

**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 Guide

2024-2023

Introduction:

The educational program is considered a coordinating and organizing package of academic courses that encompasses procedures and experiences arranged in the form of an academic syllabuses. The main goal of these syllabuses is to improve and build graduates' skills to make them ready for the job market. The program is annually reviewed and evaluated through internal or external audit procedures and programs like the External Examiner Program.

The academic program description offers a brief summary of the main features of the program and its courses. The program indicates the skills offered to students that are developed based on the goals of the academic program. This description represents a cornerstone of the requirements of program accreditation, so it is written by the teaching staff under the supervision of scientific committees of the scientific departments.

This second version of the guide, includes a description of the academic program after updating the subjects and terminologies of the previous guide to respond to the updates and developments of the educational system in Iraq that includes 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.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process.

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 of that the student is expected to achieve, demonstrating whether he or she has widely benefited from 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 progressive, inspiring, stimulating, realistic and applicable.

Program Mission: Briefly outlines the goals and activities necessary to achieve it and determines the program's development paths and directions.

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

Curriculum Structure: All courses/ subjects included in the academic program developed according to the approved learning system (quarterly, annual, Bologna Process) whether it is required by (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 the learning outcomes of each course must be determined in a way that achieves the objectives of the program.

Teaching and learning strategies: They are the strategies adopted by the faculty members to develop students' teaching and learning. 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.

Ministry of Higher Education and Scientific Research
Scientific supervision and evaluation institution
Department of Quality Assurance and Academic
Accreditation
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Description of the academic program of the Power Mechanical
Technology Engineering Department for the academic year
2024-2025

University name: Al-Furat Al-Awsat Technical University

College/Institute: Technical College - Mussiab

Scientific Department: Department of Power Mechanical Technology
Engineering

Name of the academic or professional program: Bachelor's degree

Name of final degree: Bachelor of Mechanical Power Technology
Engineering

Academic system: Annual

Description preparation date: 29/09/2024

Date of filling the file: 31/09/2024

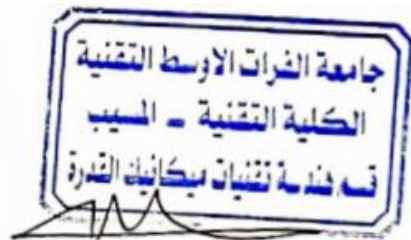
The signature:

Name of scientific assistant Dean:

Prof. Dr. **Nabil Hamid Abdel Majeed**

Date: / /2024

The signature:



Name of Department Head:

Assist. Prof. Dr. **Malik Nama Hawass**

Date: / /2024

Check the file by:

Division of Quality Assurance and University Performance

Name of the Director of the Quality Assurance and University Performance Division:

Dr. Haider Rahman Daoud

Date: / /2024

The signature:



Authentication of the Dean

1. Program vision

Keeping pace with modern scientific developments in the education program for undergraduate and postgraduate levels in the future, directing and developing scientific research, and employing applicable research energies in the fields of .power and energy production.

2. Program message

Within the framework of the mission of Al-Mussaib Technical College, the department is committed to preparing technical engineers and researchers capable of contributing to the development of the power sector and the fields of energy production in its various forms.

3. Program objectives

- 1- Preparing engineering technical staff who hold qualifications in power mechanical engineering technology
- 2- Preparing scientific staff capable of keeping pace with scientific development in mechanical engineering/power mechanical technology engineering
- 3- Learn how to maintain turbine machines, generating and cooling devices
- 4- Design of equipment and machines
- 5- Learn practical applications through laboratory experiments
- 6- Gaining practical experience through field observation to enhance the theoretical aspect.

