

**Ministry of Higher Education and Scientific Research  
Scientific Supervision and Scientific Evaluation Apparatus  
Directorate of Quality Assurance and Academic  
Accreditation  
Accreditation Department**



**Academic Program and  
Course Description of the  
Mechanical Technologies**

**2024**

## **Introduction:**

The educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quarterly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies T 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

## **Concepts and terminology:**

**Academic Program Description:** The academic program description provides a brief summary of its vision, mission and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.

**Course Description:** Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of the available learning opportunities. It is derived from the program description.

**Program Vision:** An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic and applicable.

**Program Mission:** Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.

**Program Objectives:** They are statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.

**Curriculum Structure:** All courses / subject ts included in the academic program according to the approved learning system (quarterly, annual, Bologna Process) whether it is a requirement (ministry, university, college and scientific department) with the number of credit hours.

**Learning Outcomes:** A compatible set of knowledge, skills and values acquired by students after the successful completion of the academic program and must determine the learning outcomes of each course in a way that achieves the objectives of the program.

**Teaching and learning strategies:** They are the strategies used by the faculty members to develop students' teaching and learning, and they are plans that are followed to reach the learning goals. They describe all classroom and extra-curricular activities to achieve the learning outcomes of the program.

## **Academic Program Description Form**

University Name: Al-Furat Al-Awsat University

Faculty/Institute: Najaf Technical Institute

Scientific Department: Department of Mechanical Technologies/Production Branch.

Academic or Professional Program Name: Diploma in Mineral Production Technology

Final Certificate Name: Technical Diploma in Production

Academic System: Annual

Description Preparation Date: 16/3/2024

File Completion Date: 26/March/2024

Signature:



Scientific Associate Name : Dr. Salah Mahdi Saleh

Date:

Signature:



Department Head Name: A. P. Luay Mohammed Ali

Date: 26/March/2024

The file is checked by:

Department of Quality Assurance and University Performance  
Director of the Quality Assurance and University Performance

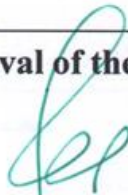
Department: Date: 24.04.2024

Signature:



Lec. Dr. Mohammad Najeh

Approval of the Dean



Prof. Dr. Hayder Hassan Abd Hussein



### 1. Program Vision

The Mechanical Engineering Department is one of the main technological departments, and the department is working towards expanding the base of technical education and its modern applications to become a leader in providing accredited technical services, fostering a spirit of competition and cooperation with the community.

### 2. Program Mission

Department of Mechanical Engineering adopts a general message based on the general framework of technical education in Iraq, a message that it seeks to achieve every year to highlight the department's distinctive aspect. The general objectives focus on graduating national technical cadres at the level of education and training who are capable of understanding technological systems and supporting the technical development process to keep pace with rapid global technological advancements.

The specific message includes the following:

1. Using computer and internet technologies in education and training.
2. Activating the relationship with the private sector in the field of training.
3. Monitoring the development of training curricula and then updating the facilities and workshops.

Interacting with the labor market and the community's needs in qualification and training.

### 3. Program Objectives

The Department of Mechanical Engineering adopts a general message based on the general framework of technical education in Iraq, a message that it seeks to achieve every year to highlight the department's distinctive features.

The general objectives focus on graduating national technical cadres at a level of education and training capable of understanding technology systems and supporting the process of technological development to keep pace with rapid global technological advancements.

The specific message includes the following:

1. Using computer and internet technologies in education and training.
2. Activating the relationship with the private sector in training fields.
3. Monitoring the development of training curricula and subsequently updating laboratories and workshops.

Interacting with the labor market and the needs of the community in qualification and training.

#### 4. Program Accreditation

ABET Program

#### 5. Other external factors

1. Market requirements.
2. Recent scientific and technological advancements.
3. Public companies and private sector institutions and companies.

#### 6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews
Institution Requirements	3			
College Requirements	3			
Department Requirements	13			

Summer Training				
Other				

\* This can include notes whether the course is basic or optional.

