Description of Academic Program & Syllabus

Department of Metallurgical Engineering

College of Materials Engineering

وصف البرنامج الاكاديمي

و المقرر الدراسي

قسم هندسة المعادن

كلية هندسة المواد

Introduction

It is one of the basic and leading branches in applied and engineering sciences, concerned with the study of the composition of metals, their properties, and ways of benefiting from them in various industrial and technological fields. It includes knowledge of methods of extraction from ores, processing and manufacturing, in addition to developing and improving properties to suit the needs of daily life and modern technologies. Creating new alloys using a variety of methods, with wide applications including the medical, aerospace and aerospace industries, as well as advanced infrastructures and technologies.

University Name	**University of Babylon**
College	**College of Materials Engineering**
Academic Department	**Metallurgical Engineering**
Academic Program Name	**Bachelor of Metallurgical Engineering**
Final Degree Name	**Bachelor of Metallurgical Engineering**
Study System	**Polonia path (First stage & Second stage)** **Semester-base (Third stage &Fourth stage)**
Approved Program	**Curricula and Courses as per the Ministry**
Other External Influences	**Practical Training in factories and companies**
Date of Description Preparation	**9/2/2025**
Date of File Completion	**9/3/2025**

كلية هندسة المواد/قسم هندسة المعادن

الوصف الاكاديمي

Academic Program Description Form

University Name: University of Babylon
Faculty/Institute: Materials Engineering
Scientific Department: Metallurgical Engineering
Academic or Professional Program Name: BSC
Final Certificate Name: BSc. Metallurgical Engineering
Academic System: Semestral
Description Preparation Date: 9/2/2025
File Completion Date: 9/3/2025

Signature:
Head of Department

Name:Hayder H. Jamal Aldeen

Date: 12/3/2025

Signature:
Scientific Associate

Name: Auda Jabbar Braihi

Date:12 /3/2025

The file is checked by:
Department of Quality Assurance and University Performance
Director of the Quality Assurance and University Performance Department:

Raed Hussein Alwan
Signature:

Date:12 /3/2025

University of Babylon
College Of Materials Engineering
Dean's Office

Approval of the Dean
Abdel Raheem K. Abed Ali

1. Program Vision
The program should be distinguished in preparing scientifically and technically qualified engineers who are able to keep pace with developments in metallurgical engineering with an emphasis on community service
2. Program Mission
To provide a comprehensive education that combines academic theory and practical application to provide students with the skills necessary to produce modern alloys using advanced casting and manufacturing methods
The objectives are divided into two main categories: 1.General Objects: a. Preparing engineering cards capable of working in factories, laboratories, and companies. b. Promoting scientific research and discussing matters related to engineering applications. C. Meeting the needs of the labor market through creative engineering skills. 2.Specific Objective: a. Developing engineering skills and innovation. b. Introduce students to metallurgical engineering and its importance. c. Instilling ethical and professional values in engineering work. d. Establishing cooperation with engineering institutions to promote and develop scientific expertise.
4. Program Accreditation:
There is a presentation to obtain accreditation
5.Other external Influences:
1-Visits to fieldwork 2-The experimental part 3-Scientific consulting 4-Lbraries and internet network

5-Podiums of social media	6-The need of work market

6. Program Structure				
Program Structure	**Number of courses**	**Credit hours**	**Percentage**	**Reviews***
College Requirements	**48**	**22**	**8%**	**-**
Department Requirements	**32**	**68**	**92%**	**-**
Summer training	**1**	**-**	**-**	**-**
Other	**-**	**-**	**-**	**-**

7. Academic Program Description for Metallurgical Engineering Department

First Stage & Second Stage according to Polonia Path				
Third Stage				
Stage	**Code**	**Course Name**	**Credit Hours**	
			Th	**Pr**
Third Year/ First	**MeMtPt331111(2,2)**	**Phase Transformation**	**2**	**2**
	MeMtMb331414(3,2)	**Mechanical Metallurgy I**	**2**	**2**
	MeMtMm331313(2,2)	**Metals Machining**	**2**	**2**

	MeMtCe331212(2,2)	Corrosion Engineering I	2	2
	MeMtHt331919(3,2)	Heat Transfer I	3	2
	MtHt331818(3,2)	Powder Technology &Composite metallic materials	3	2
	MeMtEa331818(2,0)	Engineering Analysis	3	
	MeMtE331818(2,0)	English Language I	2	
Total			19	12
Third Stage/ Second Semester	MeMtMb332424(3,2)	Mechanical Metallurgy II	3	2
	MeMtCe332222(2,2)	Corrosion Engineering II	2	2
	MeMtNa332929(3,0)	Numerical Analysis	3	
		Inspection of Metallic Materials	3	2
	Me Mt Ht332121(3,2)	Heat treatments II	3	2
	MeMtCo332626(2,0)	Composite metallic materials	2	
	Me MtE332828(2,0)	English language(II)	2	
	MeMtTr332828(2,2)	Heat Transfer II	2	2
	MeMtEb331515(2,0)	Electronic and magnetic materials	2	
Total			20	10

Fourth Stage

Stage	Code	Course Name	Credit Hours	
			Th	Pr
Fourth Stage /First Semester	Me Mt Ds441111(3,2)	Design and Selection of Engineering Materials I	3	2
	MeMtCp441212(2,2)	Casting Processes	2	2
	MeMtIq441616(3,0)	Industrial Engineering and Quality Control	3	
		Surfaces Engineering	2	2
		Biometals	2	
	MeMtCa441515(1,2)	Metallurgy applications by computer(I)	1	2

	Me MtEp441717(1,4)	Engineering Project I	2	4
		English Language I	2	
Total			**17**	**12**
Fourth Stage / Second Semester	MeMtPi441313(2,2)	Plasticity and Metals Forming	2	2
	Me Mt Ds442121(3,2)	Design and Selection of Engineering Materials II	3	2
	MeMtWm442222(2,2)	Welding Metallurgy	2	2
	MeMtCa441515(1,2)	Metallurgy applications by computer (II)	1	2
	MeMtNt442424(2,2)	Nanomaterials technology	2	2
	Me MtEp441717(2,4)	Engineering Project II	2	4
	MeMtIq442626(3,0)	Industrial engineering & quality control (II)	3	
		English language II	2	
Total			**17**	**14**

8. Outcomes of the Program

A. Knowledge		L-outcomes
1A	Knowledge the general concepts of engineering	Comprehensive understanding of all properties and characteristics of materials and especially of metals and new alloys
2A	Knowledge the basics of materials and types in general and minerals in particular	
3A	Studying and knowing the engineering of materials of all kinds and their field of application	
4A	Focusing on mineral materials and dealing with them in all their operations, from the mine to the final manufacturing	

B-Skills		L-outcomes
1B	Skill in reading and analyzing all engineering plans and designs	Solving the problems, ability to design and develop, knowing selection of materials and analysis the failure
2B	Skill in using computers and software in developing solutions to engineering problems	
3B	Developing students' ability to deal with modern devices for examining engineering samples and developing devices	
4B	Motivating students to discuss and link information to each by asking a question to students	

C. Values		L-outcomes
1C	Graduates will understand the ethical and professional responsibilities associated with metallurgical engineering practice, including issues related to safety, sustainability, and social impact	Reinforcement professional ethics and social questionnaire
2C	Students will acquire teamwork and leadership skills, enabling them to work collaboratively in multidisciplinary teams, demonstrate effective leadership qualities, and contribute to the achievement of common goals	
3C	Participating in continuous learning, following the developments in metallurgical engineering	

	in all professional life	
4C	Reinforcement values of transparency and integrity in dealing with engineering tests	

9.Learning and Teaching Strategies	
A. Interactive Lectures: Using modern tools like PowerPoint B. Group Discussions: Encouraging students to discuss engineering questions C. Practical Projects: Using digital platforms and tools for interactive learning D. Engineering Designing Programs: Training the students to use engineering programs as Ansys, AutoCAD for programming the engineering problems and find the optimum answers for them E. Projects for Engineering Research: Encouragement the students to produce scientific research about engineering applications and failure analysis F. Analysis Engineering Data: Training students to use a lot of data and finding the optimum method to summarization	A. Laboratories Assays: Training the students to use accurate methods for experimental work B. Exercises for Making Samples: Participating students in manufacturing alloys in different methods as casting, powder metallurgy C. Teamwork: Group of students are organized to discuss the latest engineering matters D. Seminars: Seminars are set between students and faculty members to exchange ideas and discuss engineering problems E. Field Training: Opportunities are provided to train students in laboratories, companies and government institutions to gain real experience F. Organize Specialized Workshops on modern applications of engineering alloys as bio applications

10.Assesment Methods

A) Continuous Assessment: Class participation, periodic tests, presentations

B) Practical Assessment: Projects, hands-on workshops, laboratories experiments

C) Theoretical Assessment: Theoretical exams, writing reports

D)Feedback and Guidance: Providing students with ongoing constructive feedback

E) Final Exam: Includes a written exam and final graduation project

11.Teaching Faculty

S	Name	Academic Title	Specialization		Special Skills		No. Faculty	
			General	Special			Permenant	Temporary
1	Haydar Hassan Jaber Jamal Al Deen	Prof.	Met. Eng.	Corrosion Eng. & Biometals			√	
2	Haydar Abdulhassan Hussain Al-Ethari	Prof.	Mechanic Eng.	Cutting Metals			√	
3	Ahmed O.Al-Roubaiy	Prof.	Mat. Eng.	Met. Eng /Welding Eng.			√	
4	Jassim Mohammed Salman	Prof.	Mat. Eng.	Met.Eng./Casting &Light Metals			√	
5	Saad Hameed Al-Shafie	Prof.	Production Eng.	Advanced Metals Machining			√	
6	Haydar Abed Hassan Al-Juboori	Prof.	Industrial Eng.	Industrial Eng.			√	
7	Ali Hubi Haleem	Prof.	Met. Eng.	Corrosion Eng.			√	

8	Abdul Raheem Kadhim Abid Ali	Prof.	Mat. Eng.	Advanced Metallic Materials			√	
9	Ekbal mohammed saeed	Prof.	Met. Eng.	Met. Eng. /Intelligent Alloys			√	
10	Nawal Mohammed Dawood	Prof.	Mat. Eng.	Advanced Biometals			√	
11	Abdulsameea Jasim Abdulzehra Alkilabi	Prof.	Mat. Eng.	Met. Eng /Welding &Met. Eng.			√	
12	Zuheir Talib Khulief	Prof.	Mat. Eng.	Met. Eng.			√	
13	Nabaa Sattar Radhi	Prof.	Mat. Eng.	Met. Eng.			√	
14	Basem Mohysen Mohammed Zubaidy	Ass. Prof.	Mat. Eng.	Met. Eng.			√	
15	Zaineb Fadhil Kadhim	Ass. Prof.	Mat. Eng.	Met. Eng. /Thermodynamic			√	
16	Khalid M. Al-Janabi	Ass. Prof.	Met. Eng.	Met. Eng.			√	
17	Ayad Mohammed Nattah	Ass. Prof.	Mat. Eng.	Met. Eng.			√	
18	Baraa Hasan Hadi	Ass. Prof.	Mat. Eng.	Met. Eng.			√	
19	Nagham Yass Khudair	Lect.	Mechanic Eng.	Thermally			√	
20	Wafa Mahdi jodia	Lect.	Mechanic Eng.	Production Eng.			√	
21	Hussein Fawzy Mahdy	Lect.	Prod. Eng. &Metallurgy	Prod. Eng			√	
22	Muqdad Jaber	Lect.	Mat. Eng.	Met. Eng.			√	

