effective Research"
5. "Data Management in the Digital Age: Best Practices for Scientists"
6. "Navigating Digital Libraries: A Practical Workshop for Researchers"
7. "Integrating Digital Resources into Research Methodologies"
8. "The Impact of Digital Technologies on Scientific Collaboration"
9. "From Data to Discovery: Leveraging Digital Resources in Research"
10. "Ethics and Digital Resources: Navigating the Challenges in Scientific Research"

Semester: 3
Teaching unit: UEM 3.3
Subject 3: Audit and certification in quality management.
VHS: 45 h00 (C: 1h30 TP: 1h30)
Credits: 2
Coefficient: 2

Module Overview

This module introduces students to the essential concepts and processes of auditing and certification in the field of quality management. It covers the role of internal and external audits in verifying that a company's quality management system (QMS) conforms to established standards. Students will learn how audits contribute to compliance, risk management, and continuous improvement. Additionally, the module explores various certification programs such as ISO 9001, IATF 16949, and others, and how they drive quality excellence within organizations.

Learning Objectives

By the end of this module, students should be able to:

- Understand the purpose and importance of auditing and certification in quality management.
- Differentiate between internal and external audits and their roles in QMS evaluation.
- Conduct internal audits to assess compliance with quality management standards.
- Understand the process of obtaining and maintaining quality certifications (e.g., ISO 9001, IATF 16949).
- Prepare for external audits by regulatory bodies or certification organizations.
- Identify common challenges in quality management audits and certification processes.
- Apply audit results to recommend corrective actions and drive continuous improvement.

Module Content

1. **Introduction to Auditing in Quality Management**
    - The importance of auditing in ensuring compliance with quality standards.
    - The role of audits in verifying that a QMS is effective and functioning as intended.
    - Types of audits: Internal audits, external audits, and third-party audits.
    - The audit process: Planning, conducting, reporting, and follow-up.
    - Differences between compliance audits and performance audits.
    - The role of auditing in risk management and continuous improvement.
2. **Types of Audits in Quality Management**
    - **Internal Audits**: Conducted by an organization's internal staff to evaluate the effectiveness and compliance of its QMS.
        - Objectives of internal audits: Identifying non-conformities, assessing process effectiveness, and ensuring ongoing improvement.

        - Audit planning and preparation: Developing an audit schedule, defining scope, and selecting auditors.
        - Audit execution: Conducting interviews, reviewing documentation, observing processes, and collecting evidence.
        - Reporting audit findings: Non-conformities, observations, and corrective actions.
        - Follow-up and verification: Ensuring corrective actions are taken and evaluating effectiveness.
    - **External Audits**: Performed by third-party auditors to assess compliance with regulatory standards or certification requirements.
        - Certification audits: Audits conducted by certification bodies to determine whether a company meets the criteria for certification (e.g., ISO 9001, IATF 16949).
        - Regulatory audits: Audits performed by government agencies or industry regulators to ensure compliance with laws and regulations.
        - The role of audit reports and findings in influencing certification decisions.
    - **Supplier Audits**: Audits conducted to assess the quality control processes of suppliers, ensuring that they meet the organization's quality requirements.
3. **Quality Management System Standards and Certification**
    - **ISO 9001:2015 (Quality Management Systems)**: An overview of the requirements for ISO 9001 certification, focusing on the QMS framework, process approach, and customer focus.
        - Key principles: Leadership, planning, support, operation, performance evaluation, and improvement.
        - Certification process: Steps to achieve certification, including preparation, documentation, audit, and certification maintenance.
        - The role of internal audits in maintaining ISO 9001 certification.
    - **IATF 16949:2016 (Automotive Quality Management)**: A specialized standard for the automotive industry, focusing on product and process quality in automotive manufacturing.
        - Key requirements: Product traceability, risk management, preventive actions, and supplier management.
        - Certification and maintenance of IATF 16949.
    - **Other Standards**: Overview of other quality management standards, such as ISO 14001 (Environmental Management), ISO 45001 (Occupational Health and Safety), and ISO 13485 (Medical Devices).
    - The benefits of certification: Improved process efficiency, better customer satisfaction, and competitive advantage.
4. **Audit Planning and Preparation**
    - The importance of proper audit planning: Defining the scope, objectives, and criteria of the audit.
    - Preparing the audit team: Selecting qualified auditors, assigning roles, and preparing audit checklists.
    - Documentation review: Examining previous audit reports, QMS documentation, and relevant records.