7. Program Description				
Year/Level	Course Code	Course Name	Credit Hours	
first	-----	Manufacturing processes1	2 theoretical	3 Practical
second	-----	Manufacturing processes2	2 theoretical	2Practical

8. Expected learning outcomes of the program	
<b>Knowledge</b>	
1- Providing information and theoretical knowledge on related subjects. 2- Preparing the student to be able to continue his studies to higher levels. 3- The ability to read and create engineering designs and plans, and prepare related research. 4- The ability to conduct studies in the fields of industrial management and project management development. 6- Performing various theoretical calculations in specialized fields.	Statement of Learning Outcomes 1:
<b>Skills</b>	
B 1 - Ability to manage factories and production lines and maintain them. B 2 - Ability to operate and maintain	Statement of Learning Outcomes 2

<p>various cutting machines, metalworking, and shaping.  B 3 - Ability to rehabilitate and reconfigure production lines and equipment to ensure performance improvement and contribute to the preparation of operation cards for workshops or machines accordingly.</p>	
<p><b>Ethics</b></p>	
<p>c 1: Training on operating various types of production machines and their maintenance.  c 2: Training on operating different programmed machines and their maintenance.  c 3: Training on maintenance and management of different production lines. C4- Education on dealing with various engineering programs related to the specialty</p>	<p>Statement of Learning Outcomes 3</p>

<p><b>9. Teaching and Learning Strategies</b></p>
<ol style="list-style-type: none"> <li>1. Theoretical lectures.</li> <li>2. Practical exercises.</li> <li>3. Preparation of student studies, reports, and research.</li> <li>4. Student projects.</li> <li>5. Encouragement of scientific and practical student initiatives.</li> <li>6. Scientific trips.</li> </ol>

<p><b>10. Evaluation methods</b></p>
<ol style="list-style-type: none"> <li>1. Discussion.</li> <li>2. Conducting daily, weekly, midterm, and final examinations.</li> </ol>

<p><b>11. The teaching staff</b></p>
<p><b>Faculty members</b></p>



Scientific rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	general	Special			Staff	Lecturer
Assistant Professor	general mechanic	Applied mechanics	With practical and theoretical experience in designs and stress calculations		1	
Lecturer	Civil Engineering	Civil Engineering			1	
Assistant Lecturer	general mechanic	Manufacturing processes	of practical and theoretical experience in production processes		1	
Assistant Lecturer	general mechanic	Refractories			2	
Assistant Lecturer	general mechanic	Applied mechanics			1	
Assistant Lecturer	English language	English Literature			1	

## **Professional Development**

### **Mentoring new faculty members**

Regular meetings to enhance academic and administrative skills, involving them in core committees, courses, and specialized workshops related to the program and the institution in general..

### **Professional development of faculty members**

Participation in academic courses and workshops, encouraging public research, scientific contributions in local and international forums and conferences, and community service.

## **Professional Development**

### **Mentoring new faculty members**

meetings to hone academic and administrative skills and involve them in the basic committees and specialized courses and workshops related to the program and the .institution in general

### **Professional development of faculty members**

Participating in academic courses and workshops, urging general research and scientific participation in local and international forums and conferences , and community service.

## 12. Acceptance Criterion

- 1- **The central and streamlined admission system of the Ministry of Higher Education and Scientific Research**
- 2- **Parallel education channel**
- 3- **Department development plans**
- 4- **ABET Accreditation program.**
- 5- **Student's desire**
- 6- **Student GPA**

7- .The type of branch from which the student graduated  
The admission plan at the institute and the department, through the flow process  
.approved by the Central Admissions Department in the Ministry

### **13. The most important sources of information about the program**

- 1- The scientific curricula prescribed in the specialized sectoral committees of the Technical Education Authority.
- 2- Proposed amendments by department faculty shall not exceed 20% of the prescribed curriculum, in accordance with the requirements of the labor market and scientific developments in various fields of science and modern industry.
- 3- ABET Academic Accreditation Program.

### **14. Program Development Plan**

- 1- Working to increase the department's absorptive capacity, develop laboratories, and equip them with modern equipment to keep pace with development. Achievement in metal production and manufacturing techniques.
- 2- The department develops the personal abilities and skills of its students at various levels by holding scientific, sports, artistic, and even literary competitions and holding strengthening courses for the scientific lessons and materials in the department through the teachers conducting these courses and developing the Students' practical skills through a project lesson, mechanical workshops, and summer training material.
- 3- Informing students and associates of the latest developments in the field of specialization.