23	Rula Sami Khudhair	Lect.	Compute r Eng.	Artificial Intelligence& Robotics			√	
24	Zaineb Fouad hamza	Lect.	Mat. Eng.	Met. Eng.			√	
25	Ruaa Hatem Kadhim	Lect.	Mat. Eng.	Met. Eng.			√	
26	Shahad Ali Hammood	Lect.	Mat. Eng.	Met. Eng.			√	
27	Qabas Khalid Naji	Lect.	Mat. Eng.	Met. Eng.			√	
28	Osama Ihsan Ali	Lect.	Mat. Eng.	Met. Eng.			√	
29	Zainab Abidulellah	Lect.	Mat. Eng.	Met. Eng.			√	
30	Walaa Amer Mughir	Lect.	Mechanic Eng.	Applied Mechanics			√	
31	Khaldun Emad Fadhel Aldawoudi	Ass. Lect.	Mat. Eng.	Met. Eng.			√	
32	Kwther Yehya	Ass. Lect.	Mat. Eng.	Met. Eng.			√	
33	Manar Assaf	Ass. Lect.	Mat. Eng.	Met. Eng.			√	
34	Saleh Sabah AL-Turaihi	Ass. Lect.	Mat. Eng.	Met. Eng.			√	
35	Rafaah Ibrahim Jabaar	Ass. Lect.	Electric. Eng.	Power			√	
36	Aenas Laith Ali	Ass. Lect.	Mat. Eng.	Met. Eng.			√	

Met. Eng.=Metallurgical Engineering; Mat. Eng.=Materials Engineering, Prod. Eng.=Production Engineering, Prof.=Professor, Ass. Prof.=Assist Professor, Lect.=Lecturer, Ass. Lect.=Assist Lecturer

12.Faculty Development

Orientation of Junior Faculty Members

A-Guidance and counselling programs **B-Workshops and training on Curricula and assessments** **C-Continuous development through conferences and e-learning** **D- Adherence to the Ministry's instruction through education and periodic review** **E-Building a culture of cooperation and continuous assessment**
Developing Senior Faculty
A-Providing the necessary environment and resources to develop the skills of the faculty levels of quality in academic performance. **B-Participating in workshops, continuing education courses, and specialized training courses.** **C-Developing the skills of the faculty member in the field of students evaluation and relying on effective alternatives in this regard.** **D-Developing the skills of the faculty member in relying on modern technology and innovating new alternatives in learning and teaching.** **E- Raising the level of the faculty member's skill in the field of scientific and professional research,** **management and community service.** **F-Exchange the experiences between faculty members in the scientific department and other corresponding departments locally and globally.** **G-Developing the multiple administrative skills of the faculty members, such as working as a team or taking skills decision making in academic and administrative work.** **H-developing the skills of the faculty member to deal with challenges facing him in performing his job duties and academic by overcoming potential career difficulties.**

13.Acceptance Criteria
Ministry Central Acceptance

14. Sources of Feedback and Evaluation
***Ministry of Higher Education and Scientific Research** ***Councils of Engineering Collages in Iraq** ***Arabian and Foreign Colleges of Engineering Materials**

15.Academic Program Development Plan
A-Updating the Curricula: Adding modern Curricula such as nanotechnology and bio applications as well as developing old materials to suit the requirements of the modern labor market. **B-Technology in Education: Combination of engineering programs as ANSYS, AutoCAD and E-learning platforms to enhance the technical skills of students.** **C-Practical Training: Signing partnerships with engineering institutions to provide field training that enhances the practical experience of students.** **D-Faculty Development: Organizing workshops and training programs for faculty members on the latest developments in metals and alloy applications and manufacturing methods.** **E-Continuous Evaluation: Adopting a continuous evaluation system that includes practical projects, presentations, and practical tests to comprehensively assess student's skills.**

F-Promoting Scientific Research: Encouraging students and faculty members to conduct research related to advanced manufacturing methods for alloys, metals and composite materials.

G-Follow up and Feedback: Establish a system to review the academic plan regularly based on the opinions of students and employers to ensure continuous development.

Values				Skills				Knowledge				Core (C) or Option (O)	Course Name	Course Code	Year
C 4	C3	C2	C1	B4	B3	B 2	B1	A4	A3	A2	A1				
		*	*	*		*	*	*	*	*	*	C	Phase transformation	Me Mt Pt331111(2,2)	Third stage/First Semester
			*	*			*	*	*	*	*	C	Corrosion engineering(I)	MeMtCe331212(2,2)	
*				*			*	*	*	*	*	C	Metals machining	MeMtMm331313(2,2)	
*				*	*			*	*	*	*	C	Mechanical metallurgy	MeMtMb331414(3,2)	
	*	*		*		*	*	*	*			C	Engineering analysis	Me MtEa331919(3,0)	
	*	*	*	*	*					*	*	C	Powder technology	MeHt221818(3,2)	

				*			*	*	*	*	*	C	Heat transfer(I)	Me MtHt331818(3,2)	
	*	*		*				*				C	English language(I)	Me MtE331818(2,0)	

Values				Skills				Knowledge				Core (C) or Opti on(O)	Course Name	Course Code	Year
C4	C3	C2	C1	B4	B3	B2	B1	A4	A3	A2	A1				
		*	*	*		*	*	*	*	*	*	C	Heat treatments	Me Mt Ht332121(3,2)	Third stage/
			*	*			*	*	*	*	*	C	Corrosion	MeMtCe332222(2,2)	

													engineering(II)		
*	*			*	*					*	*	C	Inspection of metallic materials		
*				*	*			*	*	*	*	C	Mechanical metallurgy (II)	MeMtMb332424(3,2)	
	*	*		*		*	*	*	*			C	Numerical analysis	Me MtNa332929(3,0)	
*	*	*		*	*					*	*	C	Composite metallic materials	MeMtCo332626(2,0)	
			*	*			*	*	*	*	*	C	Heat transfer (II)	Me MtTr332828(2,2)	
	*	*		*				*				C	English language(II)	Me MtE332828(2,0)	
*			*	*	*					*	*	C	Electronic and magnetic	MeMtEb331515(2,0)	

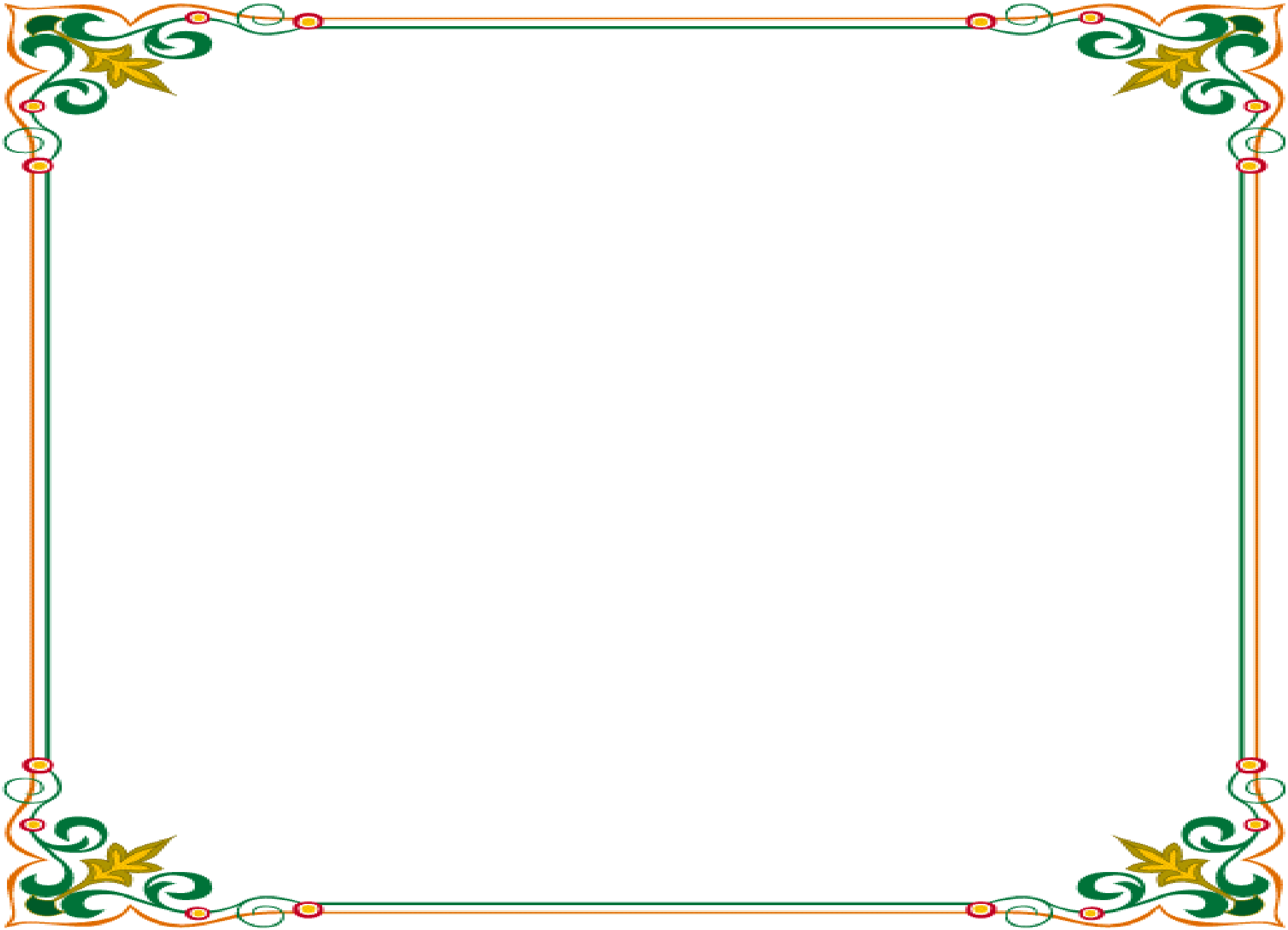
													materials		

Values				Skills				Knowledge				Core(C) or Option(O)	Course Name	Course Code	Year
C4	C3	C2	C1	B4	B3	B2	B1	A4	A3	A2	A1				
		*	*	*			*	*	*		*	C	Design &selection of engineering materials(I)	Me Mt Ds441111(3,2)	Fourth stage/ First Semester
*			*	*	*					*	*	C	Casting processes	MeMtCp441212(2,2)	
		*	*		*		*			*	*	C	Plasticity and metal forming	MeMtPi441313(2,2)	