4. Programmatic accreditation

Does the program have program accreditation? no

5. Other external influences

Is there a sponsor for the program? no

6. Program structure				
* comments	percentage	Study unit	Number of courses	Program structure
		195	43	Institution requirements
		185	38	College requirements
		185	38	Department requirements
For the second and third stages		2 months		Work placement (summer training)
				others

7. Program Description						
Year/ Level	Module Code	Module Name	Credit Hours (hr./w)			
			Theoretical	Laboratory	Practical	Tutorial
One/ 1 st	ATU24011	English for Academic (Level 1)	1			
	ATU24012	Computer Principals	1	2		
	ATU24013	Mathematics -I	3			1
	ATU24014	Workshop			6	
	ATU24015	Fundamentals of Engineering Mechanics-Statics	2			1
	ATU24016	Engineering Drawing (Fundamentals)		6		
One/ 2 nd	ATU24021	Human Right and Democracy	1			
	ATU24022	Mathematics -II	3			1
	ATU24023	Engineering Materials	2			
	ATU24024	Fundamentals of Engineering Mechanics-Dynamics	2			1
	ATU24025	Engineering Drawing (CAD Drawing)		4		2
	ATU11	Arabic Language	1			
	ATU24026	Fundamentals of Electricity	3	2		1

Two/ 3 rd	ATU24031	Fluid Mechanics - static	2	2		
	ATU24032	Electrical Engine	2	2		
	ATU24033	Mechanical Drawing) (CAD)	2	4		
	ATU24034	Fundamentals of Thermodynamics	2	2		1
	ATU24035	English for Academic (Level 2)	1			
	ATU24036	Mathematics- III	3			1
	ATU24037		2			
Two/ 4 th	ATU24041	Fluid Mechanics- Dynamics	2	2		1
	ATU24042	Metallurgy	2	2		
	ATU24043	Mathematics- IV	3			1
	ATU24044	Strength of Materials	2	2		1
	ATU24045	Computer 2	1	2		
	ATU24046	Thermodynamic - Applications	2	2		1
Three / 5 th	ATU24051	Hydraulics	2	2		1
	ATU24052	Renewable Energy	2	2		1
	ATU24053	Engineering Analyses	2			1
	ATU24054	Gas Dynamics	2	2		1
	ATU24055	Heat Transfer (conduction)	2	2		1
	ATU24056	English for Academic (Level 3)	1			
Three / 6 th	ATU24061	Internal Combustion Engine	2	2		1
	ATU24062	Turbo-Machinery Operation and Maintenance	2		3	
	ATU24063	Heat Transfer (Convection & Radiation)	2	2		1
	ATU24064	Computer 3	1	2		
	ATU24065	Numerical Analyses	3			1
	ATU24066	Theory of Machines	2	2		1
Four/ 7 th	ATU24071	Steam Power Plants	2	2		1
	ATU24072	Vibration Theory	2	1		1
	ATU24073	Refrigeration and Air Conditioning	3	2		1
	ATU24074	Manufacturing Process	2			
	ATU24075	Computer 4	1	2		

	ATU24076	Project			2	1
Four/ 8 th	ATU24081	Machine Design	3			1
	ATU24082	Measuring and Control Devices	3		1	1
	ATU24083	Hydraulic Power Plants	2	2		1
	ATU24084	the industrial engineering	2			
	ATU24085	English for Academic (Level 4)	1			
	ATU24086	Project			2	1

8. Expected learning outcomes of the program

Knowledge

The student's awareness of the importance of power .mechanical engineering techniques in practical life

1 - Preparing qualified technical engineering personnel to design, inspect, install, operate and maintain various types of turbine machines and their accessories.
2- Teaching students what is meant by mechanical engineering and creating a generation of engineers in the specialty of power mechanics.
-3Spreading knowledge awareness related to mechanical engineering/power mechanical engineering techniques.

Skills

General skills and qualifying the student to maintain and rehabilitate power stations

1- He has the ability to work in electrical power production units and refrigeration and air conditioning systems.
-2 Proficiency in working in the public and private sectors in the specialty of mechanical engineering/power mechanical technology engineering.

Value

Acquiring skills and experience in the field of mechanical engineering in general and the energy sector in particular.

1- Observation, perception, analysis and interpretation
2- The ability to use the acquired knowledge in designing machines, turbine machines, and cooling devices
3Conclusion and evaluation in solving engineering problems and how to develop engineering devices and equipment
4The ability to evaluate numerical data and apply analytical methods for the purposes of mechanical design, manufacturing methods, and product control.

9. Teaching and learning strategies	
1- The lecture 2- Laboratory 3- Seminars and summer training 4- Scientific trips and seminars 5- Scientific books 6- Graduation projects	
10. Evaluation methods	
Conducting tests (daily, quarterly, final) Annual Evaluation Homeworks Quizzes.	