## Program Skills Outline

Program Skills Outline															
				Required program Learning outcomes											
Year/level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B 1	B2	B3	B4	C1	C2	C3	C4
First year		Manufacturing / processes ) (1	Basic	*	*		*	*	*		*	*	*	*	
		Material properties	Basic	*	*	*	*		*	*	*	*	*	*	
		Parameter(1 (	Basic	*		*	*	*		*	*		*	*	*

		<b>*Mechanics</b>	<b>Basic</b>	*	*		*	*	*	*	*	*	*	*	
		<b>mathematics</b>	<b>Basic</b>	*		*	*	*	*		*	*	*	*	*
		<b>Computer Applications (1)</b>	<b>Basic</b>	*	*	*		*	*	*		*	*	*	*
		<b>Engineering drawing (1)</b>	<b>Basic</b>		*	*	*	*		*	*	*	*	*	*
		<b>Electricity technology</b>	<b>Basic</b>	*	*	*		*	*	*	*		*	*	

		human rights Human rights	Basic	*	*		*	*		*	*	*	*		*
		English language/1	Basic	*		*		*	*	*	*		*	*	*

• Please check the boxes corresponding to the individual learning outcomes from the program subject to evaluation

### Program Skills Outline

				Required program Learning outcomes											
Year/level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B 1	B2	B3	B4	C1	C2	C3	C4
Second Year		Machine parts * technology	Basic	*		*	*	*	*	*		*	*	*	*
		Manufacturing processes(2)	Basic	*	*		*	*	*		*	*	*	*	

		<b>Metals</b>	<b>Basic</b>		*	*	*	*		*	*	*	*	*	*
		<b>) Factories2 (</b>	<b>Basic</b>	*		*	*	*		*	*	*	*	*	
		<b>The project</b>	<b>Basic</b>	*	*	*	*		*	*	*	*		*	*
		<b>Industrial drawing</b>	<b>Basic</b>	*	*		*	*	*	*	*	*	*	*	*
		<b>Occupational management and safety</b>	<b>Basic</b>	*	*	*		*	*	*	*		*	*	*
		<b>Computer ( 2 )Applications</b>	<b>Basic</b>	*	*		*	*	*	*	*	*	*	*	
		<b>English language</b>	<b>Basic</b>	*	*	*	*		*	*	*		*	*	*



## Course description form

1. Course Name : Manufacturing Processes (1)	
2. Course Code	
3. Semester/ Year: First academic year	
4. <b>2024 March , 16</b> : Date this description was prepared	
5. Available forms of attendance: 1- Theoretical in attendance - Lecture hall 2- Practical in attendance - Mechanical workshops.	
6. Number of study hours (total) / Number of units (total): 4 hours (2 theoretical + 2 practical) / 8 units	
7. Name of the course administrator (if more than one name is mentioned):	
Name: assistant teacher. Inas Ali Hashem Email: [email address]	
8. objectives Course	
<b>Objectives of the study subject</b>	<ul style="list-style-type: none"> <li>1- The ability to use various measuring tools.</li> <li>2- Preparation of casting models.</li> <li>3- Supervising the conduct of casting and inspection operations.</li> <li>4- Detecting defects in castings, inspecting and handling metal melting furnaces.</li> </ul>

	<p>5- Supervising welding operations, inspecting welds, and inspecting for defects.</p> <p>6- Supervising forging operations..</p>
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### 9. Teaching and learning strategies

<b>The strategy</b>	<p>A - Cognitive Objectives:</p> <p>A1- Acquiring information and theoretical knowledge about relevant subjects.</p> <p>A2- Preparing the student to be able to continue his studies to higher levels.</p> <p>A3- Ability to read, create engineering designs and plans, and prepare related research.</p> <p>A4- Ability to prepare studies in the fields of industrial management and project management development.</p> <p>A5- Ability to deal with modern engineering software related to design and management.</p> <p>A6- Performing various theoretical calculations in specialized fields.</p> <p>B - Skills Objectives Specific to the Course:</p> <p>B1- Ability to manage factories, production lines, and their maintenance</p> <p>B2- Ability to operate and maintain various cutting machines, metalworking, and forming machines.</p> <p>B3- Ability to rehabilitate and reconfigure production lines and equipment to ensure performance improvement and contribute to the preparation of operation cards for workshops or machines based on operational elements.</p>
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### 10. Course structure

the week	hours	Required learning outcomes	Name of the unit or topic	Learning method	Assessment Method
First	4	The student shall become familiar with the methods of measurement and units of measurement, error and their causes, methods of	Definition of measurement and units of measurement, error and its causes,	Lecture + practical workshop	Discussion + exam Oral and written