	*	*				*	*	*	*			C	Metallurgy applications by computer(I)	MeMtCa441515(1,2)	
			*				*	*	*		*	C	Industrial engineering &quality control(I)	MeMtIq441616(3,0)	
*				*	*	*	*	*	*	*	*	C	Biometals		
	*	*		*				*				C	English language(I)		
			*	*			*	*	*	*	*	C	Engineering project		

Values				Skills				Knowledge				Core(C) or Option(O)	Course Name	Course Code	Year/Level
C4	C3	C2	C1	B4	B3	B2	B1	A4	A3	A2	A1				
		*	*	*			*	*	*		*	C	Design &selection of engineering materials(II)	Me Mt Ds442121(3,2)	Fourth Stage/ Second Semester
	*	*		*	*					*	*	C	Welding metallurgy	MeMtWm442222(2,2)	
	*	*				*	*	*	*			C	Metallurgy applications by	MeMtCa44252	

													computer(II)	5(1,2)
*	*	*	*	*	*	*	*	*	*		*	C	Industrial engineering &quality control(II)	MeMtIq442626(3,0)
*	*			*	*					*	*	C	Surface engineering	MeMtSe441414(2,2)
	*	*						*				C	English language(II)	
*				*	*					*	*	C	Nano-materials technology	MeMtNt442424(2,2)
*	*		*	*			*	*	*	*	*	C	Engineering project	Me MtEp441717(2, 4)



Department of Metallurgical Engineering
Course Description for 2024 -2025 First Semester

(Third and Fourth Stages)

Description of Corrosion Engineering I:

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programmed specification.

1. Teaching Institution	University of Babylon
2. University Department/Centre	Scientific Department / Department of Metallurgical Engineering
3. Course title/code	Corrosion Engineering
4. Modes of Attendance offered	weekly
5. Semester/Year	Semester
6. Number of hours tuition (total)	30
7. Date of production/revision of this specification	20/9/2024
8. Aims of the Course	

Introduce the student to the basic principles of corrosion engineering. Where the concepts and basics of corrosion are studied and the basic theories of corrosion are identified with a touch on the negative and positive aspects of the corrosion as well as the classification of corrosion depending on its causes and appearance with the division of the types of corrosion into pure chemical corrosion, electrochemical corrosion and polarization phenomena and its three types: activation, concentration and mixed. Its importance and determinants, as well as methods for calculating corrosion rates and types of corroding cells and also the types of corrosion, which include general uniform corrosion, localized corrosion, which includes intergranular corrosion, stress cracking, galvanic corrosion, erosion corrosion, stress corrosion, pitting corrosion, fissure erosion, scaling corrosion, selective leaching, atmospheric corrosion and biological corrosion with the identification of the methods used in the diagnosis Flour for the type of corrosion and its reduction

9· Learning Outcomes, Teaching, Learning and Assessment Method
A- Cognitive goals. A1- Building integrated projects in terms of interfaces and properties and writing equations related to corrosion engineering and its basics. . A2 - How to deal with engineering problems related to corrosion engineering and how to address them to reduce corrosion rates
B. The skills goals special to the course. Design and deal with engineering problems related to corrosion engineering such as macroscopic examination and laboratory tests to accurately determine the type of corrosion, its causes, find effective solutions and treatments to reduce corrosion rates and in proportion to the specialization of students in the Department of Metallurgical Engineering
Teaching and Learning Methods
1- Using the display screen 2- Discussion 3- Student groups 4- Experiential education

5- Interactive education

Assessment methods

1- Using the display screen
2- Discussion
3- In-class effectiveness
4- Daily exams
5- Semester exams
6- Final exam

C. Affective and value goals
C1- Written exams
C2- Semester exams
C3 - Final exams
C4- Daily assessment

D. General and rehabilitative transferred skills(other skills relevant to employability and personal development)
D1 Verbal communication (the ability to express thinking clearly and confidently in speech)
D2 Teamwork (working with confidence within the group)
D3 Written communication (the ability to express yourself clearly in writing)
D4 Planning and Organizing (the ability to plan and implement activities effectively)

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1-3	6	Recognition the Principles and the main equations	The concept of corrosion - its damages - its classifications - resistance to corrosion - expression of the rate of corrosion - chemical manifestations of corrosion	Direct lecture to students	surprise exams
4+5	4	Deals with theories and drive relations with many engineering examples	Electrochemical reactions, polarization, passivity	Direct lecture to students	surprise exams
6-8	6	Study the relations and cases studies	Effects of environment variables on corrosion rate	Direct lecture to students	surprise exams
9+10	4	Using industrial and experimental examples	The effect of metallurgical factors on the rate of corrosion	Direct lecture to students	surprise exams
11-13	6	Diagnose the types of corrosion of real examples in industrial structures and determine the type of failure	Corrosion Types	Direct lecture to students	surprise exams
14+15	4	Determine effective design methods in reducing corrosion rates	Corrosion reduction	Direct lecture to students	surprise exams final examination

11. Infrastructure	
1. Books Required reading:	
2. Main references (sources)	

A- Recommended books and references (scientific journals, reports…).	1. Zaki Ahmad, Principles of Corrosion Engineering and Corrosion Control, Butterworth-Heinemann, 1st August 2006. 2. Pedeferri, Pietro, Corrosion Science and Engineering, Springer International Publishing, 2018. 3. Dr. Volkan Cicek , Corrosion Engineering, Wiley, April 2014. 4. Sohan L. Chawla and R. K. Gupta, Materials Selection for Corrosion Control, Amazon, 2016
B-Electronic references, Internet sites…	
12. The development of the curriculum plan: 1- Work in conformity with the existing curricula in international universities. 2- Follow up on scientific developments within the global education sector. 3- Scientific communication with the latest scientific developments within the scientific specialization. 4- Using the latest versions of specialized software deals with corrosion engineering. 5- Going towards the latest publications from international scientific sources.	

1. Description of Machining of Metals:

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programmer specification.	
1. Teaching Institution	University of Babylon
2. University Department/Centre	Scientific Department / Department of Metallic Materials Engineering
3. Course title/code	Machining of Metals
4. Modes of Attendance offered	weekly
5. Semester/Year	Semester
6. Number of hours tuition (total)	15
7. Date of production/revision of this specification	20/9/2024
8. Aims of the Course	

Introducing the student to the basic principles of machining metals with various applications. Where the types of number of pieces are studied along with how their angles are measured. Then studying the types of operation in general and emphasizing the traditional operation and how to measure the cutting forces by mathematical and graphic methods and the effect of these forces on the cutting tool, the cutting machine and the workpiece, in addition to identifying the heat generated during the cutting process, the cutting fluids used, and the surface finished after the cutting process.
9· Learning Outcomes, Teaching, Learning and Assessment Methode
B- Building integrated projects in terms of interfaces and characteristics and writing equations related to metalworking. C- How to choose the appropriate cutting tool for metal cutting.
D- B. The skills goals special to the course. Design the appropriate number and measure cutting speed and cutting forces by mathematical and graphic methods
Teaching and Learning Methods
1- Using the display screen 2- Discussion 3- Student groups 4- Experiential education 5- Interactive education
Assessment methods
1- Using the display screen 2- Discussion 3- In-class effectiveness 4- Daily exams 5- Semester exams 6- Final exam
C. Affective and value goals C1- Written exams C2- Semester exams C3 - Final exams C4- Daily assessment
D. General and rehabilitative transferred skills(other skills relevant to employability and personal development) D1 Verbal communication (the ability to express thinking clearly and confidently in speech) D2 Teamwork (working with confidence within the group) D3 Written communication (the ability to express yourself clearly in writing) D4 Planning and Organizing (the ability to plan and implement activities

effectively)

10. Course Structure					
Week	**Hours**	**ILOs**	**Unit/Module or Topic Title**	**Teaching Method**	**Assessment Method**
1-3	9	Learn how to get the final product and focus on the product that comes out of the operation process	Introduction and classification of the machining process and classification of the number of pieces, the hexagonal shape of the cutting tool and the angles of the cutting tool	Direct lecture to Equilibrium of A Fluid Element Hydrostatic Pressure students	surprise exams
4+5	4	Distinguish between different speeds such as cutting speed, sculpting flow speed, and shear speed, and the relationship between them	Handling of graphs	Direct lecture to students	surprise exams
6-8	6	Learn how to form a sculptor and the types and forms of a sculptor	Dealing with theorems and deriving relationships with many engineering examples	Direct lecture to students	surprise exams
9+10	4	Learn how to measure different cutting forces	Using the Mathematical Method and the Merchant Method	Direct lecture to students	surprise exams
11-13	6	Knowing the emotion during the cutting process and how to form and remove the emerging categorical limit	Study of the type of metal cut and the effect of cutting conditions on it	Direct lecture to students	surprise exams
14+15	4	Heat in the cutting process and its effect on the workpiece after cutting (product) and how heat is distributed in the cutting process	Study of different minerals in addition to the types of number of pieces used	Direct lecture to students	surprise exams final examination

11. Infrastructure	
1. Books Required reading:	
2. Main references (sources)	
A- Recommended books and references (scientific journals, reports...).	**1-**K.P.Sinha & S.C.Prasad, "Theory of Metal Forming and Metal Cutting"1979. **2-**Trent E.M., "Metal Cutting"1984. **3-**B.L.Juneja & G.S.Sekhon, "Fundamentals of Metal Cutting and Machine Tools"1987. **4-** Sandvik Coromant "Modern Metal Cutting – a practice handbook"1994.
B-Electronic references, Internet sites...	
12. The development of the curriculum plan	
1- Work in conformity with the existing curricula in international universities. 2- Follow up on scientific developments within the global education sector. 3- Scientific communication with the latest scientific developments within the scientific specialization. 4- Using the latest versions of specialized software deals with fluid flow like Ansys. 5- Going towards the latest publications from international scientific sources.	

Description for English language:

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.