5. **Audit Execution and Data Collection**
    - Conducting the audit: How to interact with the auditee, collect data, and observe processes.
    - Interviewing staff and management: Gathering insights on QMS practices and identifying potential non-conformities.
    - Reviewing documents and records: Verifying that processes are being documented and followed according to standards.
6. **Audit Reporting and Documentation**
    - Writing audit reports: Structure of an audit report, including an executive summary, findings, non-conformities, and recommendations.
    - Non-conformities: Identifying and categorizing non-conformities (major and minor) and their impact on the QMS.
    - Root cause analysis: Analyzing non-conformities to determine their root causes and suggest corrective actions.
    - .
7. **Corrective and Preventive Actions (CAPA)**
    - The role of CAPA in the audit process: Addressing non-conformities and preventing their recurrence.
    - Steps for implementing CAPA: Identifying root causes, implementing corrective actions, and verifying effectiveness.
8. **Audit Follow-Up and Closure**
    - Follow-up audits: Verifying that corrective actions have been implemented and are effective.
    - Audit closure: Concluding the audit process by confirming that all audit objectives have been met.
    - Maintaining audit records: Proper documentation of audit findings, corrective actions, and audit reports for future reference.
9. **Challenges in Auditing and Certification**
    - Common challenges in the audit and certification process: Resource constraints, resistance to change, and difficulty in identifying non-conformities.
    - Overcoming challenges: Training auditors, ensuring top management commitment, and fostering a quality culture.
    - Dealing with audit failures: Steps to address failed audits and prepare for re-audit or certification renewal.
    - The role of audits in identifying opportunities for process improvement.
10. **Maintaining Certification and Continuous Improvement**
    - The ongoing nature of certification: The importance of continuous improvement in maintaining certification.
    - Surveillance audits: Regular follow-up audits conducted by certification bodies to ensure continued compliance with standards.
11. **Case Studies and Real-World Applications**
    - Case studies of organizations that achieved ISO 9001 and other certifications.
    - Analyzing audit findings and corrective actions taken in real-world scenarios.

- Group discussions: Evaluating the effectiveness of audits and certification processes in improving quality and compliance.

Assessment and Evaluation

- **Group project:** Conduct a mock internal audit for a hypothetical organization, identify non-conformities, and prepare an audit report with recommendations for corrective actions.
- **Practical exam:** Simulate a certification audit scenario, where students perform an audit of a QMS, report findings, and suggest improvements.
- **Case study analysis:** Review a case where a company achieved certification and analyze the audit and certification process, identifying key challenges and lessons learned.
- **Quizzes:** Test understanding of audit processes, certification standards, and auditing best practices.

Recommended Readings

- "ISO 9001:2015 Internal Audits Made Easy" by Ann W. Phillips
- "The ISO 9001:2015 Implementation Handbook" by Milton P. Dentch
- "Auditing and Assurance Services" by Arens, Elder, and Beasley
- "IATF 16949:2016 - A Complete Guide to the Automotive Quality Standard" by N. D. S. A. Meil

TP:

1. "Quality Management System Audit: Best Practices and Methodologies"
2. "Certification Processes in Quality Management: A Comprehensive Guide"
3. "Conducting Effective Quality Audits: Tools and Techniques"
4. "The Role of Audits in Continuous Quality Improvement"
5. "ISO 9001 Certification: Steps to Achieve Compliance"
6. "Evaluating Quality Management Systems: An Audit Approach"
7. "Case Studies in Quality Management Audits and Certifications"
8. "The Impact of Quality Audits on Organizational Performance"
9. "Preparing for a Quality Management Certification Audit"
10. "Understanding the Audit Cycle in Quality Management"

Semester: 3
Teaching unit: UEM 3.3
Subject 1: Organization and production planning
VHS: 22 h30 (C: 1h30)
Credits: 2
Coefficient: 1

Module Overview

This module focuses on the principles and practices of organization and production planning within manufacturing and service industries. It covers the strategic and operational aspects of planning, scheduling, and controlling production processes to optimize efficiency and meet customer demands. Students will learn how to design effective production systems and manage resources effectively.

Learning Objectives

By the end of this module, students will be able to:

Understand the key concepts and terminology related to organization and production planning.

Analyze production processes and identify areas for improvement.

Develop production plans that align with organizational goals and customer requirements.

Apply various scheduling techniques to optimize resource utilization.

Evaluate the impact of production planning decisions on overall organizational performance.

Module Content

Introduction to Organization and Production Planning

Definition and importance of production planning

Overview of production systems and processes

Production Planning Strategies

Types of production planning: make-to-order, make-to-stock, and assemble-to-order

Capacity planning and resource allocation

Forecasting Demand

Techniques for demand forecasting (qualitative and quantitative methods)

Importance of accurate forecasting in production planning

Scheduling Techniques

Overview of scheduling methods (Gantt charts, critical path method, etc.)

Job shop scheduling vs. flow shop scheduling

Inventory Management

Role of inventory in production planning

Inventory control techniques (EOQ, JIT, ABC analysis)

Production Control

Monitoring and controlling production processes

Key performance indicators (KPIs) for production efficiency

Case Studies and Best Practices

Real-world examples of effective organization and production planning

Lessons learned from industry leaders

Assessment and Evaluation

Quizzes: Short quizzes to assess understanding of key concepts (20%).

Assignments: Practical assignments involving the development of production plans and scheduling (30%).

Midterm Exam: A comprehensive exam covering the first half of the module (25%).

Final Project: A group project focused on creating a detailed production plan for a specific product or service (25%).

Recommended Readings

Stevenson, W. J. (2018). Operations Management. McGraw-Hill.

Heizer, J., & Render, B. (2016). Operations Management. Pearson.