		measuring the main dimensions and simple measuring devices.	Methods of measuring main dimensions, simple measuring devices carriers		
<b>second</b>	4	The student shall become familiar with the capabilities of measurement (thermometers), their components, uses, and types	Measurement devices (vernier calipers), their parts, uses, types	<b>Lecture + practical workshop</b>	<b>Discussion + examination</b> <b>Oral and written</b>
<b>third</b>	4	The student shall become familiar with micrometers, their types, uses, method of use, and improve their use.	The student should be familiar with micrometers, their types, uses, method of use, and improve their use.	<b>Lecture + practical workshop</b>	<b>Discussion + examination</b> <b>Oral and written</b>
<b>fourth</b>	4	The student should be familiarized with the templates of measurement and their uses, types, and methods of use	Measurement templates and their uses, types, and how to use them.	<b>Lecture + practical workshop</b>	<b>Discussion + examination</b> <b>Oral and written</b>
<b>Fifth</b>	4	The student should be familiarized with the measurement of angles and lateral shapes, tools for measuring angles, and types of measurement boundaries (ticks)	Measuring angles and side shapes, angle measuring tools, measurement limits (notches), and their types.	<b>Lecture + practical workshop</b>	<b>Discussion + examination</b> <b>Oral and written</b>
<b>Sixth</b>	4	The student should be familiarized with the method of measuring the elements of parallelograms, external and internal diameters, step measurement, and step diameter.	Method of measuring the elements of parallelograms, outer and inner diameter, step measurement and step diameter.	<b>Lecture + practical workshop</b>	<b>Discussion + examination</b> <b>Oral and written</b>
<b>Seventh</b>	4	The student should be familiarized with the uses, types, mechanical and electronic aspects of comparison devices.	Comparison devices, their uses, types, mechanical, electronic.	<b>Lecture + practical workshop</b>	<b>Discussion + examination</b> <b>Oral and written</b>
<b>Eighth</b>	4	The student should be familiarized with the optical device and some	Optical device, some modern	=	=

		modern measurement methods (sound frequency measurement devices, digital optical devices).	measurement methods (devices using sound frequency, digital optical).		
<b>Ninth</b>	4	The student should be familiarized with the models, their types, the woods used in their manufacturing and the necessary conditions for the model.	Models, types, The woods used in their manufacturing, the conditions that must be met in the model.	=	=
<b>tenth</b>	4	The student should be familiarized with the tools and devices used in model manufacturing, the design method of simple models, and the molds, as well as the method of designing an eco-friendly model.	Tools and devices Used in the manufacturing of the model and aquar molds and the method of designing a simple model..	=	=
<b>Eleventh</b>	4	The student shall be familiarized with casting, a historical overview of the main casting methods (casting sand casting, casting with metal molds, other casting methods), and the practical advantages of casting.	Foundry, Historical Overview, Main Foundry Methods (Sand Casting, Investment Casting, Die Casting, Other Foundry Methods), Advantages of the Foundry Process..	=	=
<b>Twelfth</b>	4	The student shall be acquainted with sand casting, sand types for casting, specifications, components, sand used in casting equipment utilized, and additives to sand for casting.	Sand Casting, Foundry Sand, Specifications, Components, Foundry Sand Type Equipment Used, Additives to Foundry Sand.	=	=

<b>Thirteenth</b>	4	The student shall be introduced to molding and tools used in preparing sand molds, the process of molding a simple and complex model, and executing it correctly.	Molding and Tools Used in Preparing Sand Molds, Process of Molding a Simple Model and a Complex One.	=	=
<b>Fourteenth</b>	4	The student shall learn and proficiently use, cement molds, core molds, their types, core sand mixing ratios, added materials, work stages (sand mixing and preparation, core making, drying), the benefit of the drying process, drying methods for cores, and equipment.	Patternmaking, Cement Molds, Core Types, Core Sand, Mixing Ratios, Additives, Work Stages (Sand Mixing and Preparation, Core Making, Drying), Benefits of the Drying Process, Methods and Equipment for Core Drying	=	=
<b>Fifteenth</b>	4	The student shall be introduced to and proficient in lost wax casting, continuous casting, and shell casting.	Lost Wax Casting, Continuous Casting, Shell Casting.	=	=
<b>Sixteenth</b>	4	The student shall be introduced to and proficient in metal mold casting, its types.	Die Casting, Types.	=	=
<b>Seventeenth</b>	4	The student shall be introduced to and proficient in centrifugal casting, its types.	Centrifugal Casting Types..	=	=
<b>Eighteenth</b>	4	The student shall be introduced to and proficient in metal melting and its principles, types of melting furnaces, cupola furnace, crucible furnace	Metal Melting and Principles, Types of Melting Furnaces, Cupola Furnace, Crucible Furnace.	=	=
<b>Nineteenth</b>		The student shall be introduced to and proficient in using electric furnaces, induction furnace, rotary	Electric Furnaces, Induction Furnace, Rotary Furnace, Casting Pouring,	=	=