1. Teaching Institution	University of Babylon
2. University Department/Centre	Scientific Department / Metallurgical Engineering Department
3. Course title/code	English Language
4. Modes of Attendance offered	Weekly
5. Semester/Year	Third Year (5^{th} & 6^{th} semester)
6. Number of hours tuition (total)	60
7. Date of production/revision of this specification	20/9/2024

8. Aims of the Course

Introduce the student to the rules of the English language, which includes verb tenses and how to solve exercises for each tense. Also, learn how to choose the appropriate verb in formulating sentences in direct and indirect transmitted speech, as well as using some social expressions, as well as reading the pieces and solving their exercises with the help of verb patterns and following the rule for that, as well as using the audio recording of some pieces and enabling the student to use his skill by listening and answering questions. Enable the student to test his skill in solving exercises using the exercise book as well as external duties.

9· Learning Outcomes, Teaching, Learning and Assessment Methods

A- Language Proficiency: Developing overall proficiency in the English language, including the ability to understand, speak, read, and write English effectively.

B- Communication Skills: Improving the ability to communicate fluently and accurately in various contexts, such as conversations, presentations, and written communication.

C- Grammar and Vocabulary: Enhancing knowledge and understanding of grammar rules and vocabulary, enabling learners to express themselves accurately and appropriately.

D- Reading Comprehension: Developing the ability to understand and

interpret different types of texts, such as articles, stories, and academic materials.

E- Listening Comprehension: Improving the ability to understand spoken English in different situations, including conversations, lectures, and audio materials.

F- Writing Skills: Acquiring the skills necessary to produce well-structured and coherent written texts, including essays, reports, emails, and formal letters.

G- Speaking Skills: Developing oral communication skills, including pronunciation, fluency, and the ability to engage in conversations, discussions, and presentations.

H- Critical Thinking: Fostering the ability to analyze and evaluate information, express opinions, and support arguments effectively.

I- Cultural Awareness: Enhancing understanding of different cultures and developing intercultural competence, allowing learners to navigate diverse cultural contexts and communicate respectfully.

Independent Learning: Encouraging self-directed learning skills, including the ability to set goals, manage time, and utilize resources for ongoing language development outside the classroom.

Teaching and Learning Methods

1- Using the display screen
2- Discussion
3- Student groups
4- Experiential education
5- Interactive education

Assessment methods

1- In-class effectiveness
2- Daily exams
3- Semester exams
4- Final exam

C. Affective and value goals
C1- Written exams
C2- Semester exams
C3 - Final exams
C4- Daily assessment

D. General and rehabilitative transferred skills (other skills relevant to employability and personal development)
D1 Verbal communication (the ability to express thinking clearly and confidently in speech)
D2 Teamwork (working with confidence within the group)
D3 Written communication (the ability to express yourself clearly in writing)
D4 Planning and Organizing (the ability to plan and implement activities effectively)

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1-3	6	Tenses, Auxiliary verbs, Everyday situation, Make a small Talk. Past Tense, spelling, and Pronunciation, Giving opinions	Units 1-2	Direct lecture to students	surprise exams
4-6	6	Modal and related verbs, Polite request and offers.	Units 3-4	Direct lecture to students	surprise exams
7-9	6	Future forms, may-might-could, Arranging to meet	Unit 5	Direct lecture to students	surprise exams
10-12	6	Information questions	Unit 6	Direct lecture to students	surprise exams
13-15	6	Adjectives and adverbs	Unit 7	Direct lecture to students	surprise exams

11. Infrastructure	
1. Books Required reading:	New Headway Intermediate. Student's book_2012, 4th
2. Main references (sources)	
A- Recommended books and references (scientific journals, reports...).	
B-Electronic references, Internet sites...	Google, Youtube
12. The development of the curriculum plan	

Heat transfer I:

TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

This Course Specification provides an overview of the concepts of heat transfer. This may be useful in engineering. Also it gives an introduction of the most important methods of heat transfer by conduction, convection and radiation. This enhance student idea to recognize, describe and represent numbers and their relationships, and to count, estimate, calculate and check with competence and confidence in solving problems.

1. Teaching Institution	University of Babylon
2. University Department/Centre	Scientific Department / Department of Metallic Materials Engineering
3. Course title/code	Heat Transfer
4. Modes of Attendance offered	weekly
5. Semester/Year	Semester
6. Number of hours tuition (total)	60
7. Date of production/revision of this specification	15/9/2024
8. Aims of the Course	

Introducing the student to the basic principles of heat transfer with its various applications. Where different methods of heat transfer are studied that enable the student how to properly used to calculate and solving the problems. Then studying the types of heat exchangers and their importance in the different industrial applications. This will enhance the ability of students to deal with different types of heat flows and calculate the heat transfer rate . in addition to identifying the heat transfer through the fins.

9· Learning Outcomes, Teaching ,Learning and Assessment Method

1. Understand the general form of the heat transfer methods and identify their equation.
2. Learn how to identify and apply charts and table of heat transfer to be able to solve the problems.
3. Introduce different types of heat exchangers and their practical applications.

Teaching and Learning Methods

1- Discussion
2- Using the display screen
3- Student groups
4- Experiential education
5- Interactive education

Assessment methods

1- Using the display screen
2- Discussion
3- In-class effectiveness
4- Daily exams
5- Semester exams
6- Final exam

C. Affective and value goals
C1- Written exams
C2- Semester exams
C3 - Final exams
C4- Daily assessment

D. General and rehabilitative transferred skills(other skills relevant to employability

and personal development)
D1 Verbal communication
D2 Teamwork groups
D 3 Written communication
D 4 Planning and Organizing

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	4	Learn how to get the knowledge and idea in heat transfer science	Introduction	Direct lecture to students &solve a problems	surprise exams and home works , experimental lab, questions and answer in class
2	4	Learn how to get the knowledge and idea in heat transfer science	physics principles	Direct lecture to students &solve a problems	surprise exams and home works , experimental lab, questions and answer in class
3	4	Learn how to get the knowledge and idea in heat transfer science	conduction	Direct lecture to students &solve a problems	surprise exams and home works , experimental lab, questions and answer in class
4	4	Learn how to get the knowledge and idea in heat transfer science	Steady heat transfer	Direct lecture to students &solve a problems	surprise exams and home works , experimental lab, questions and answer in class
5	4	Learn how to get the knowledge and idea in heat transfer science	Extended surfaces	Direct lecture to students &solve a problems	surprise exams and home works , experimental lab, questions and answer in class
6	4	Learn how to get the knowledge and idea in heat transfer science	Lumped system	Direct lecture to students &solve a problems	surprise exams and home works , experimental lab,

					questions and answer in class
7	4	Learn how to get the knowledge and idea in heat transfer science	Numerical solution	Direct lecture to students &solve a problems	surprise exams and home works , experimental lab, questions and answer in class
8	4	Learn how to get the knowledge and idea in heat transfer science	convection	Direct lecture to students &solve a problems	surprise exams and home works , experimental lab, questions and answer in class
9	4	Learn how to get the knowledge and idea in heat transfer science	Internal flow	Direct lecture to students &solve a problems	surprise exams and home works , experimental lab, questions and answer in class
10	4	Learn how to get the knowledge and idea in heat transfer science	External flow	Direct lecture to students &solve a problems	surprise exams and home works , experimental lab, questions and answer in class
11	4	Learn how to get the knowledge and idea in heat transfer science	Free convection	Direct lecture to students &solve a problems	surprise exams and home works , experimental lab, questions and answer in class
12	4	Learn how to get the knowledge and idea in heat transfer science	Heat exchanger	Direct lecture to students &solve a problems	surprise exams and home works , experimental lab, questions and answer in

					class
13	4	Learn how to get the knowledge and idea in heat transfer science	Radiation	Direct lecture to students &solve a problems	surprise exams and home works , experimental lab, questions and answer in class
14	4	Learn how to get the knowledge and idea in heat transfer science	applications	Direct lecture to students &solve a problems	surprise exams and home works , experimental lab, questions and answer in class
15	4	Learn how to get the knowledge and idea in heat transfer science	applications	Direct lecture to students &solve a problems	surprise exams and home works , experimental lab, questions and answer in class

11. Infrastructure	
1. Books Required reading:	
2. Main references (sources)	
A- Recommended books and references (scientific journals, reports…).	Basic texts * Heat Transfer bt Holman 7 edition Yunus A Cengel; Heat Transfer, A Practical Approach • Any modern source about the course can be used
B-Electronic references, Internet sites…	Google
12. The development of the curriculum plan	
1- Work in conformity with the existing curricula in international universities. 2- Follow up on scientific developments within the global education sector. 3- Scientific communication with the latest scientific developments within the scientific specialization.	

Description for Powder Metallurgy:

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programmed specification.

1. Teaching Institution	University of Babylon
2. University Department/Centre	Scientific Department / Department of Metallurgical Engineering
3. Course title/code	Powder technology
4. Modes of Attendance offered	weekly
5. Semester/Year	Semester
6. Number of hours tuition (total)	30
7. Date of production/revision of this specification	20/9/2024

Aims of the Course: This course aims to study the powder technology process based on its basic sequential steps, which include mixing, pressing and sintering processes. The course also aims to study the factors affecting the manufacture of a mineral substance by powder technology. The course also includes an overview of the basic methods of producing mineral powders and characterizing the shape of mineral powders depending on the method of production. Finally, in this course, the advantages and disadvantages of this technology and the most important modern applications of powder metallurgy products are introduced, and examples of each application are taken.

9· Learning Outcomes, Teaching, Learning and Assessment Method

A- Cognitive goals .

A1- Building integrated projects in terms of interfaces and properties and writing equations related to powder technology and its basics. .

A2 - How to deal with engineering problems related to metal matrix composite and how to address them to improve its properties.

B. Cognitive goals .

1- Building integrated projects in terms of interfaces and properties and writing equations related to powder technology and its basics. .

2 - How to deal with engineering problems related to metal matrix composite and how to address them to improve its properties.