Slack, N., Chambers, S., & Johnston, R. (2010). Operations Management. Pearson.

Online resources and case studies related to organization and production planning.

Semester: 3
Teaching unit: UED 3.1
Subject 1: Entrepreneurship
VHS: 22 h30 (C: 1h30)
Credits: 1
Coefficient: 1

Course Objectives:

- To gather business ideas, concepts, and techniques that will enable students to develop managerial skills.
- To allow students to make informed decisions regarding the future directions of the business.
- This type of thinking, encouraged by the adopted approach, will provide a bridge between the technical training program and project management concepts, leading to the creation of a new business based on the development of an innovative new product.
- This subject is designed to provide a framework and overview for students to think integratively about the future strategy of the business.

Recommended Prerequisites:

Course Content:

1. Business Structures and Organizations
2. The Business Environment
3. Functions within a Business
4. Steps in Business Creation
5. The Innovative Business
6. Research and Development in a Business (R&D)
7. Business Strategies and Their Development
8. Developing a Business Plan for an Innovative Project
9. Types of Business Plans
10. How to Attract Investors to Fund Your Business Project
11. Supply Chain Management in Business (SCM)

Semester: 3
Teaching unit: UED 3.3
Subject 2: English/Russian in Professional Communication
VHS: 22h30 (C: 1h30)
Credits: 1
Coefficient: 1

Module Overview:
The primary objective of this module is to enhance students' proficiency in a foreign language within the context of professional communication. Students will develop the ability to effectively engage in verbal and written communication in a professional setting, focusing on industry-specific vocabulary, cultural nuances, and communication strategies. The module aims to prepare students for real-world scenarios where they must navigate language barriers and communicate effectively with diverse audiences.

Recommended Prerequisites: Students are expected to have a foundational understanding of the foreign language being studied, ideally at an intermediate level. Familiarity with basic professional communication concepts and practices is also recommended to facilitate deeper engagement with the course material.

Course Content:

13. Introduction to Professional Communication in a Foreign Language
    - Importance of language skills in the workplace
    - Overview of communication styles across cultures
14. Vocabulary Development
    - Industry-specific terminology
    - Common phrases and expressions used in professional settings
15. Verbal Communication Skills
    - Effective speaking techniques
    - Presentation skills in a foreign language
    - Role-playing exercises to simulate professional interactions
16. Written Communication Skills
    - Business writing fundamentals (emails, reports, proposals)
    - Understanding tone and formality in written correspondence
17. Cross-Cultural Communication
    - Navigating cultural differences in professional contexts
    - Strategies for effective intercultural communication
18. Case Studies and Practical Applications
    - Analysis of real-world scenarios
    - Group projects to apply learned skills in simulated environments

Assessment Methods: Students will be evaluated through a combination of formative and summative assessments, including:

- Participation in class discussions and role-playing exercises
- Written assignments demonstrating proficiency in business writing

- Oral presentations on selected topics relevant to professional communication
- A final project that integrates course concepts and showcases language skills in a professional context

Bibliographic References:

9. Guffey, M. E., & Loewy, D. (2018). *Business Communication: Process and Product*. Cengage Learning.
10. Hall, E. T. (1976). *Beyond Culture*. Anchor Books.
11. Hinds, J. (1990). *Inductive and Deductive Reasoning in Writing*. In *Cohesion in English* (pp. 185-206). Longman.
12. Scollon, R., & Scollon, S. W. (2001). *Intercultural Communication: A Discourse Approach*. Blackwell Publishing.

V – curriculum vitae
Of the teaching team involved in the speciality
(Internal and external)

CV

Nom et Prénom : HAMOUDA Khaled

Dernier Diplôme et date d'obtention : Doctorat, 2001, DSTU Rostov on Don RUSSIE
Spécialité : Construction Mécanique.
Grade : Professeur
Fonction : Enseignant - Chercheur

Etablissement de rattachement : Université des Sciences et de la Technologie Houari Boumediene, Alger
Domaines scientifiques d'intérêts :

Indiquer les 05 dernières publications :

1. Study of the Forces Acting on new Cutting Driving Mechanism of Reciprocating Mowers. Mohamed Amine Djema, Dj. Saidi, K.Hamouda, [...].
Journal: AMA-Agricultural Mechanization in Asia Africa and Latin America
ID: AMA-27-04-2024-13012, Volume 55, Issue 04, April 2024. ISSN: 00845841,

2. Contribution à l'amélioration de la résistance à l'usure du matériau AISI 1010 par le procédé de tribofinition utilisant les plans expérimentaux Box-Behnkenorum sur les défauts et la diffusion
Djamel Saidi Djema Mohamed Amine Khaled Hamouda [...]Mohamed Bouaziz
Décembre 2023 *Forum sur les défauts et la diffusion.*

3. Contribution to the Improvement of the Wear Resistance of the AISI 1010 Material by the Tribofinishing
Process Using the Box-Behnken Experimental Designs.
Dj. Saidi, Mohamed Amine Djema, K. Hamouda, S. Abdi, M. Bouaziz
Defect and Diffusion Forum ISSN: 1662-9507, Vol. 429, pp 127-135 © 2023 Trans Tech Publications Ltd,Switzerland.