		furnace, casting pouring, equipment, and principles.	Equipment and Principles.		
<b>Twentieth</b>	4	The student shall be introduced and proficient in cleaning castings, casting defects, and inspecting castings.	Cleaning Castings, Defects in Castings, Inspection of Castings.	=	=
<b>Twenty-first</b>	4	The student shall be familiar with and proficient in the use of welding, the principles of metal welding, the main welding methods (pressure welding, fusion welding, brazing welding, and soldering welding), and types of welding joints.	Welding, Principles of Welding Metals, Main Welding Methods (Pressure Welding, Fusion Welding, Friction Welding, and Brazing), Types of Welding Joints.	=	=
<b>Twenty-second</b>	4	The student shall be familiar with and proficient in hot pressure welding (electric resistance welding, spot welding, seam welding, flash welding) and cold pressure welding	Hot Pressure Welding (Electric Resistance Welding, Spot Welding, Seam Welding, Flash Welding), Cold Pressure Welding..	=	=
<b>Twenty-third</b>	4	The student shall be familiar with and proficient in fusion welding, gas welding, oxy-hydrogen welding, oxy-acetylene welding, and types of flames	Fusion Welding, Gas Welding, Oxy-Hydrogen Welding, Oxy-Acetylene Welding, Types of Flames.	=	=
<b>twenty fourth</b>	4	The student shall be familiar with and proficient in right-hand welding, left-hand welding, cutting with oxyacetylene, pressure welding using explosives, pressure welding using ultrasonic waves.	Right-hand welding and left-hand welding, oxyacetylene cutting, pressure welding using explosives, pressure welding using ultrasonic waves.	=	=

<b>Twenty-fifth</b>	4	The student shall be familiar with and proficient in the use of electric arc welding, welding current, direct and reverse polarity, types of electrodes, coating of metal electrodes and their types, electrode movement, electrode insulation methods, and the welding zone.	Electric arc welding using shielding gas (welding with carbon dioxide gas, argon arc welding, TIG welding, and MIG welding).	=	=
<b>twenty-sixth</b>	4	The student shall be familiar with and proficient in the use of electric arc welding with protective gases (welding with carbon dioxide gas arc welding, TIG welding, and MIG welding).	Electric arc welding with atomic hydrogen, submerged arc welding, and thermit fusion welding.	=	=
<b>Twenty-seventh</b>	4	The student shall be familiar with and proficient in the use of some modern types of welding (laser beam welding, electron beam welding).	Welding defects, welding tests.	=	=
<b>Twenty-eighth</b>	4	The student shall be familiar with and proficient in identifying welding defects and welding tests.	Plastics, types, methods of manufacturing products, blow molding, injection molding, and hot forming.	=	=
<b>Twenty-ninth</b>	4	The student shall be familiar with and proficient in the use of some modern types of welding (laser beam welding, electron beam welding).			
<b>thirty</b>	4	The student shall be familiar with and proficient in the use of some modern types of welding (laser beam welding, electron beam welding).			

11. Course evaluation

Distribution of grades out of 100 according to the tasks assigned to the student such as daily preparation, daily exams, oral, monthly, and written reports as follows:  
 First Semester: 20% (10% theoretical + 10% practical)  
 Second Semester: 20% (10% theoretical + 10% practical) + Yearly Assignments 10% = Annual Effort 50%  
 Final Exam 50% (40% theoretical + 10% practical)  
 Final Grade = 100%

12. Learning and teaching resources	
Required textbooks (methodology, if any)	<b>Manufacturing processes book ( Osama Mohammed Elmardi Suleiman Khayal ( 2017</b>
Main references (sources)	1- Introduction to Production Engineering 2- Principles of Metal Casting 3- Metal Forming Techniques 4- Manufacturing Methods 5- Ignition of Metals - Technological Foundations 6- Principles of Milling Operations
Recommended supporting books and references (scientific journals, reports....)	The Internet and websites of Iraqi and foreign colleges and universities
Electronic references, Internet sites	Internet