C. The skills goals special to the course.

Constructive dealing with engineering specifications related to the manufacture and examination of a metallic powder samples and with high-quality engineering and physical specifications such as density and porosity

tests, elastic modulus, compression strength, wear and fatigue, and in accordance with the specialization of students in the Department of Metallurgical Engineering
Teaching and Learning Methods
1- Using the display screen 2- Discussion 3- Student groups 4- Experiential education 5- Interactive education
Assessment methods
1- Using the display screen 2- Discussion 3- In-class effectiveness 4- Daily exams 5- Semester exams 6- Final exam
C. Affective and value goals C1- Written exams C2- Semester exams C3 - Final exams C4- Daily assessment
D. General and rehabilitative transferred skills(other skills relevant to employability and personal development) D1 Verbal communication (the ability to express thinking clearly and confidently in speech) D2 Teamwork (working with confidence within the group) D3 Written communication (the ability to express yourself clearly in writing) D4 Planning and Organizing (the ability to plan and implement activities effectively

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2	Introductions to powder metallurgy	principle of powder metallurgy	Direct lecture to students	surprise exams
2	2	Study of physical properties powder size, volumetric analysis, powder shape, surface area, composition, microscopic hardness.	Basic properties of powder	Direct lecture to students	surprise exams
3	2	To know the apparent density, compressibility of powder, flowability, total volume, true density, compressibility, sintering ability.	Technological properties of powder	Direct lecture to students	surprise exams
4	2	Powder production methods	Basics of powder production methods	Direct lecture to students	surprise exams
5	2	Mechanical methods for producing crushing and grinding powder	The main properties of powders produced in this way	Direct lecture to students	surprise exams
6	2	Physical methods of powder production such as atomization	The main properties of the powders produced in this way, the advantages and disadvantages	Direct lecture to students	surprise exams
7	2	Chemical methods for the production of powder such as reduction	Manufacture of iron and tungsten powder by reduction method and specifications of the resulting	Direct lecture to students	surprise exams

			powder		
8	2	Powder storage, powder treatment, powder mixing and merging, evaluation of mixing operations, powder pelletizing	Powder consolidations and heat treatment		
9+10+11	6	Definition of pressing processes and their basics, types of pressing processes, briquetting processes, the behavior of powder in briquetting processes, manufacturing and squeezing complex powders, other unconventional methods of pressing, hot pressing, extrusion pressing, rolling pressing, equidirectional pressing, blast pressing, hot pressing, cold pressing, injection molding, forming and pressing without pressing, sliding casting	The basics of shaping and pressing of powder	Direct lecture to students	surprise exams
12	2	Mass transfer, viscous flow, evaporation and condensation, diffusion on crystal boundaries, plastic flow	The basics of sintering processes	Direct lecture to students	surprise exams
13	2	sintering in liquid state, sintering in solid state, activated sintering	Types of sintering process	Direct lecture to students	surprise exams
14	2	Protected atmosphere, types of sintering furnaces	The equipment used and the atmosphere during the sintering	Direct lecture to students	surprise exams

			process		
15	2	Iron-based products, piece number products, porous products, non-ferrous metal products, bearing and lubricating materials, abrasives	powder technology products	Direct lecture to students	surprise exams final examination

11. Infrastructure	
1. Books Required reading:	
2. Main references (sources)	
A- Recommended books and references (scientific journals, reports...).	• Kateřina Skotnicová, Miroslav Kursa, " POWDER METALLURGY". Ostrava 2014 • THUMMLER. "An Introduction to Powder Metallurgy" Series Editors LJENKINS, 2006. • Verlinden, L. Froyen, , Belgium. "Aluminium Powder Metallurgy" (2012). • Katsuyoshi Kondoh*" POWDER METALLURGY"* seventh edition, Copyright ©John Wiley & Sons, Inc 2012.
B-Electronic references, Internet sites...	

12. The development of the curriculum plan
1- Work in conformity with the existing curricula in international universities. 2- Follow up on scientific developments within the global education sector. 3- Scientific communication with the latest scientific developments within scientific specialization. 4- Using the latest versions of specialized software deals with metal matrix composite. 5- Going towards the latest publications from international scientific sources.

13. Course Development Plan	
1- Work in conformity with the existing curricula in international universities. 2- Follow up on scientific developments within the global education sector. 3- Scientific communication with the latest scientific developments within scientific specialization. 4- Orientation towards the latest publications from international scientific sources	
14. Acceptance	
Prerequisites	Central

Less number of students	20
The largest number of students	40

Description for Engineering Analysis:

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the program specification.	
1. Teaching Institution	University of Babylon
2. University Department/Centre	Scientific Department / Department of Metallic Materials Engineering
3. Course title/code	Engineering Analysis
4. Modes of Attendance offered	Weekly
5. Semester/Year	Semester
6. Number of hours tuition (total)	45
7. Date of production/revision of this specification	20/9/2024
8. Aims of the Course	
Providing students with the basics of scientific knowledge and improving their professional abilities in the direction of analytical and creative thinking through the use of information technologies, data analysis and modern experimental methods in formulating and solving problems and preparing well-qualified engineers to improve engineering activities and the ability to manage dealing with them in all aspects of life.	

9· Learning Outcomes, Teaching, Learning and Assessment Methode
A- Cognitive goals. A1- Broad-based education to understand the impact of engineering solutions globally and economically. A2- Ability to work in multidisciplinary teams. A3 - The possibility of designing and implementing experiments, analyzing the results and translating them into reality. A4- The ability to design systems to meet the required needs within realistic economic determinants.

B. The skills goals special to the course.

B1 - Using the least teaching methods in line with the level of the students and allowing the students to discuss.

B 2- Using modern and advanced means to deliver the largest amount of knowledge to the student.

B 3- Activating the role of educational guidance in the matter.

Teaching and Learning Methods

1- Using the display screen
2- Discussion
3- Student groups
4- Experiential education
5- Interactive education

Assessment methods

1- Using the display screen
2- Discussion
3- In-class effectiveness
4- Daily exams
5- Semester exams
6- Final exam

C. Affective and value goals

C1- Written exams
C2- Semester exams
C3 - Final exams
C4- Daily assessment

D. General and rehabilitative transferred skills(other skills relevant to employability and personal development)

1 Develop the student's ability and ability to use computer programs in the field of specialization.

2 Develop the student's ability and ability to deal with modern technologies related to the course vocabulary.

3 Develop and develop the student's ability and ability to face problems and dilemmas and find appropriate solutions.

4 Develop the student's ability and ability to translate academic information into practical reality.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1-3	9	Properties of Laplace transformation& Laplace inverse	The Concept of A Fluid (Newtonian And Non-Newtonian Fluid) Viscosity, Units of Viscosity, Dynamic Viscosity, Kinematic Viscosity Viscosity Measurements Equilibrium of A Fluid Element Hydrostatic Pressure	Direct lecture to Equilibrium of A Fluid Element Hydrostatic Pressure students	surprise exams
4+5	6	Laplace transformation to solve O.D.E.	Equations of Motion and Potential Flow Conservation of Mass, Conservation of Momentum, Conservation of Energy, Differential Relations for Fluid	Direct lecture to students	surprise exams

			Motion, Analysis of Rate of Deformation		
6-8	9	Power series	The Concept of Laminar Fluid Flow The Concept of Turbulent Fluid Flow	Direct lecture to students	surprise exams
9+10	6	Fourier transformation	Hydraulics of Pipe Systems, Basic Computations, Fluid Friction, Pipe Design and Pipe Materials	Direct lecture to students	surprise exams
11-13	9	Study the relations and drive the boundary layers equations	Similitude: Dimensional Analysis and Data Correlation And Boundary layer	Direct lecture to students	surprise exams
14+15	6	Theories and procedures	Non-Newtonian Fluids Classification of Non-Newtonian Fluids Apparent Viscosity Constitutive Equations Rheological Property Measurements Fully Developed Laminar Pressure Drops for Non-Newtonian Fluids Fully Developed Turbulent Flow Pressure Drops	Direct lecture to students	surprise exams final examination

11. Infrastructure	
1. Books Required reading:	
2. Main references (sources)	
A- Recommended books and references (scientific journals, reports...).	Basic texts * Kreith, F.; Berger, S.A.; et. al. "Fluid Mechanics" *Mechanical Engineering Handbook* Ed. Frank Kreith Boca Raton: CRC Press LLC, 1999 Verbeeten,Wilco M.H. " Computational Polymer Melt Rheology" Technische Universiteit Eindhoven, 2001. Ron darby "Chemical Engineering Fluid Mechanics", second edition, Marcel Dekker, Inc. 2001. Bruce E. Larock,Roland W.Jeppson,Gary Z. Watters,"Hydraulics of Pipeline systems" CRC Press LLC, 2000. M. Doi and S. F. Edwards "The Theory of Polymer Dynamics" 1994 • Any modern source about the course can be used
B-Electronic references, Internet sites...	
12. The development of the curriculum plan	
1- Work in conformity with the existing curricula in international universities. 2- Follow up on scientific developments within the global education sector. 3- Scientific communication with the latest scientific developments within the scientific specialization. 4- Using the latest versions of specialized software deals with fluid flow like Ansys. 5- Going towards the latest publications from international scientific sources.	

Course Description for 2024 -2025 Second Semester

Description of Corrosion Engineering II:

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programmed specification.

1. Teaching Institution	University of Babylon
2. University Department/Centre	Scientific Department / Department of Metallurgical Engineering
3. Course title/code	Corrosion Engineering
4. Modes of Attendance offered	weekly
5. Semester/Year	Semester
6. Number of hours tuition (total)	30
7. Date of production/revision of this specification	15/ 9/ 2024
8. Aims of the Course	
Introduce the student to the basic principles of Bacterial Corrosion, What causes bacterial corrosion? What are the examples of corrosion bacteria? What is the mechanism of microbial corrosion? What is biological corrosion with examples? What is corrosion in biology? What is biochemical corrosion? What are the main types of biological corrosion? Definition of Tafel Extrapolation, Linear Polarization, High Temperature Corrosion, Mechanisms and Kinetics, Electrochemical and Morphology Aspects of Oxidation, Mechanisms of Oxidation, Oxide Defect Structure, Oxidation Kinetics, Oxidation Growth Laws, Breakaway Oxidation, Nature of Protective Oxide Scale, Effect of Alloying, Catastrophic Oxidation, Internal and Outward Oxidation.	

9· Learning Outcomes, Teaching ,Learning and Assessment Method

A- Cognitive goals .

A1- Building integrated projects in terms of interfaces and properties and writing equations related to corrosion engineering and its basics. .