4. Analyse du comportement vibratoire d'une poutre boulonnée en présence de frottement.
Khaled Hamouda H. BournineKhaled Brahimi[...]Alain Le Bot Janvier 2022 *Dinamika Nelineinaya*

5. Modélisation statistique et optimisation des facteurs affectant la rugosité de surface de l'acier C45 traité par le procédé de finition de masse par disque

centrifuge.
Kamel Djender **Khaled Hamouda** Mourad Keddam MH Amrou
Janvier 2020 *Journal international de l'innovation en ingénierie des matériaux.*

CV

Nom et Prénom : ABDI Said

Dernier Diplôme et date d'obtention : Doctorat d'état / Mai 2003

Spécialité : Génie Mécanique / option : Génie Matériaux

Grade : Professeur

Fonction : Enseignant chercheur /Directeur de recherche

Etablissement de rattachement : U S T H B **Domaines scientifiques d'intérêts :** Génie des surfaces **Les 05 dernières publications :**

1- S. Abdi and S. Lebaili, Alternative to chromium, a hard alloy powder NiCrBCSi (Fe) coatings thermally sprayed on 60CrMn4 steel. Phase and comportments". Physics Procedia, vol 02 issue 3 (2009) 637–642, Site Web: http://www.sciencedirect.com

2- Abdi , B.Malki and S. Lebaili, "Tribological and adhesion behaviour of hard alloy powder NiCrBCSi(Fe) coatings thermally sprayed on 60CrMn4 steel" Int, Journal Microstructure and Materials properties, Volume:.4 No: 3. (2009) 330–346 Site Web: http://www.inderscience.com 3-E. Bouaroudj, W. Bouzidi, O. Menchi, S. ABDI, « "Effect of copper powder insert layer on the proprieties of friction welded joints between Al Cu 4140 structural steel". Defect and Diffusion Forum, Volumes 283 - 286, (2009), P166-170. http://www.scientific.net

4- S. Abdi, B. Malki, S. Lebaili, "Effect of Bond Coat Diffusion on Adhesion Behaviour of Hard Alloy Powder NiCrBCSi (Fe) Coatings Thermally Sprayed on 60CrMn4 Steel", Defect and Diffusion Forum,, Volumes 273 -276, (2008), P8-13. Site Web: http://www.scientific.net

5- S. Abdi S. Llebaili, S. Hamar Thibault, « Addition effect of iron in NiCrWSiBC alloys, phases and comportments », Materials Engineering, vol 13, n.1 2002, pp 121-139

CV

Nom et Prénom : DJEMA Mohamed Amine

Dernier Diplôme et date d'obtention : Doctorat, 2000, *Centre kazakh de Recherches Scientifiques en Mecanisation et électrification. Almaty , Kazakhstan*

Spécialité : Construction Mécanique.

Grade : Professeur
Fonction : Enseignant - Chercheur

Etablissement de rattachement : Université des Sciences et de la Technologie Houari Boumediene, Alger
Domaines scientifiques d'intérêts :

Indiquer les 05 dernières publications :

1. Study of the Forces Acting on new Cutting Driving Mechanism of Reciprocating Mowers.

Mohamed Amine Djema, Dj. Saidi, K.Hamouda, [...].
Journal: AMA-Agricultural Mechanization in Asia Africa and Latin America
ID: AMA-27-04-2024-13012, Volume 55, Issue 04, April 2024 . ISSN: 00845841,

2. Contribution to the Improvement of the Wear Resistance of the AISI 1010 Material by the Tribofinishing Process Using the Box-Behnken Experimental Designs.
Dj. Saidi, **Mohamed Amine Djema,** K. Hamouda, S. Abdi, M. Bouaziz
Defect and Diffusion Forum ISSN: 1662-9507, Vol. 429, pp 127-135 © 2023 Trans Tech Publications Ltd, Switzerland.

3. Determining mower's double cutter-bar basic parameters.
Mohamed Amine Djema, Dj. Saidi, Zh. Zhortuylov, A. Adilsheev.
Journal: AMA-Agricultural Mechanization in Asia Africa and Latin America
ID: AMA-24-04-2023-12213, Volume 54, Issue 04, April 2023, ISSN: 00845841.

4. Feed Rate and the Pinch of the Cutting Mechanism with Double Strokes Knives.
Mohamed Amine Djema, Zhortuylov Omerserik and Saidi Djamel
Journal: Imperial Journal of Interdisciplinary Research (IJIR) Vol-2, Issue-12, 2016.
ISSN: 2454-1362, http://www.onlinejournal.in.

CV

Nom et Prénom : DJERDJARE Boubekeur

Dernier Diplôme et date d'obtention : Doctorat d'état / Juin 2007

Spécialité : Génie Mécanique / option : Génie Matériaux

Grade : Professeur

Fonction : Enseignant chercheur /Directeur de recherche

Etablissement de rattachement : U S T H B

Domaines scientifiques d'intérêts : Génie des surfaces/Génie des matériaux

Les 05 dernières publications:

1- **B. Djerdjare**; S. Lebaili; S. Lay: « Microstrustructral study of Co-Ni-Fe based alloys». Materials science and engineering A. 475. pp.336-342. **(2008)**.