11. The teaching staff						
Faculty members						
Number of the teaching staff		Special requirements/skills (if any)		field		Academic position
lecturer	Permanent staff			specialization	General specialization	
	√			Power/ thermal engineering	Mechanical Engineering	Prof
	√			Applied mechanics	Mechanical Engineering	Prof.
	√			Design and manufacture	Mechanical Engineering	Assist. Prof.
	√			Applied mechanics	Mechanical Engineering	Assist. Prof.
	√			Power/ thermal engineering	Mechanical Engineering	Assist. Prof.
	√			Power/ thermal engineering	Mechanical Engineering	Assist. Prof.
	√			Applied mechanics	Mechanical Engineering	lecturer

	√			Power/ thermal engineering	Mechanical Engineering	lecturer
	√			Power/ thermal engineering	in MSc Mechanical Engineering	lecturer
	√			Power/ thermal engineering	in MSc Mechanical Engineering	Assist. lecturer

Professional development

Orienting new faculty members

They are defined as members who are newly hired by the university and are within their first year of academic service. A faculty member in his second year is eligible to participate if he is nominated by the deanship.

Professional development for faculty members

The ability of teachers is developed by involving them in teaching methods courses held at the Faculty Development Center, as well as by holding seminars at the department level, where each teacher is assigned to prepare a seminar on one of the scientific topics, and it is delivered in the presence of the teaching staff in the department. The topic is discussed and notes are recorded. Necessary, as this is useful in refining the teacher's personality and helping him in managing discussion, defense, and expressing opinion, which would help raise the academic level of the teacher and develop his capabilities. Also, in recent years, many of the department's teachers have participated in courses inside and outside the country that have had a positive impact in increasing knowledge and developing skills. Most of the department's teachers also participate annually in many scientific conferences held by Iraqi universities as researchers or as participants.

12. Acceptance criterion

Inputs:-

1. Graduates of preparatory school, scientific branch.
2. The top five students are graduates of vocational training/mechanics branch.
3. The top ten students who are graduates of technical institutes and distinguished state employees are graduates of the Technical Education Authority for the following specializations:
 - Machinery and Equipment Department - Pump Operation Branch.
 - Machinery and Equipment Department - Automotive Branch.
 - Mechanics Department - Production Branch.
 - Mechanics Department - Power or Capacity
4. The top ten distinguished employees of state departments are graduates of the Petroleum Training Institute for the following specializations:
 - Mechanics Department - Pumps and Turbine Branch.
 - Mechanics Department - Automotive and Heavy Equipment Branch.

Admission system:

Students are accepted through central admission at the Ministry of Higher Education and Scientific Research in two stages, as follows:

1. The first grade includes graduates of preparatory school in the scientific stream, as well as the top graduates of vocational education in the specializations that can be accepted into the specialization.
2. The second grade is accepted:
 - ☐ The top ten graduates of the technical institutes specified in the specialization entries.
 - ☐ Distinguished people in the field of work in the specializations specified in the entries.
 - ☐ The top ten graduates of the institute for the specializations specified in the

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13. The most important sources of information about the program

The official website of the college

<https://cms.atu.edu.iq>

Mussaib Technical College/Babylon

14. Program development plan

The Mechanical Technology Engineering Department works to develop the student's practical skills and increase his confidence in his scientific capabilities. The curricula are updated by 20% annually by the subject teacher, and periodic updating follows the Deans' Committee.