### Course description form

13.	Course name: Operations Manufacturing ( 2 )
14.	: Course Code
15.	Semester/ Year: Second academic year



16. Date this description was prepared: March 16, 2024	
17. Available forms of attendance: 1- Theoretical in attendance - Lecture hall 2- Practical in attendance - Mechanical workshops.	
18. Number of study hours (total) / Number of units (total): 4 hours (2 theoretical + 2 practical) / 8 units	
19. Name of the course administrator (if more than one name is mentioned): :Amiel - Name: M.M. Enas Ali Hashem Alalienas73@atu.edu.iq	
20. objectives Course	
Objectives of the study subject	<p>1- Ability to analyze operations into operational elements.</p> <p>2- Preparation of the technological path between production units.</p> <p>3- Preparation of operation cards and orders for each unit and each machine, calculating operation time elements and loading programs for the units.</p> <p>4- Preliminary calculation of operating costs</p> <p>5- Supervising the conduct of various manufacturing operations according to the properties of engineering materials.</p>
21. Teaching and learning strategies	
The strategy	<p>A- Cognitive Objectives:</p> <p>A1- Acquiring information and theoretical knowledge about related subjects.</p> <p>A2- Preparing the student to be able to continue their studies to higher levels</p> <p>A3- The ability to read, create engineering designs and plans, and prepare</p>

related research.

A4- The ability to prepare studies in the fields of industrial management and project management development.

A5- The ability to deal with modern engineering programs related to design and management.

A6- Performing various theoretical calculations in specialized fields.

B- Specific Skills Objectives of the Course:

B1- The ability to manage factories and production lines and maintain them.

B2- The ability to operate and maintain various cutting machines, metalworking, and shaping machines.

B3- The ability to rehabilitate and reconfigure production lines and equipment to ensure performance development and contribute to preparing operation cards for workshops or machines based on operational elements

22. Course structure

the week	hours	Required learning outcomes	Unit or Topic Name	Learning method	Assessment Method
First	4	The student shall be familiarized with types of engineering tolerances, duplications, duplication systems, tolerance grades, duplication units, basic deviations.	Geometric tolerancing, duplications, duplication systems, tolerance ranks duplication units, fundamental deviations.	Lecture + practical workshop	Discussion + exam Oral and written
second	4	The student shall be familiarized with types of tolerances, basic hole system, basic shaft system, bilateral tolerances, detailed duplications, selection of duplications, and their economic advantages.	Types of tolerances, basic hole system, basic shaft system, duplication symbols, tolerances for external dimensions, detailed duplications, selection of duplications and their economic features..	Lecture + practical workshop	Discussion + exam Oral and written

<b>third</b>	4	The student shall be familiarized with types of engineering tolerances in form and position, as well as types of form and position tolerances	Geometric tolerances in form and position, and types of form and position tolerances.	<b>Lecture + practical workshop</b>	<b>Discussion + exam</b> <b>Oral and written</b>
<b>fourth</b>	4	The student shall be familiarized with types of measuring instruments, design of measuring instruments, types of measuring instruments (internal measuring instruments, external measuring instruments, adjustable measuring instruments, solid measuring instruments, special measuring instruments).	Measurement features, measurement feature design, types of measurement features (internal measurement features, external measurement features, adjustable measurement features, solid measurement features, special measurement features).	<b>Lecture + practical workshop</b>	<b>Discussion + exam</b> <b>Oral and written</b>
<b>Fifth</b>	4	The student shall be familiarized with types of metal manufacturing classification, metal operations, an introduction to the theory of chip formation, influencing factors, methods of securing workpieces including round and non-round workpieces, cutting boundaries used, longitudinal and transverse feed rates.	Classification of metal manufacturing, metal operations, an introduction to the theory of chip formation and influencing factors, methods of securing workpieces including round and non-round workpieces, the cutting edges used, and longitudinal and transverse feed rates.	<b>Lecture + practical workshop</b>	<b>Discussion + exam</b> <b>Oral and written</b>
<b>Sixth</b>	4	The student should be familiarized with the types of conventional lathe pens, shaping lathe pens, and their specific	Identifying the types of conventional lathe pens and shaping lathe pens, as well as their specific angles, the effect of lathe	<b>Lecture + practical workshop</b>	<b>Discussion + exam</b> <b>Oral and written</b>