2- Amine Rezzouga,[b*], Said Abdi[b], Samir Mouffok[b], Fares Djemateneb & **Boubekeur Djerdjare [b]** Tribological investigation of carbon fiber-epoxy composite reinforced by metallic filler layer .Indian Journal of Engineering & Materials Sciences

Vol. 26, October-December 2019, pp. Date de publication2019 Éditeur NISCAIR-CSIR, India

3- Aniss-Rabah Boukantar[a], **Boubekeur Djerdjare[a]**, Fernando Guiberteau[b], Angel L. Ortiz[b,]
Spark plasma sinterability and dry sliding-wear resistance of WC densified with

Co, Co+Ni, and Co+Ni+Cr

International Journal of Refractory Metals & Hard Materials 92 (2020) 105280

4- Fares Djematene **[a], Boubekeur Djerdjare[a],** Aniss-Rabah Boukantar [a], Amine Rezzoug [a,b], Said Abdi [a], Ismail Daoud [a], Angel L. Ortiz [c,*]

Thème comparative study of the dry sliding wear of WC-10wt.%(Co+Fe+Ni) cemented carbides pressureless sintered with different Fe/Co ratios. Submitted to Submitted to *Ceramics International*, January 2020. Statut: **Under review 2020**

5- Fares Djematene **[a],** Ismail Daoud [a], Djamel MIROUD [a],**Boubekeur Djerdjare[a],** Ridvan YAMANOGLU
Effect of Ni addition on the tribological behaviour of copper alloy matrix composites reinforced with WC particles prepared by spontaneous infiltration.. **Under review 2020**

CV

Nom et Prénom : **MIROUD *Djamel***

Dernier Diplôme et date d'obtention : **Doctorat d'état 2007**
Spécialité : **Métallurgie**.
Grade : **Professeur**
Fonction : **Enseignant - Chercheur**
Etablissement de rattachement : **Université des Sciences et de la Technologie Houari Boumediene, Alger**

Domaines scientifiques d'intérêts : Sciences des matériaux fonctionnels, Reverse engineering

Les 05 dernières publications :

1. Ali Mameri,Ismail Daoud,Amine Rezzoug,AnissRabah Boukantar,Djamel Miroud,Ridvan Yamanoglu,Angel L. Ortiz, Effet des adjuvants Ni sur le comportement tribologique non lubrifié des carbures cémentés WC fabriqués par infiltration sans pression d'un liant en alliage Cu, ***Céramique Internationale***, Volume 51, numéro 3, *janvier* **2025**, pages 3115-3125

2. Ismaïl Daoud , Abdelaziz Sahmi , Ali Mameri , Djamel Miroud , Mohammed Amine Benziada & Mohamed Trari, Etude des paramètres physico-chimiques de la photocatalyse de la dégradation de l'ibuprofène par le semi-conducteur Scheelite $BaWO_4$, ***Journal brésilien de génie chimique*** , *janvier* **2025**

3. Mohamed Mehenni , Azzeddine Lounis , Fatma Ahnia , Djamel Miroud , Amar Manseri et Mohamed Trari, Effet de l'ajout de MB40 sur la résistance à la corrosion électrochimique d'un aimant NdFeB recyclé à partir de déchets électroniques, ***Journal de l'ingénierie et de la performance des matériaux***, *septembre* **2024**

4. Ammar Jabbar Hassan, Billel Cheniti , Brahim Belkessa , Taoufik Boukharouba , Djamel Miroud &Nacer Eddine Titouche, Caractérisation de la résistance à la traction des assemblages en acier Cr-Ni-Mo (AISI 316) pendant le procédé de soudage par friction à entraînement direct, Volume 128, pages 5621–5633, (**2023**)

5. Jabbar Hassan Ammar, Cheniti Billel, Belkessa Brahim, Boukharouba Taoufik, Miroud Djamel, Titouche Nacer-Eddine, Friction welding influence on microstructure,

microhardness and hardness behavior of CrNiMo steel (AISI 316), **China welding**, **2023**, 32(3): 21-27.

Curriculum Vitae succinct

Nom et prénom : KAOUA Sid Ali
Date et lieu de naissance : 20/10/1963 à Alger Fonction : Enseignant - Chercheur
Grade : Professeur
Etablissement ou institution de rattachement : Université des Sciences et de la Technologie Houari Boumediene, Alger

Diplômes obtenus (graduation, post graduation, etc…) avec date et lieu d'obtention et spécialité :

(1). Doctorat, Construction Mécanique, USTHB, 2009
(2). Magister, Génie Civil, ENP, 1991
(3). Ingéniorat d'état, Génie Civil, ENP, 1988

Cinq dernières publications :

1- **A novel bio-inspired hydrogel-based lattice structure to mechanically mimic human annulus fibrosus: A finite element study**

K Kandil, SA Kaoua, A Mesbah, Y Voznyak, F Zaïri, F Zaïri International Journal of Mechanical Sciences 211, 106775 (2021)