Program Skills Outline																	
Level	Semester	.No	Module Code	Module Name in English	Module Type	Required program Learning outcomes											
						Knowledge				Skills				Ethics			
						A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
1 st	One	1	PME111	English for Academic(Level 1)	S	*				*	*			*			
		2	PME112	Computer Principals	B	*				*				*			
		3	PME113	Mathematics -I	B	*				*						*	
		4	PME114	Workshop	C		*			*				*			
		5	PME115	Fundamentals of Engineering Mechanics-Statics	C	*				*				*			
		6	PME116	Engineering Drawing (Fundamentals)	S	*						*		*			
	Two	1	PME121	Human Right and Democracy	B		*			*							
		2	PME122	Mathematics -II	B	*				*						*	
		3	PME123	Engineering Materials	S												
		4	PME124	Fundamentals of Engineering Mechanics-Dynamics	C	*				*				*			
		5	PME125	Engineering Drawing (CAD Drawing)	S	*						*		*			
		6	PME126	Fundamentals of Electricity	S	*				*	*			*			
2 nd	Three	1	PME211	Fluid Mechanics -static	C	*					*			*			
		2	PME212	Electrical Engine	S	*				*	*			*			
		3	PME213	Mechanical Engineering Drawing	S	*						*		*			
		4	PME214	Fundamentals of Thermodynamics	C	*				*				*			
		5	PME215	English for Academic (Level 2)	S	*				*	*			*			
		6	PME216	Mathematics- III	B	*				*						*	
	Four	1	PME221	Fluid Mechanics-Dynamics	C	*					*				*		
		2	PME222	Metallurgy	S	*					*				*		
		3	PME223	Mathematics- IV	B	*				*						*	
		4	PME224	Strength of Materials	S	*				*					*		
		5	PME225	Programming (Mat Lab)	S	*						*		*			
		6	PME226	Thermodynamic - Applications	C	*				*				*			

rd3	Five	1	PME311	Hydraulics	C	*	*		*					*			
		2	PME312	Internal Combustion Engine	C	*	*		*					*			
		3	PME313	Analyses Engineering	S	*					*				*		
		4	PME314	Gas Dynamics	C	*	*		*					*			
		5	PME315	Heat Transfer (conduction)	C	*	*		*					*			
		6	PME316	English for Academic(Level 3)	S	*				*	*				*		
	Six	1	PME321	pumps Technology	C	*	*		*					*			
		2	PME322	Turbo-Machinery Operation and Maintenance	C	*	*		*					*			
		3	PME323	(Radiation & Heat Transfer (Convection	C	*	*		*					*			
		4	PME324	(D Auto CAD-3) Programming	S	*						*			*		
		5	PME325	Analyses Numerical	S	*					*				*		
		6	PME326	Theory of Machines	S			*		*			*				
th4	Seven	1	PME411	Steam Power Plants	C	*	*		*					*			
		2	PME412	Theory Vibration	S			*		*			*				
		3	PME413	Refrigeration and Air Conditioning	C	*	*		*					*			
		4	PME414	Manufacturing Processe	S	*				*				*			
		5	PME415	Programming (Solid Work)	S	*						*			*		
		6	PME416	Project	C	*	*	*	*	*	*	*	*	*	*	*	*
	Eight	1	PME421	Machine Design	S			*		*			*				
		2	PME422	Measuring and Control Devices	C	*				*				*			
		3	PME423	Hydraulic Power Plants	C	*	*		*					*			
		4	PME424	the industrial engineering	S	*				*				*			
		5	PME425	English for Academic(Level 4)	S	*				*	*				*		
		6	PME426	Final Project	C	*	*	*	*	*	*	*	*	*	*	*	*



Ministry of Higher Education and Scientific
Research Scientific Supervision and Scientific
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University: Al-Furat Al-Awsat Technical University
College: Engineering Technical College/ Al-Mussiab
Department: Power Mechanical Technology Engineering
Name lecturer: Atheer Saleh Hassoon
Scientific title: Lecturer
Academic qualification: Doctorate
Work location: Power Mechanical Technology Engineering

Course Description Form 2023/2024

1. Course Name	Gas Dynamics	
2. Course Code	ATU24054	
3. Semester / Year	2024/2023	
4. Description Preparation Date:	2024/9/1	
5. Available Attendance Forms:	Lectures in the presence of students and online if necessary	
6. Number of study hours (total)/number of units (total)	15 week / 4 units	
7. Name of the course administrator (if there is more than one teaching staff, all of their names will be mentioned)	Dr. Atheer Saleh Hassoon	
8. Expected learning outcomes of the program		
Knowledge and understanding		
A1	Ability to apply knowledge in mathematics, science, and engineering.	✓
A2	Understand the professional and ethical responsibilities of the field of specialization.	✓
A3	Ability to evaluate course outcomes with faculty, industry and professional practitioners, as well as employers and graduate students to improve them	✓
A4	Teaching leadership skills and the value of quality commitment, ethical behavior and respect for others.	✓
Subject-specific skills		
B1	Ability to work and integrate into multidisciplinary teams.	✓
B2	Ability to design and conduct experiments as well as analyze and interpret data.	✓