		angles, the impact of lathe pen angles on the cutting process, types of metals for lathe pens, cutting conditions, cutting elements, the use of cutting speeds, and the use of speed tables and maps, classifying cutting tools in terms of operating methods and the number of cutting edges.	pen angles on the cutting process, types of metal lathe pens, cutting conditions, cutting elements, the use of cutting speeds, and the use of speed tables and maps, classification of cutting tools in terms of operating methods and the number of cutting edges.		
<b>Seventh</b>	4	The student should be acquainted with the types of cutting edges, the formation theory of the emerging cutting edge, factors affecting it, factors leading to its size reduction, cooling and its importance for cutting operations, and different cooling fluids.	The cutting edge, the formation of the cutting edge, the factors that affect it, the factors that lead to its reduction in size, cooling and its importance for cutting operations, different cooling fluids.	<b>Lecture + practical workshop</b>	<b>Discussion + exam Oral and written</b>
<b>Eighth</b>	4	How to conduct an operation card for a set of operations, calculate its elements and the cutting time for each operation to benefit from the card in tracing the product path through different units.	How to perform an operation card for a group of operations, calculate its elements, and calculate the cutting time for each operation to benefit from the card in creating the product's path through different units.	=	=
<b>tenth Ninth</b>	8	The student should be familiarized with the types of tower lathes, automatic lathes, and the study of operations that can be performed	Tower lathes, automatic lathes, studying the operations that can be performed and analyzing the operations on the product, how to prepare	=	=

		on them, analyzing operations on the product, and how to prepare operation cards. Types of tools used and their arrangement on the hexagonal, front quadrilateral, and rear quadrilateral towers.	operation cards. Types of tools used and their arrangement on the hexagonal, front quadrilateral, and rear quadrilateral tower.		
<b>Eleventh</b>	4	The student should be familiarized with the type of milling, understanding the processes that can be carried out on milling machines, the parts and components of horizontal and vertical milling machines, and the nature of operation of each part	Milling: Understanding the operations that can be performed on milling machines, parts and components of horizontal and vertical milling machines, and the nature of operation of each part.	=	=
<b>Twelfth</b>	4	The student should be acquainted with the types of milling machine accessories, dividing heads, and the methods of division used on them	Accessories of milling machines, dividing heads and the methods of division used on them.	=	=
<b>Thirteenth</b>	4	The student should be introduced to the types of milling cutters (disc and finger), gear hobbing cutters, and the angles of milling cutters.	Types of milling cutters (disc and finger), gear hobbing cutters, angles of milling cutters.	=	=
<b>Fourteenth</b>	4	The student should be guided through the steps of milling operations, selecting the appropriate machine, the initial dimensions of workpiece	Explanation of the steps of performing milling operations, selecting the appropriate machine, initial dimensions of workpiece	=	=

		and methods of securing workpieces.	and methods of securing workpieces.		
<b>Fifteenth</b>	4	The student should be familiarized with the different types of milling various gears (spur gears, bevel gears, helical worm gears).	Milling different types of gears (spur, bevel, helical worm).	=	=
<b>Sixteenth</b>	4	The student should be familiarized with the type of machining rates, cutting speeds, feeds, and the principles of their selection for various milling operations (such as helical interpolation, V-block interpolation).	Cutting speeds, feed rate and selection criteria for various milling operations (such as face milling, V-block milling).	=	=
<b>Seventeenth</b>	4	The student should be familiarized with the type of planing: defining the types of planers (shaper, slotter, vertical), the operations performed on the planing machine, the operating capabilities available for each machine and workpiece fastening methods.	Planing: Introducing the types of planers (shaper, slotter, vertical) and the operations performed on planing machine, the operational capabilities of each machine, and workpiece clamping methods.	=	=
<b>Eighteenth</b>	4	The student should be familiarized with the type of machining rates, including cutting speeds and feeds, planer attachments such as dividing heads or special devices, tool bit angles, and the types of forces affecting them.	Operating parameters including cutting speeds, feed rates, planer accessories such as dividing heads or special devices, planer tool angle and types of forces affecting them.	=	=

Nineteenth	4 The student should be familiarized with the types of grinding: an introduction to the theory of cutting and the shape of the cutting edge in the grinding process, the types of grinding stones used (peripheral, face, lateral, cup, internal), their specifications and uses, well as the methods of attachment and their balancing.	Grinding: An overview of cutting theory and chip formation in the grinding process, grinding stones used (peripheral, surface, side, cup, internal) their specifications and uses, as well as mounting methods and balancing.	=	=
Twentieth	4 The student should also become acquainted with the different types of grinding machines and their operational capabilities of each type (external and internal cylindrical grinding machines, various types of surface grinding machines and gear cutting machines).	Different types of grinding machines and their operational capabilities for each type (external and internal cylindrical grinding machines, various types of surface grinding machines, gear grinding machines).	=	=
Twenty-first	4 The student should be familiarized with the types of machines for preparing comprehensive operation cards for all cutting processes.	Comprehensive cutting operation card preparation	=	=
Twenty-second	4 The student should be acquainted with the types of metal forming: forming theory, principles of cold and hot forming, and types of forming.	Metal forming: Forming theory, cold and hot forming principles, types of forming.	=	=
Twenty-third	4 The student should be introduced to the basics	Fundamentals of rolling and its methods, rolled	=	=