2- **Numerical modelling of open-cell metal foam with Kelvin cell SA Kaoua, S Boutaleb, D Dahmoun, M Azzaz**

Computational and Applied Mathematics 35, 977-985 (2016)

3- **Finite element prediction of mechanical behaviour under bending of honeycomb sandwich panels**

K Sid-Ali, M Amar, S Boutaleb, K Azouaoui Advanced Materials Research 980, 81-85 (2014)

4- **Numerical simulation of free flowing particles mixing in V-blender A Bouhaouche, S Kaoua, K DaoudGranular Matter 21, 1-14 (2019)**

5- **Numerical Modelling of Metal Foams with Weaire-Phelan Cell SA Kaoua, H Meriem, D Djaffar, M Azzaz**

Defect and Diffusion Forum 334, 122-126 (2013)

Compétences professionnelles pédagogiques (matières enseignées etc.)

(1). Simulation et Calcul des Structures,
(2). Conception Assistée par Ordinateur,
(3). Résistance Des Matériaux,
(4). Mécanique des Milieux Continus,
(5). Méthode des Eléments Finis,
(6). Caractérisation des Matériaux,
(7). T.P. Elasticimétrie, Extensométrie, Essais de Traction, Compression, Flexion et Torsion,

(8). **TP éléments finis sur SolidWorks, Abaqus, Catia**.

CV CHIKH Salah

Nom et Prénom : CHIKH Salah

Dernier Diplôme et date d'obtention : Doctorat d'Etat, 1997, USTHB Spécialité : Génie Mécanique, Energetique.

Grade : Professeur

Fonction : Enseignant - Chercheur

Etablissement de rattachement : Université des Sciences et de la Technologie Houari Boumediene, Alger

Domaines scientifiques d'intérêts : Energie, développement durable, matériaux énergétiques Indiquer les 05 dernières publications :

Mimouni, N., Chikh, S., Bennacer, R., Rahli, O. (2024).

Hydrodynamic Anisotropy Analysis on 3D Elongated Porous Domain Subjected to Thermosolutal Cross Fluxes. Advances in Computational Heat and Mass Transfer. Lecture Notes in Mechanical Engineering. Springer, Cham. https://doi.org/10.1007/978-3-031- 66609-4_38

Lakhdari, Y.A., Chikh, S. (2024).

Effect of Dual PCM Layer Location on the Thermal Response of a Multi-layered Building Envelope. Advances in Computational Heat and Mass Transfer. Lecture Notes in Mechanical Engineering. Springer, Cham. https://doi.org/10.1007/978-3-031-66609-4_31

Boubendir, L., Chikh, S., Tadrist, L. (2024).

Numerical Study of the Triple Line Behavior for a Two-Phase Flow in a Rectangular Microchannel. Advances in Computational Heat and Mass Transfer. Lecture Notes in Mechanical Engineering. Springer, Cham. https://doi.org/10.1007/978-3-031-66609-4_55

Abderrahmane Dourari , Rafik Lankri , Salah Chikh , Smail Khalfallah , Lounès Tadrist

Complex evaporation kinetics of a volatile droplet of methanol. International Communication in Heat and Mass Transfer (Elsevier), Volume 144, May 2023, 106741 https://www.sciencedirect.com/science/article/abs/pii/S0735193323001306

Farid Boudali Errebai , Salah Chikh , Lotfi Derradji , Mohamed Amara , Zohir Younsi

Optimum mass percentage of microencapsulated PCM mixed with gypsum for improved latent heat storage, Journal of Energy Storage (Elsevier), Volume 33, January 2021, 101910
https://www.sciencedirect.com/science/article/abs/pii/S2352152X20317473

CV

Nom et Prénom : MESBAH AMAR
Dernier Diplôme et date d'obtention : Doctorat / Mai 2011
Spécialité : Génie Mécanique / option : CONSTRUCTION MECANIQUE
Grade : Professeur

Fonction : Enseignant chercheur

Etablissement de rattachement : U S T H B **Domaines scientifiques**

d'intérêts : Modélisation Micromécanique

Les 05 dernières publications :

1) **Mesbah**, F. Zaïri, M. Naït-Abdelaziz, J.M. Gloaguen, K. Anoukou, A. Zaoui,Z. Qu, T. Boukharouba, J.M. Lefebvre, «Micromechanics-based constitutive modeling of plastic yielding and damage mechanisms in polymer-clay nanocomposites: Application to polyamide-6 and polypropylene-based nanocomposites». Composites Science and Technology; http://dx.doi.org/10.1016/j.compscitech.2014.05.032
2) **MESBAH Amar**, AZOUAOUI Krimo, KAOUA Sid-Ali, BOUTALEB Salah, «Micromechanical Model Prediction Overall Young Modulus Nanocomposites Polymer-Clay-Silica by Self Consistent Approach». Advanced Materials Research Vol. 980 (2014) pp 152-156 Trans Tech Publications, Switzerland doi:10.4028/www.scientific.net/AMR.980.152
3) Abderrahman Tamoud . Fahmi Zaïri . **Amar Mesbah** . Fahed Zaïri « A microstructure-based model for time-dependent mechanics of multi-layered soft tissues and its application to intervertebral disc annulus». Meccanica (2021) 56:585–606.
https://doi.org/10.1007/s11012-020-01281-4
4) Amar Mesbah, Mohamed Elmeguenni, Zhu Yanb, Fahmi Zaïri,, Ning Ding, Jean-Michel Gloaguen, «How stress triaxiality affects cavitation damage in high-density polyethylene: Experiments and constitutive modeling». Polymer Testing
https://doi.org/10.1016/j.polymertesting.2021.107248