B3	The ability to use modern techniques, engineering skills and tools to practice engineering.	✓
B4	Ability to identify and formulate engineering problems in the field of specialization.	✓
Thinking skills		
C1	The ability to communicate effectively with those concerned with the field of specialization.	✓
C2	Recognizing the need and ability to engage in lifelong learning.	✓
C3	Knowledge of contemporary issues in the field of specialization	✓
C4	The broad learning necessary to understand the impact of engineering solutions on global economic, environmental and social problems.	✓
Generic and transferable skills (other skills related to employability and personal development)		
D1	Ability to manage and work on examinations in the fields of Power Mechanical engineering and all sectors.	✓
D4	The ability to adapt to similar specializations (Air conditional and Refrigeration, Aerodynamic engineering, Automobile Engineering, renewable energies...).	✓
9. Teaching and Learning Strategies		
Strategies	Encourage students' participation in solving exercises, while improving and expanding their critical thinking skills. This will be accomplished through interactive classroom and tutorial programs and by looking at types of simple experiments that include some sampling activities of interest to students.	

10. Outcomes of the bachelor's program in technical engineering according to the guidelines of the National Council for Programmatic Accreditation for Technical Engineering Education, the Academic Accreditation for Engineering and Technology (ABET), and the International Engineering Alliance (IEA).		
a - Selects and applies modern knowledge, techniques, skills and devices in large-scale engineering activities.		✓
b - Selects and applies knowledge of mathematics, engineering, technology, and other sciences to solve engineering problems that require the application of applied principles, procedures, or methodologies.		✓
c- Conducts the required tests, experiments, and measurements, analyzes and interprets their results, and applies experimental results to improve engineering processes.		
d- Designs systems, components, or processes for large-scale engineering problems that fit the objectives of the educational program.		
e- Works effectively as a member or leader in a specialized engineering team.		✓
f- Identifies, analyzes and solves large-scale engineering problems.		✓
g - Identify and utilize appropriate technical literature as well as apply written documents, oral communications, and graphics in both technical and non-technical environments.		✓
h- Participates in self-directed continuing professional development.		✓
i - Selects and applies modern knowledge, techniques, skills and devices in large-scale engineering activities.		✓
j - Selects and applies knowledge of mathematics, engineering, technology, and other sciences to solve engineering problems that require the application of applied principles, procedures, or methodologies.		✓
k- Conducts the required tests, experiments, and measurements, analyzes and interprets their results, and applies experimental results to improve engineering processes.		✓

11. Objectives of the educational program: Due to the rapid scientific and technological progress in the field of Gas Dynamics that include rocket and Airplane manufacturing, the Power Mechanical Technology Engineering Department is working to achieve clear strategic objectives that will help it achieve a prominent position within the academic communities, and they are becoming clear.

A- Maintaining and improving the quality of the curriculum	A1	Introducing scientifically and internationally updated study materials in the study of the specialty of <u>Gas dynamics</u> and keeping pace with rapid scientific development through direct contact with decision-makers for construction engineering in all parts of the world and direct contact with colleges and institutes specialized in construction engineering.	✓
	A2	Continuous evaluation and development of curricula.	✓
	A3	Linking student projects and research to community needs.	✓
	A4	Expanding students' concepts with field visits, seminars, and training in projects and companies in the Power Mechanical sector.	✓
B - Modernizing and opening laboratories by providing them with the latest technical equipment and equipment in the field of specialization and managing with them killed technicians.	B1	Students use the latest modern laboratory and programming technologies.	✓
C- Providing the best university environment for faculty and students	C1	Providing air-conditioned classrooms equipped with the latest display devices, providing offices for teachers, green spaces, a club, and a library.	✓
D- Maintaining the technical development of faculty members	D1	Encouraging participation and effective scientific visits in conferences and technical meetings, especially with the administrations of Iraqi companies, state and international departments, and international training companies.	✓
	D2	Continuous review and evaluation of student and faculty activities.	✓
	D3	Continuous review and evaluation of student and faculty activities Encouraging students' initiatives and achievements in various academic, artistic and religious fields with the teaching staff.	✓
E- Knowledge production	E1	Conducting distinguished theoretical and applied research for students with the faculty.	✓
	E2	Encouraging scientific publishing and stimulating the collective work of research groups from different disciplines.	✓
	E3	Striving to increase sources of funding for practical and theoretical research for students and faculty through publishing in local and international engineering journals.	✓
F- Initiatives	F1	Initiatives to reduce administrative routine and facilitate work procedures through educational guidance and developing the relationship between students and teachers.	✓
G- Activating and strengthening ties with public government agencies and the private sector	G1	Organizing conferences, seminars and educational courses.	✓
	G2	Encouraging consulting work and providing services at the professional level in all engineering specializations (technology incubator).	✓