A2 - How to deal with engineering problems related to corrosion engineering and how to address them to reduce corrosion rates

B. The skills goals special to the course.

Design and deal with engineering problems related to corrosion engineering such as macroscopic examination and laboratory tests in order to accurately determine the type of corrosion ,its causes, find effective solutions and treatments to reduce corrosion rates and in proportion to the specialization of students in the Department of Metallurgical Engineering

Teaching and Learning Methods

1- Using the display screen
2- Discussion
3- Student groups
4- Experiential education
5- Interactive education

Assessment methods

1- Using the display screen
2- Discussion
3- In-class effectiveness
4- Daily exams
5- Semester exams
6- Final exam

C. Affective and value goals

C1- Written exams

C2- Semester exams

C3 - Final exams

C4- Daily assessment

D. General and rehabilitative transferred skills(other skills relevant to employability and personal development)
D1 Verbal communication (the ability to express thinking clearly and confidently in speech)
D2 Teamwork (working with confidence within the group)
D3 Written communication (the ability to express yourself clearly in writing)
D4 Planning and Organizing (the ability to plan and implement activities effectively)

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1-3	6	What causes bacterial corrosion? What are the examples of corrosion bacteria? What is the mechanism of microbial corrosion?	Bacterial Corrosion	Direct lecture to students	surprise exams
4+5	4	What is biological corrosion? What is biological corrosion with example? What is corrosion in biology? What is biochemical corrosion? What are the main types of biological corrosion?	Biological Corrosion	Direct lecture to students	surprise exams
6-8	6	Definition of Tafel Extrapolation, Linear Polarization	Corrosion Rate Measurments	Direct lecture to students	surprise exams
9+10	4	Mechanisms and Kinetics of hot corrosion, Chemical and Morphology of hot corrosion	High Temperature Corrosion	Direct lecture to students	surprise exams
11-13	6	Aspects of Oxidation, Mechanisms of Oxidation, Oxide Defect Structure, Oxidation Kinetics, Oxidation Growth Laws, Breakaway Oxidation,	Oxidation at high temperature	Direct lecture to students	surprise exams
14+15	4	Chaeacterization of protective oxide, effects of alloying elements, Inward and outward oxidation.	Oxide layer test	Direct lecture to students	surprise exams final examination

11. Infrastructure	
1. Books Required reading:	
2. Main references (sources)	
A- Recommended books and references (scientific journals, reports…).	1. Zaki Ahmad, Principles of Corrosion Engineering and Corrosion Control, Butterworth-Heinemann, 1st August 2006. 2. Pedeferri, Pietro, Corrosion Science and Engineering, Springer International Publishing, 2018. 3. Dr. Volkan Cicek , Corrosion Engineering, Wiley, April 2014. 4. Sohan L. Chawla and R. K. Gupta, Materials Selection for Corrosion Control, Amazon, 2016
B-Electronic references, Internet sites…	
12. The development of the curriculum plan	
1- Work in conformity with the existing curricula in international universities. 2- Follow up on scientific developments within the global education sector. 3- Scientific communication with the latest scientific developments within the scientific specialization. 4- Using the latest versions of specialized software deals with corrosion engineering. 5- Going towards the latest publications from international scientific sources.	

Description of Numerical Engineering:

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the program specification.

1. Teaching Institution	University of Babylon
2. University Department/Centre	Scientific Department / Department of Metallic Materials Engineering
3. Course title/code	Numerical Analysis
4. Modes of Attendance offered	Weekly
5. Semester/Year	Semester
6. Number of hours tuition (total)	30
7. Date of production/revision of this specification	20/9/2024
8. Aims of the Course	
Providing students with the basics of scientific knowledge and improving their professional abilities in the direction of analytical and creative thinking through the use of information technologies, data analysis and modern experimental methods in formulating and solving problems and preparing well-qualified engineers to improve engineering activities and the ability to manage dealing with them in all aspects of life.	

9· Learning Outcomes, Teaching ,Learning and Assessment Methode
A- Cognitive goals . A1- Broad-based education to understand the impact of engineering solutions globally and economically. A2- Ability to work in multidisciplinary teams. A3 - The possibility of designing and implementing experiments, analyzing the results and translating them into reality. A4- The ability to design systems to meet the required needs within realistic economic determinants.
B. The skills goals special to the course. B1 - Using the least teaching methods in line with the level of the students and allowing the students to discuss. B 2- Using modern and advanced means to deliver the largest amount of knowledge to the student. B 3- Activating the role of educational guidance in the matter.
Teaching and Learning Methods
1- Using the display screen 2- Discussion 3- Student groups 4- Experiential education 5- Interactive education
Assessment methods
1- Using the display screen 2- Discussion 3- In-class effectiveness 4- Daily exams 5- Semester exams 6- Final exam
C. Affective and value goals C1- Written exams C2- Semester exams C3 - Final exams C4- Daily assessment

D. General and rehabilitative transferred skills(other skills relevant to employability and personal development)

1 Develop the student's ability and ability to use computer programs in the field of specialization.

2 Develop the student's ability and ability to deal with modern technologies related to the course vocabulary.

3 Develop and develop the student's ability and ability to face problems and dilemmas and find appropriate solutions.

4 Develop the student's ability and ability to translate academic information into practical reality.

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2	**Introduction to numerical method**		Direct lecture to students	surprise exams
2	2	**Errors and measurment**		Direct lecture to students	surprise exams
3	2	**Solution of Algebraic and Transcendental Equations • Locate of the root • Method of Bisection • Secant Method • False position method**		Direct lecture to students	surprise exams
4+5	4	**Solution of Algebraic and Transcendental Equations • NewtonRaphson for Two Equations • Iterative Method for Two Equations**		Direct lecture to students	surprise exams
6+7	4	**Operations with Matrices Addition/Subtraction Sc alar Multiplication Matrix Multiplication Identity Matrix**		Direct lecture to students	surprise exams final examination
8	2	**Gauss Seidel**		Direct lecture to students	surprise exams
9	2	**Direct Method of Interpolation**		Direct lecture to students	surprise exams
10	2	**Lagrangian Interpolation**		Direct lecture to students	surprise exams
11+12+13	6	**Numerical Differentiation**		Direct lecture to students	surprise exams

14+15	4	**Numerical Differentiation and Integration**		Direct lecture to students	surprise exams final examination

11. Infrastructure	
1. Books Required reading:	**1-**Numerical Methods for Engineers, Steven C. Chapral
2. Main references (sources)	
A- Recommended books and references (scientific journals, reports...).	
B-Electronic references, Internet sites...	Numerical Methods for Engineers, Steven C. Chapra L Shampine, L. F. (1994). Numerical solution of ordinary differential equations (Vol. 4): CRC Press.
12. The development of the curriculum plan	
1- Work in conformity with the existing curricula in international universities. 2- Follow up on scientific developments within the global education sector. 3- Scientific communication with the latest scientific developments within the scientific specialization. 4- Using the latest versions of specialized software deals with fluid flow like Ansys. 5- Going towards the latest publications from international scientific sources.	

Description of Electrical and Magnetic Materials:

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.	
1. Teaching Institution	University of Babylon
2. University Department/Centre	Scientific Department / Department of Metallic Materials Engineering
3. Course title/code	Electronic and Magnetic Materials
4. Modes of Attendance offered	weekly
5. Semester/Year	Semester
6. Number of hours tuition (total)	15
7. Date of production/revision of this specification	20/9/2024
8. Aims of the Course	
Introducing the student to the basic principles of electronic and magnetic materials with its various applications.Knowing electrical conductivity ,semiconductor materials and application .Knowing of super conductivity .Studying magnetic and origin of magnetic .Studying types of magnetic materials and laws.	
9· Learning Outcomes, Teaching ,Learning and Assessment Methode	
A- The student recognizes of materials and relationship of electrons. B- How to reasons happening of electrical and magnetic.	
The skills goals special to the course. How electrical conductivity ,semiconductor and how happens break down of dielectric. Origin of magnetic.	
Teaching and Learning Methods	
1- Using the display screen 2- Discussion 3- Student groups 4- Experiential education 5- Interactive education	
Assessment methods	

1- Using the display screen
2- Discussion
3- In-class effectiveness
4- Daily exams
5- Semester exams
6- Final exam.

C. Affective and value goals
C1- Written exams
C2- Semester exams
C3 - Final exams
C4- Daily assessment

D. General and rehabilitative transferred skills(other skills relevant to employability and personal development)
D1 Verbal communication (the ability to express thinking clearly and confidently in speech)
D2 Teamwork (working with confidence within the group)
D3 Written communication (the ability to express yourself clearly in writing)
D4 Planning and Organizing (the ability to plan and implement activities effectively)

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1-3	6	Electrical conductivity ,semiconductor and band of energy	Introduction and studying laws.	Direct lecture to Equilibrium of A Fluid Element Hydrostatic Pressure students	surprise exams
4+5	4	Concept of Fermi level and Solar cell and manufacture photo-resistanc	Knowing concept of Fermi ,functions Fermi and photo-resistance	Direct lecture to students	surprise exams
6-8	6	Diode and transistor .Dielectric materials. Principles of dielectric polarization	How is manufacture diode and types of dielectric	Direct lecture to students	surprise exams
9+10	4	Dielectric breack down ,Superconductive materials and Mazner effect	How happens breakdowns and Mazner effect	Direct lecture to students	surprise exams
11-13	6	Magnetic materials ,origin of magnetic and ferromagnetic	Studying magnetic materials	Direct lecture to students	surprise exams
14+15	4	Paramagnetic and Diamagnetic materials	Study of different between of materials	Direct lecture to students	surprise exams final examination

11. Infrastructure	
1. Books Required reading:	
2. Main references (sources)	
A- Recommended books and references (scientific journals, reports...).	1-Materials science structure and characterization of polycrystalline materials ,Vadimir vovilov .2003. 2-Intrent. 3-Phasicalmatallurgy.Robertw.catn and peter Haasan Fourth edition .
B-Electronic references, Internet sites...	
12. The development of the curriculum plan	
1- Work in conformity with the existing curricula in international universities. 2- Follow up on scientific developments within the global education sector. 3- Scientific communication with the latest scientific developments within the scientific specialization. .	

Description of Composite Material:

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programmed specification.	
1. Teaching Institution	University of Babylon
2. University Department/Centre	Scientific Department / Department of Metallurgical Engineering
3. Course title/code	Metal Matrix Composite
4. Modes of Attendance offered	weekly
5. Semester/Year	Semester
6. Number of hours tuition (total)	30
7. Date of production/revision of this specification	20/9/2024
8. Aims of the Course	
The course aims to study composite materials, their history and types, depending on the classification of reinforcing materials (particle reinforcement, dispersion reinforcement and fiber reinforcement) or depending on the type of base material, studying the law of mixtures and how to use it in calculating resistance, density, electrical and thermal conductivity. The course also aims to study the factors affecting the manufacture of an efficient composite material. Also learn about the uses of composite materials, traditional and advanced manufacturing methods, and modern applications of composite materials.	
9· Learning Outcomes, Teaching ,Learning and Assessment Method	
C- Cognitive goals . A1- Building integrated projects in terms of interfaces and properties and writing equations related to metal matrix composite and its basics. .	
A2 - How to deal with engineering problems related to metal matrix composite and how to address them to improve its properties.	
B. The skills goals special to the course. Constructive dealing with engineering specifications related to the manufacture and examination of a composite material with a metal basis and with high-quality engineering and physical specifications such as density and porosity tests, elastic modulus, tensile strength, wear and fatigue, and in accordance with the specialization of students in the	

Department of Metallurgical Engineering
Teaching and Learning Methods

1- Using the display screen 2- Discussion 3- Student groups 4- Experiential education 5- Interactive education
Assessment methods
1- Using the display screen 2- Discussion 3- In-class effectiveness 4- Daily exams 5- Semester exams 6- Final exam
C. Affective and value goals C1- Written exams C2- Semester exams C3 - Final exams C4- Daily assessment
D. General and rehabilitative transferred skills(other skills relevant to employability and personal development) D1 Verbal communication (the ability to express thinking clearly and confidently in speech) D2 Teamwork (working with confidence within the group) D3 Written communication (the ability to express yourself clearly in writing) D4 Planning and Organizing (the ability to plan and implement activities effectively