5) **MahrezSaadedine, FahmiZaïri, NourdineOuali, AbderrahmanTamoud, Amar Mesbah, «A micromechanics-based model for visco-super-elastic hydrogel-based nanocomposites», International Journal of Plasticity, doi.org/10.1016/j.ijplas.2021.103042**

6) **Fateh Enouar Mamache, Amar Mesbah, Hanbing Bian and Fahmi Zaïri «Micromechanical Modeling of the Biaxial Deformation-Induced Phase Transformation in Polyethylene Terephthalate», Polymers 2022, 14, 3028. https://doi.org/10.3390/ polym14153028**

POLYTECH
Peter the Great
St.Petersburg Polytechnic
University

جامعة هواري بومدين
للعلوم والتكنولوجيا
USTHB

AGREEMENT ON COOPERATION
IN EDUCATION AND RESEARCH
between
PETER THE GREAT ST.PETERSBURG POLYTECHNIC UNIVERSITY, RUSSIA
and
UNIVERSITY OF SCIENCE AND TECHNOLOGY HOUARI BOUMEDIENE, ALGERIA

In aspiration to fostering long-term cooperation between our universities and taking into consideration the interests of both universities in extending mutually beneficial cooperation in the field of education and research,
Peter the Great St. Petersburg Polytechnic University (SPbPU), Russia,
represented by its **Rector, Prof. ANDREI RUDSKOI,**
and **University of Science and Technology Houari Boumediene (USTHB), Algeria**
represented by its **Rector Prof. AKRETCHE DJAMEL-EDDINE**
(hereinafter referred to as the Parties) agree to carry out the following activities:

I

The Parties agree to develop scientific and educational cooperation in different areas of mutual interest.
Both Parties shall undertake:

1. Collaborative research in the fields of mutual interest in accordance with the funds available.
2. Mutual invitation of lecturers and researchers for teaching and research activities;
3. Implementation of joint, network Bachelor and Master programs, continuing education programs;
4. Development of vocational education programs;
5. Exchange of students, scientists and faculty in accordance with requirements accepted in both universities;
6. Organization of joint international events;
7. Collaboration in PhD programs (joint PhD programs, joint supervision, internships and research within PhD programs);
8. Invitation of SPbPU and USTHB employees to become members of dissertation councils;
9. Joint publication activity, and cooperation between scientific and technical journals;
10. Cooperation of library complexes, access to educational and scientific literature, and educational and methodological materials;
11. Cooperation in terms of access to online courses and educational programs; placement of online courses on open platforms and portals
12. Other activities of mutual interest.

II

On the basis of this Agreement, the Parties shall develop the additional agreements and programs for cooperation envisaging specific measures for performance of this Agreement, which shall be considered and signed as separate documents.

III

Both Parties may offer changes and additions to the Agreement aiming at fostering the cooperation. They are entered in a written form and become effective only after their signing by officials of both Parties.

IV

This Agreement becomes effective immediately upon its signing by the official representatives of the Parties. This Agreement will be in effect for a period of five (5) years from the date of execution. The Agreement may be terminated if either Party gives the other Party a written notice of termination of this Agreement. This notice shall be given at least six months in advance prior to its termination. The Agreement is to be deemed terminated after the work completion according to any sub-agreements being effective in the framework of this Agreement.

V

The states and governments of the Parties will not bear any responsibility for default and improper execution of the obligations taken by the Parties under this Agreement. The Agreement has been executed in duplicate in English, both copies being authentic and equal in force.

For PETER THE GREAT ST.PETERSBURG POLYTECHNIC UNIVERSITY, RUSSIA	UNIVERSITY OF SCIENCE AND TECHNOLOGY HOUARI BOUMEDIENE, ALGERIA
Prof. ANDREI RUDSKOI Rector	Prof. AKRETCHE DJAMEL-EDDINE Rector
	On behalf of the Rector, Prof. Azzeddine CHAFA Vice-Rector of External Relations
Date _____	Date _____

ARTICLE 11 : REGLEMENT DES LITIGES

Les litiges et différents nés à l'occasion de l'exécution de la présente convention, seront réglés à l'amiable et dans le cadre des dispositions législatives et réglementaires en vigueur.

ARTICLE 12 : CONFIDENTIALITE

Les deux Parties s'engagent à assurer la protection de tous renseignements ou informations dont ils ont pris connaissance au titre de la présente convention et prendrons toutes les mesures nécessaires pour éviter la divulgation de tout renseignement ou information.