12. Course structure

Week	Hours	Required learning outcomes	Name of the unit or topic	Learning method	Assessment Method
1-2	10	▪ Knowledge and understanding. ▪ Subject-specific skills. ▪ Thinking skills. Generic and transferable skills (other skills related to employability and personal development).	Review (Fundamental of thermodynamics and fluid mechanics)	▪ The direct method is through lectures. ✓ ▪ The subjective method is through preparing research papers and discussing them collectively. ✓ ▪ Scientific seminars on the most important research carried out in the field of specialization. ✓ ▪ An interactive method by dividing students into small groups. ✓	▪ Written tests. ✓ ▪ Oral exams. ✓ ▪ Completion files and performance assistant. ✓ ▪ Projects and observation. ✓
3	5	▪ Knowledge and understanding. ▪ Subject-specific skills. ▪ Thinking skills. Generic and transferable skills (other skills related to employability and personal development).	Basics of compressible flow	▪ The direct method is through lectures. ✓ ▪ The subjective method is through preparing research papers and discussing them collectively. ✓ ▪ Scientific seminars on the most important research carried out in the field of specialization. ✓ ▪ An interactive method by dividing students into small groups. ✓	▪ Written tests. ✓ ▪ Oral exams. ✓ ▪ Completion files and performance assistant. ✓ ▪ Projects and observation. ✓
3	5	▪ Knowledge and understanding. ▪ Subject-specific skills. ▪ Thinking skills. Generic and transferable skills (other skills related to employability and personal development).	Isentropic flow	▪ The direct method is through lectures. ✓ ▪ The subjective method is through preparing research papers and discussing them collectively. ✓ ▪ Scientific seminars on the most important research carried out in the field of specialization. ✓ ▪ An interactive method by dividing students into small groups. ✓	▪ Written tests. ✓ ▪ Oral exams. ✓ ▪ Completion files and performance assistant. ✓ ▪ Projects and observation. ✓
5-6	10	▪ Knowledge and understanding. ▪ Subject-specific skills. ▪ Thinking skills.	Isentropic flow through variable area duct	▪ The direct method is through lectures. ✓ ▪ The subjective method is through preparing research papers and discussing them collectively. ✓ ▪ Scientific seminars on the most important	▪ Written tests. ✓ ▪ Oral exams. ✓ ▪ Completion files and performance assistant. ✓