		rolling and its methods, rolled products, the sequence of operations in rolling, machines used, conditions for completing the rolling process. Principles of metal extrusion, types of metals used, direct extrusion, backward extrusion, and types of extrusion products.	products, sequence of operations in rolling, machines used, conditions for completing the rolling process. Fundamentals of metal extrusion and the metals used, direct extrusion, reverse extrusion, types of extrusion products.		
<b>twenty fourth</b>	4	The student should be familiar with the basics of cutting operations, types of molds and their components, in each case dimensions of the raw material and selection methods, calculating cutting force. Principles of drawing and deep drawing operations, calculating drawing forces and specific ratios in each case, types of drawing and their uses.	Principles of cutting operations, types of molds and their parts, in each case, dimensions of the raw material and methods of selection, calculation of cutting force. Principles of drawing and deep drawing calculation of drawing forces and specific ratios in each case, types of drawing and their uses.	=	=
<b>Twenty-fifth</b>	4	The student should be introduced to the types of unconventional methods in metal forming: A- Hydrostatic extrusion B- Electric discharge machining C- Electromagnetic fields D- Explosive forming and the advantages of this process.	Studying non-traditional methods in metal forming: A- Hydrostatic extrusion B- Electric discharge machining C- Electromagnetic fields D- Forming with explosives and the advantages of this process.	=	=
<b>twenty-sixth</b>	4	The student should familiarize themselves with	Machines programmed using the G-Code system	=	=



		the types of programmed machines using the G-Code system, machine components, axes of motion, control panel, machine zero point, workpiece zero point, and motion level functions (G17, G18, G19).	involve the machine components, motion axes, control panel, machine zero point, workpiece zero point, and motion level functions (G17, G18, G19).		
<b>Twenty-seventh</b>	4	ForThe student should become acquainted with the types of linear motion functions (G0, G1), reference points (G51, G52, G53, G54, ..., G59), auxiliary functions F, M, S, T.	Linear motion functions (G0, G1), reference points (G51, G52, G53, G54, ..., G59), and auxiliary functions F, M, S, T are all essential.	=	=
<b>Twenty-eighth</b>	4	ForFurthermore, the student should learn about the types of rotational motion functions (G2, G3), drilling function, gear cutting function, and designing programs using the aforementioned functions.	Rotational motion functions (G2, G3), hole function, and gear cutting function are part of the programming. Designing programs using the above functions is crucial	=	=
<b>Twenty-ninth</b>	4	Additionally, the student should be introduced to the types of CNC lathe machines operating with (Cad-Cam) system, utilizing (Cad-Cam) software for engineering product design.	Programmable lathe machines operating with (Cad-Cam) system, utilizing (Cad-Cam) software for designing engineering products.	=	=
<b>Thirtieth</b>	4	Moreover, the student should be introduced to the types of CNC milling machines operating with (Cad-Cam) system, using (Cad-Cam) software for	Programmable milling machines operating with (Cad-Cam) system, employing (Cad-Cam)	=	=

	engineering product design.	software for designing engineering products.		
<b>23. Course evaluation</b>				
Distribution of grades out of 100 according to the tasks assigned to the student, such as daily preparation, daily, oral, monthly, and written exams, and reports are as follows:  First Semester: 20% (10% theoretical + 10% practical) Second Semester: 20% (10% theoretical + 10% practical) + Annual work 10% = Annual effort 50% Final exam 50% (40% theoretical + 10% practical) Final grade = 100%				
<b>24. Learning and teaching resources</b>				
Required textbooks (methodology, if any)	<b>Manufacturing processes book ( Osama Mohammed Elmardi Suleiman Khayal 2017 (</b>			
Main references (sources)	7- Introduction to Production Engineering 8- Principles of Metal Casting 9- Metal Forming Techniques 10- Manufacturing Methods 11- Metal Ignition - Technological Foundatio 12- Principles of Milling Operations			
Supporting books and references recommended (scientific journals, reports...)	The Internet and websites of Iraqi and foreign colleges and universities			
Electronic references, internet sites	Internet			