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1-3	6	To describe types of matrix and reinforcement phases	Define principle of composite materials	Direct lecture to students	surprise exams
4+5	4	Particulate and Dispersion-Strengthened Composites ,Cite the difference in strengthening mechanism for large-particle and dispersion-strengthened particle-reinforced composites.	physical and metallurgical parameters of composite materials	Direct lecture to students	surprise exams
6-8	6	Characteristics of Fiber-Reinforced Composites, Calculate longitudinal modulus and longitudinal strength for an aligned and continuous fiber–reinforced composite	Fiber-Reinforced Composites	Direct lecture to students	surprise exams
9+10	4	several techniques (pultrusion, filament winding, and prepregs production processes) by which useful products of these materials are manufactured will be discussed	Manufacturing Fibers and Composite	Direct lecture to students	surprise exams
11-13	6	Composites used	Fiber-Reinforced	Direct lecture to	surprise exams

		for many structural applications are commonly prepared using a lay-up operation (either hand or automated), wherein prepregs tape plies are laid down on a tooled surface and are subsequently fully cured by the simultaneous application of heat and pressure composites in sport applications	Systems and Applications	students	
14+15	4	Composite in space applications and sport applications Laminar composites are built of layers of deferent materials. These layers may be sheets of deferent metals, with one metal providing strength, and the other providing hardness or corrosion resistance. Sandwich materials, including honeycombs, are exceptionally lightweight laminar composites, with solid facings joined to an almost hollow core	Advanced composite	Direct lecture to students	surprise exams final examination

11. Infrastructure	
1. Books Required reading:	
2. Main references (sources)	
A- Recommended books and references (scientific journals, reports...).	1. Peters, Stanley T., ed. Handbook of composites. Springer Science & Business Media, 2013. 2. Kainer, Karl Ulrich. Basics of metal matrix composites. Wiley-VCH GmbH & Co. KGaA, Weinheim, Germany, 2006. 3. Askeland, Donald R., Pradeep P. Fulay, and Wendelin J. Wright. "The Science and Engineering of Materials,—6th ed., Cengage Learning." (2010): 06-21. 4. Dieter, George Ellwood, and David J. Bacon. Mechanical metallurgy. Vol. 3. New York: McGraw-hill, 1986. 5. W. D. Callister, Jr."Materials Science and Engineering An Introduction" seventh edition, Copyright © 2007 John Wiley & Sons, Inc.
B-Electronic references, Internet sites...	
12. The development of the curriculum plan	
1- Work in conformity with the existing curricula in international universities. 2- Follow up on scientific developments within the global education sector. 3- Scientific communication with the latest scientific developments within the scientific specialization. 4- Using the latest versions of specialized software deals with metal matrix composite. 5- Going towards the latest publications from international scientific sources.	

Fourt Stage-First Semester

Design of Engineering Materials

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.

1. Teaching Institution	University of Babylon
2. University Department/Centre	Scientific Department / Metallurgical Department
3. Course title/code	**Selection of Engineering Materials**
4. Modes of Attendance offered	weekly
5. Semester/Year	Semester
6. Number of hours tuition (total)	45 hrs.
7. Date of production/revision of this specification	2024/9/20
8. Aims of the Course	
The primary objective of this course is to outline the importance of concept generation and selection in decision making exercises in a product development. learn how to finalize the product architecture, determine the shape or form of the parts to attain the requisite functions, and quantify the important design parameters.	

9· Learning Outcomes, Teaching ,Learning and Assessment Methode

- A- Cognitive goals .

  Knowledge - Remembering or recalling information.

- Comprehension - The ability to obtain meaning from information.
- Application - The ability to use information.
- Analysis - The ability to break information into parts to understand it better.

A. The skills goals special to the course.

By the end of this course, the student will learn

B1) the main goal of material selection is to choose appropriate eco-friendly material for given application with best combination of properties, easy fabrication process, and minimal cost. This course will provide information for each student to learn best practices of material selection from the major sources around the world.

B2) what is a material index and how does it help in selection of material for a given application, and

B3) how to develop material indices considering the appropriate material properties for an intended service.

B4)how to use the typical material indices for the selection of material for common ngineering parts.

B5)what is shape factor and how it can be used to enhance the mechanical efficiency of a material, and

B6) how to develop shape factors considering appropriate load and different cross section.

Teaching and Learning Methods

1- Interactive lectures at classes
2- E-learning on campus
3- Scientific trips
5- Workshops
6- Student groups
7- Experiential learning

Assessment methods

1- Monthly Exams
2- oral assessment
3- reports
4- Assignments & other activities.
5- Quizzes (Shock exams).
6- HomeWorks

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	3		Introduction	Lecture	Quiz and oral discussion
2	3		The material property charts	Lecture	Quiz and oral discussion
3	3		Materials selection—the basics	Lecture	Quiz and oral discussion
4	3		The selection strategy	Lecture	Quiz and oral discussion
5	3		Attribute limits and material indices	Lecture	Quiz and oral discussion
6	3		The selection procedure	Lecture	Quiz and oral discussion
7	3		Materials selection—case studies	Lecture	Quiz and oral discussion
8	3		Processes and process selection	Lecture	Quiz and oral discussion
9	3		Process selection case studies	Lecture	Quiz and oral discussion
10	3		Multiple constraints and objectives	Lecture	Quiz and oral discussion
11	3		Traditional methods of dealing with multiple constraints and objectives	Lecture	Quiz and oral discussion
12	3		Case studies—	Lecture	Quiz and oral

			multiple constraints and conflicting objectives		discussion
13	3		Selection of material and shape	Lecture	Quiz and oral discussion
14	3		Selection of material and shape: case studies	Lecture	Quiz and oral discussion
15	3		Information and knowledge sources for design	Lecture	Quiz and oral discussion

11. Infrastructure	
1. Books Required reading:	Materials Selection in Mechanical Design by Michael F. Ashby, Third Editiion
2. Main references (sources)	Materials Selection in Mechanical Design by Michael F. Ashby, Third Editiion
A- Recommended books and references (scientific journals, reports…).	G Dieter, Engineering Design - a materials and processing approach, McGraw Hill, NY, 2000. Materials Science and Engineering AN INTRODUCTION By William D. Callister, JR. & David G. Rethwisch
B-Electronic references, Internet sites…	
12. The development of the curriculum plan	

Casting Processes

Course Description

This course description provides a concise summary of the main features of the course and the learning outcomes expected of the student, demonstrating whether the student has made the most of the learning opportunities available. It must be linked to the programme description.

1. Educational institution	University of Babylon
2. University department/center	Department of Metallurgical Engineering / College of Materials Engineering
3. Course name/code	Casting Processes
4. Programs in which it is included	Bachelor's
5. Available forms of attendance	Weekly
6. Semester/year	Semester
7. Number of study hours (total)	15
8. Date this description was prepared	17-9-2024
9. Course objectives:	
1. **Functionality:** The primary aim is to design castings that fulfill their intended function. This includes understanding the mechanical, thermal, and chemical requirements of the component and designing it to meet these specifications. 2. **Material Selection:** Choose the appropriate casting material based on the desired properties of the final product. Consider factors such as strength, hardness, corrosion resistance, and thermal conductivity. 3. **Cost-Effectiveness:** Design with an awareness of the overall manufacturing cost. This involves optimizing the design to minimize material usage, reduce machining requirements, and streamline the casting process. 4. **Casting Process Considerations:** Consider the casting process during the design phase. This includes choosing the right casting method (sand casting, investment casting, die casting, etc.) and designing features that facilitate the casting process, such as proper draft	

angles and gating systems.

5. **Structural Integrity:** Ensure that the casting design provides the necessary structural integrity to withstand the loads and stresses the component will experience during its service life. This involves analyzing the component for potential weak points or areas of high stress concentration.
6. **Dimensional Accuracy:** Design with precision to achieve the required dimensional accuracy in the final casting. This involves accounting for factors like shrinkage during solidification and cooling.
7. **Surface Finish Requirements:** Consider the required surface finish of the casting and design features that facilitate achieving the desired surface quality. This may involve specifying tolerances and allowances for machining or finishing processes.
8. **Heat Treatment Considerations:** If heat treatment is required for the casting, design with this in mind. Account for potential changes in material properties and dimensions that may occur during heat treatment.
9. **Assembly Requirements:** If the casting will be part of an assembly, design it to facilitate easy and accurate assembly. This may involve incorporating features such as tabs, holes, or alignment surfaces.

10. Learning outcomes, teaching and learning methods and assessment

1. **Knowledge of Casting Processes:** Understand the various casting processes, including sand casting, investment casting, die casting, and others, and be able to identify the suitable process for different applications.
2. **Material Selection Skills:** Demonstrate the ability to select appropriate casting material based on the mechanical, thermal, and chemical requirements of a given component.
3. **Understanding of Casting Design Principles:** Gain a deep understanding of casting design principles, including the consideration of draft angles, fillets, and gating systems t optimize the casting process.
4. **Structural Analysis Competence:** Be able to analyze the structural integrity of casting designs, identifying potential weak points, stress concentrations, and designing components to withstand expected loads.
5. **Cost Estimation Skills:** Develop the ability to estimate the manufacturing cost of castin considering material usage, processing, and other relevant factors.
6. **Dimensional Accuracy Awareness:** Understand the factors affecting dimensional accuracy in castings, including shrinkage during solidification, and design components with appropriate tolerances.
7.
8. **Knowledge of Heat Treatment:** Understand the effects of heat treatment on casting materials and design components that can undergo heat treatment while maintaining th desired properties.
9. **Surface Finish Requirements:** Demonstrate knowledge of surface finish requirements

and design features that facilitate achieving the desired surface quality, including allowances for machining or finishing processes.

10. **Assembly Design Skills:** Develop skills in designing castings for easy and accurate assembly, considering features such as alignment surfaces, tolerances, and interfaces wit other components.
11. **Critical Thinking and Problem-Solving:** Develop critical thinking skills to analyze complex design challenges in casting and propose effective solutions.