		Generic and transferable skills (other skills related to employability and personal development).		research carried out in the field of specialization. ✓ ▪ An interactive method by dividing students into small groups. ✓	Projects and observation. ✓
7	5	▪ Knowledge and understanding. ▪ Subject-specific skills. ▪ Thinking skills. Generic and transferable skills (other skills related to employability and personal development).	Normal shock wave	▪ The direct method is through lectures. ✓ ▪ The subjective method is through preparing research papers and discussing them collectively. ✓ ▪ Scientific seminars on the most important research carried out in the field of specialization. ✓ ▪ An interactive method by dividing students into small groups. ✓	▪ Written tests. ✓ ▪ Oral exams. ✓ ▪ Completion files and performance assistant. ✓ Projects and observation. ✓
8	5	▪ Knowledge and understanding. ▪ Subject-specific skills. ▪ Thinking skills. Generic and transferable skills (other skills related to employability and personal development).	Fanno flow	▪ The direct method is through lectures. ✓ ▪ The subjective method is through preparing research papers and discussing them collectively. ✓ ▪ Scientific seminars on the most important research carried out in the field of specialization. ✓ ▪ An interactive method by dividing students into small groups. ✓	▪ Written tests. ✓ ▪ Oral exams. ✓ ▪ Completion files and performance assistant. ✓ Projects and observation. ✓
9	5	▪ Knowledge and understanding. ▪ Subject-specific skills. ▪ Thinking skills. Generic and transferable skills (other skills related to employability and personal development).	Rayleigh flow	▪ The direct method is through lectures. ✓ ▪ The subjective method is through preparing research papers and discussing them collectively. ✓ ▪ Scientific seminars on the most important research carried out in the field of specialization. ✓ ▪ An interactive method by dividing students into small groups. ✓	▪ Written tests. ✓ ▪ Oral exams. ✓ ▪ Completion files and performance assistant. ✓ Projects and observation. ✓
10	5	▪ Knowledge and understanding. ▪ Subject-specific skills. ▪ Thinking skills.	Oblique shock wave	▪ The direct method is through lectures. ✓ ▪ The subjective method is through preparing research papers and discussing them collectively. ✓ ▪ Scientific seminars on the most important	▪ Written tests. ✓ ▪ Oral exams. ✓ ▪ Completion files and performance assistant. ✓ Projects and observation. ✓

		Generic and transferable skills (other skills related to employability and personal development).		research carried out in the field of specialization. ✓ ▪ An interactive method by dividing students into small groups. ✓	
11	5	▪ Knowledge and understanding. ▪ Subject-specific skills. ▪ Thinking skills. Generic and transferable skills (other skills related to employability and personal development).	Prandtl Meyer Function	▪ The direct method is through lectures. ✓ ▪ The subjective method is through preparing research papers and discussing them collectively. ✓ ▪ Scientific seminars on the most important research carried out in the field of specialization. ✓ ▪ An interactive method by dividing students into small groups. ✓	▪ Written tests. ✓ ▪ Oral exams. ✓ ▪ Completion files and performance assistant. ✓ Projects and observation. ✓
12-13	10	▪ Knowledge and understanding. ▪ Subject-specific skills. ▪ Thinking skills. Generic and transferable skills (other skills related to employability and personal development).	Adiabatic flow	▪ The direct method is through lectures. ✓ ▪ The subjective method is through preparing research papers and discussing them collectively. ✓ ▪ Scientific seminars on the most important research carried out in the field of specialization. ✓ ▪ An interactive method by dividing students into small groups. ✓	▪ Written tests. ✓ ▪ Oral exams. ✓ ▪ Completion files and performance assistant. ✓ Projects and observation. ✓
14-15	10	▪ Knowledge and understanding. ▪ Subject-specific skills. ▪ Thinking skills. Generic and transferable skills (other skills related to employability and personal development).	Jet propulsion- Rocket engine	▪ The direct method is through lectures. ✓ ▪ The subjective method is through preparing research papers and discussing them collectively. ✓ ▪ Scientific seminars on the most important research carried out in the field of specialization. ✓ ▪ An interactive method by dividing students into small groups. ✓	▪ Written tests. ✓ ▪ Oral exams. ✓ ▪ Completion files and performance assistant. ✓ Projects and observation. ✓
	3		Final Exam		
SUM		Notes / Number of theoretical hours = 2 hr./w			
15	78	Number of experimental hour = 2 hr/w			
Week	Hours	Number of Tutorial hour = 1 hr/w			

13- Course evaluation: Distributing the grade out of 100 according to the tasks assigned to the student, such as daily preparation, daily, oral, monthly, and written exams, reports, etc.

quizzes	homework	class activities	mid-exam	Final/ theoretical exam
20 %	10%	10%	10%	50%

14- Electronic references, Internet sites

Compressible fluid flow, Michel A. Saad.	Text books
- Fundamentals Of Gas Dynamics, Robert D. Zucker and Oscar Biblarz. - Thermodynamics An Engineering Approach 5th Edition - Cengel, Boles. - Fundamentals of Fluid mechanics" Bruce Munson - مبادئ ديناميكا الغازات – الدكتور منذر اسماعيل الدروبي	References books
	Internet sources