Aucune partie ne peut publier sans avis préalable de l'autre partie, les résultats se rapportant spécifiquement aux projets conjoints.

Chacune des parties s'engage à ne pas divulguer, sans l'accord préalable de l'autre partie, les informations scientifiques et industrielles considérées comme confidentielle, pour l'exécution du projet et ne doivent être utilisées autrement que dans les conditions fixées par la présente convention.

Les deux parties s'engagent à imposer aux organismes associés dans le cadre du projet, l'obligation de confidentialité à laquelle elles sont elle-même tenues et ce, dans les conditions prévues dans la présente convention.

ARTICLE 13 : ENTREE EN VIGUEUR

La présente convention entre en vigueur dès sa signature par les deux parties.

Fait à Alger, en quatre (04) exemplaires originaux, le 09 FEV. 2025

Le Directeur Général
de l'OASIS TESTING SEVICES

BENFERHAT Abdenaceur
Gérant
OTS
OASIS TESTING SERVICES

Le Recteur
de l'Université des Sciences et de la Technologie Houari Boumediene

مدير جامعة هواري بومدين
للعلوم والتكنولوجيا
الأستاذ. جمال الدين الكرتش

REPUBLIQUE ALGERIENNE DEMOCRATIQUE ET POPULAIRE

FIELD CONTROL SERVICE & MAINTENANCE INDUSTRY COMPANY

MINISTERE DE L'ENSEIGNEMENT SUPERIEUR ET DE LA RECHERCHE SCIENTIFIQUE

OASIS TESTING SERVICES

UNIVERSITE DES SCIENCES ET DE LA TECHNOLOGIE HOUARI BOUMEDIENE

OTS
OASIS TESTING SERVICES

جامعة هواري بومدين للعلوم والتكنولوجيا
USTHB

CONVENTION DE PARTENARIAT SCIENTIFIQUE ET PEDAGOGIQUE

OTS - USTHB

2025

Contrat Spécifique de coopération scientifique N°02/2024

Entre

SONATRACH/ Direction Centrale Recherche et Développement (DC-R&D)
Et
Université des Sciences et de la Technologie Houari Boumediene USTHB

N°391/PDG/GICA/2021

REPUBLIQUE ALGERIENNE DEMOCRATIQUE ET POPULAIRE

Convention de Sponsoring

PGS EN ENERGIE RENOUVELABLE

GROUPE GICA - USTHB

ENTRE LES SOUSSIGNES

1/- LE GROUPE INDUSTRIEL DES CIMENTS D'ALGERIE, par abréviation «**GICA**», Société par actions, au capital de 25 358 000 000,00 DA, sis Route Dar El Beida, Meftah, wilaya de Blida, représenté par Monsieur Rabah GUESSOUM, Président Directeur Général, ci-après désigné «*Groupe GICA*».

D'une part,

Et

2/- L'UNIVERSITE DES SCIENCES ET DE LA TECHNOLOGIE HOUARI. BOUMEDIENE, par abréviation «**l'USTHB**», sise à Bab Ezzouar -Alger, représentée par Monsieur Djamal Eddine AKRETCHE, Recteur de l'université, ci-après désignée «*l'USTHB* »

D'autre part.

-Considérant la convention cadre du 25 Mai 2021 ;
-Considérant la demande du Ministère de la Transition Energétique et des Energies Renouvelables (MTEER) en date du 09/02/2021, portant sur « la contribution au financement de la formation PGS sur les énergies renouvelables »,

CONVENTION CADRE DE PARTENARIAT

ENTRE :

D'une part
L'Université des Sciences et de la Technologie Houari Boumediene (USTHB) - Représentée par son Recteur **Prof. Djamal Eddine AKRETCHE**.

Et d'autre part :
La Société des Eaux et de l'Assainissement d'Alger – SEAAL, Sise au 97, Parc Ben Omar, Kouba Alger, Représentée par : **Lyes MIHOUBI, Directeur Général**

N° 0.5/03/2024

VII - Avis et Visas des organes Administratifs et Consultatifs

Intitulé du Master : Quality control

Chef de département + Responsable de l'équipe de domaine

Date et visa:

17 FEV. 2025

رئيس قسم الهندسة الميكانيكية وهندسة الإنتاج
الأستاذ: مجدودي عبد الحميد

مسؤول فريق ميدان التكوين علوم وتكنولوجيا
بجامعة هواري بومدين للعلوم والتكنولوجيا
السيد : حجوط العربي
04/03/2025

Doyen de la faculté (ou Directeur d'institut)

Date et visa :

17 FEV. 2025

عميد الكلية
الدكتور: بلعيد رمضان

وزارة التعليم العالي والبحث العلمي
جامعة هواري بومدين للعلوم والتكنولوجيا

Chef d'établissement universitaire

Date et visa:

A.F.

وزارة التعليم العالي والبحث العلمي
جامعة هواري بومدين للعلوم والتكنولوجيا

مدير جامعة هواري بومدين
للعلوم والتكنولوجيا
الأستاذ: جمال الدين أكرتش

VIII – Opinion and approval of the Regional Conference

IX – Opinion and Approval of the National Pedagogical Committee of the Field