Subject-specific skills

1. **Material Selection:** The ability to select appropriate materials for casting based on facto such as mechanical properties, thermal conductivity, corrosion resistance, and cost.
2. **Casting Process Knowledge:** Understanding various casting processes (e.g., sand castin investment casting, die casting) and knowing when to apply each method based on design requirements.
3. **Structural Analysis:** The skill to perform structural analysis to assess the strength, stability, and load-bearing capacity of casting designs using engineering principles and tool
4. **Dimensional Accuracy Control:** The ability to control and predict dimensional accuracy in casting designs, considering factors like shrinkage during solidification and cooling.
5. **Gating and Riser Design:** Knowledge and skills in designing effective gating and riser systems to ensure proper filling of the mold and minimize defects such as porosity and shrinkage.
6. **Cost Estimation:** The ability to estimate manufacturing costs associated with casting designs, considering material consumption, processing, and additional finishing operations.
7. **Knowledge of Heat Treatment:** Understanding the effects of heat treatment on castinc materials and designing components that can undergo heat treatment to achieve desired material properties.
8. **Surface Finish Considerations:** Skill in designing for the desired surface finish, includinc allowances for machining or finishing processes, and addressing issues like surface roughne
9. **Assembly Design:** Ability to design castings that facilitate easy and accurate assembly, incorporating features such as alignment surfaces, tolerances, and interfaces with other components.
10. **Quality Assurance:** Skills in designing for quality, including the ability to identify potent defects and implement features that prevent or minimize defects in the casting.
11. **Problem-Solving:** The ability to analyze complex design challenges in casting and propose innovative and effective solutions.

Teaching and learning methods

Delivering lectures using discussion method
Using the board
Using e-learning

Showing models Video
Assessment Methods
Short Exam Homework Distributing short topics to enable the student to discuss them
Thinking skills 1- Conduct a short exam to know the extent of benefit from the lecture 2- Ask intellectual questions and identify students with high ability to follow the lecture and what is related to the subject 3- Know the percentage of benefit students have from the lecture - a referendum at the end of each lecture and diagnosing the defect
General and transferable skills (other skills related to employability and personal development). 1- Raise a problem related to the industry and how to solve it

11. Course structure

Assessment Method	Teaching Method	Name of Unit/Course or Topic	Required Learning Outcomes	Hours	Week
Discussion-Quiz-Homework	Class lecture	Overview of casting processes	Introduction to Casting Design	2	1
=	=	Importance of casting design in manufacturing Basic principles of material selection for castings	Introduction to Casting Design	2	2
=	=	In-depth study of common casting materials	Casting Materials and Properties	2	3
=	=	Mechanical, thermal, and chemical properties Factors influencing material selection for specific applications	Casting Materials and Properties	2	4
=	=	Detailed study of different casting processes (sand casting, investment casting, die casting, etc.)	Casting Processes	2	5
=	=	Advantages, limitations, and applications of each process	Casting Processes	2	6
=	=	Principles of structural analysis for cast components	Structural Analysis in Casting Design	2	7
=	=	Analyzing casting designs for strength, stability, and load-bearing capacity	Structural Analysis in Casting Design	2	8
=	=	Understanding and controlling dimensional accuracy in casting	Dimensional Accuracy and Tolerances	2	9
=	=	Application of tolerances in casting design	Dimensional Accuracy and Tolerances	2	10
=	=	Gating and riser design for effective mold filling	Advanced Topics in Casting Design	2	11
=	=	Surface finish considerations and machining allowances	Advanced Topics in Casting Design	2	12
=	=	Heat treatment and its impact on casting design	Advanced Topics in Casting Design	2	13
=	=	Review of key concepts	Review and Project Presentation	2	14
=	=	Final project presentations incorporating all aspects of casting design	Review and Project Presentation	2	15

12. Infrastructure

Any book titled: Casting Processes and Design	Required readings: □ Core texts □ Course books □ Other
	Special requirements (including, for example, workshops, periodicals, software, websites)

	Social services (including, for example, guest lectures, vocational training, field studies)

13. Central admission - evening	
Scientific secondary school graduate	Prerequisites
20	Minimum number of students
40	Maximum number of students

Metallurgical Applications with Computer

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the program specification.

1. Teaching Institution	University of Babylon
2. University Department/Centre	Scientific Department / Department of Metallic Materials Engineering
3. Course title/code	Metallurgical applications with computers.
4. Modes of Attendance offered	Weekly
5. Semester/Year	Semester
6. Number of hours tuition (total)	45
7. Date of production/revision of this specification	15/9/2024
8. Aims of the Course	

Introducing the Plotting of experimental data, Label of graphs,Best fitting equations have been presented.knowing Laminator program: analysis of composite laminates,Classical lamination theory,Case studiesare done.knowingFinite element and finite difference methods.learning Drawing: key points, lines, areasVolumes: blocks, cylinders prism and cones,operations ,extrude and add,subtract,overlap glue operations.knowing Types of elements and meshing.knowing Analysis types,static,transient harmonic

Real constant and section properties learning analysis of bar structures and analysis of uniformly distributed beams.Two dimensional elasticity . knowing analysis of axisyemtry problems .Analysis of die castings, heat transfer in two dimensions.tudent to the basic principles of analysis of metallurgical applications with ansys.

9· Learning Outcomes, Teaching ,Learning and Assessment Methode

B- Building integrated projects in terms of interfaces and characteristics and writing equations related to metalworking.

C- How to choose the appropriate cutting tool for metal cutting.

B. The skills goals special to the course.

Design the appropriate number and measure cutting speed and cutting forces by mathematical and graphic methods

Teaching and Learning Methods

1- Using the display screen
2- Discussion
3- Student groups
4- Experiential education
5- Interactive education

Assessment methods

1- Using the display screen
2- Discussion
3- In-class effectiveness
4- Daily exams
5- Semester exams
6- Final exam

C. Affective and value goals
C1- Written exams
C2- Semester exams
C3 - Final exams
C4- Daily assessment

D. General and rehabilitative transferred skills(other skills relevant to employability and personal development)
D1 Verbal communication (the ability to express thinking clearly and confidently in speech)
D2 Teamwork (working with confidence within the group)
D3 Written communication (the ability to express yourself clearly in writing)
D4 Planning and Organizing (the ability to plan and implement activities effectively)

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1-3	9	Learn plotting and drawing and laminator program.	Plotting of experimental data and materials properties in laminator program.	Direct lecture to	surprise exams
4+5	4	Knowing types of elements and meshing	Types of element and meshing	Direct lecture to students	surprise exams
6-8	6	Learn how to consider boundary conditions and solving.	Boundary conditions supports and forces and moments	Direct lecture to students	surprise exams
9+10	4	Learn how to analyse beams and bars	Concentrated beams and uniform loading beams	Direct lecture to students	surprise exams
11-13	6	Knowing the analysis of plane stress and plain strains	Plane stress with two dimension analysis	Direct lecture to students	surprise exams
14+15	4	Heat and fluid analysis using flotran program.	Thermal analysis with insulated edge	Direct lecture to students	surprise exams final examination

11. Infrastructure

1. Books Required reading:	
2. Main references (sources)	

A- Recommended books and references (scientific journals, reports…).	1- **Engineering analysis with ansys software,Yashimoto 2006.** 2- Finite element analysis with ansys,Saeed Moviny 2018.
B-Electronic references, Internet sites…	

12. The development of the curriculum plan
1- Work in conformity with the existing curricula in international universities. 2- Follow up on scientific developments within the global education sector. 3- Scientific communication with the latest scientific developments within the scientific specialization. 4- Using the latest versions of specialized software deals with fluid flow like Ansys. 5- Going towards the latest publications from international scientific sources.

Bio metals

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.

1. Teaching Institution	Babylon University
2. University Department/Centre	The Engineering Materials College / Department of Metallurgy
3. Course title/code	Biometals
4. Modes of Attendance offered	weekly
5. Semester/Year	semester
6. Number of hours tuition (total)	30
7. Date of production/revision of this specification	20/9/2024
8. Aims of the Course: Teaching the students, the metals and alloys that used in the human body and their required properties (mechanical properties, corrosion resistance, wear resistance, etc), and the allowable tolerances for this metals and alloys in the human body and the disadvantages for increasing or decreasing their percentage in the body.	

9· Learning Outcomes, Teaching, Learning and Assessment Method.

A- Cognitive goals

A1. Knowing the types of biomaterials used in the body

A2. Knowing the biggening of metals and alloys using as surgical implants.

A3. Knowing the required biocompatibility for using metals and alloys.

A4. knowing the required properties for using metals and alloys in the body.

A5. Studying the metals and alloys used in the body.

B. The skills goals special to the course.

B1. Acquire skill in determine the properties for each implant.

B2. The capability of metals and alloys selection for each implant application.

B3. The capability of development of alloys for best functional performance.

Teaching and Learning Methods

1- The lecture method

2- The discussion method

Assessment methods

1. The classical discussion during the lecture

2. Make quizzes

3. (oral, monthly and final) examinations to assess the level of students intelligence

C. Affective and value goals

C1. Give hard questions to the students for reaching to the right answers

C2. . Give importance to the subject with respect to time, scientific substance and discipline

C3. Encouragement of right answers & discussion of wrong answers.

Teaching and Learning Methods

1- Using the display screen

2- Discussion

3- Student groups

4- Experimental education

5- Interactive education

Assessment methods

1-direct & abrupt questions

2-large competition inside the class between students for more inducing them on thinking

D. General and rehabilitative transferred skills(other skills relevant to employability and personal development)

D1. Verbal communication
D2. Teamwork
D3. Written communication
D4. planning and organizing

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2	Biomaterials	Introduction to biomaterials	Direct lecture	Give abrupt questions to the students The classical discussion
2	2	Biometals	Introduction to metallic implants	Direct lecture	Give abrupt questions to the students The classical discussion
3	2	Properties of metallic implants	Mechanical properties of metallic implants	Direct lecture	Give abrupt questions to the students The classical discussion
4	2	Properties of metallic implants	Corrosion of metallic implants	Direct lecture	Give abrupt questions to the students The classical discussion
5	2	Types of metallic implants	Stain less steel	Direct lecture	Give abrupt questions to the students The classical discussion
6	2	Types of metallic implants	Shape memory alloys	Direct lecture	Give abrupt questions to the students The classical discussion
7	2	Types of metallic implants	Shape memory effect	Direct lecture	Give abrupt questions to the students The classical discussion

8	2	First month exam			
9	2	Types of metallic implants	CoCr alloys	Direct lecture	Give abrupt questions to the students The classical discussion
10	2	Types of metallic implants	Ti and its alloys	Direct lecture	Give abrupt questions to the students The classical discussion
11	2	Types of metallic implants	Dental metals: Dental amalgam	Direct lecture	Give abrupt questions to the students The classical discussion
12	2	Types of metallic implants	Amalgam Alloy Constituents Effects	Direct lecture	Give abrupt questions to the students The classical discussion
13	2	Types of metallic implants	Gold and its alloys	Direct lecture	Give abrupt questions to the students The classical discussion
14	2	Types of metallic implants	Composite materials	Direct lecture	Give abrupt questions to the students The classical discussion
15	2	Second month exam			

11. Infrastructure	
1. Books Required reading:	1- principal texts 2-methodical books 3-other additional sources

2. Main references (sources)	Biomaterials PRINCIPLES and APPLICATIONS (Edited by JOON B. PARK JOSEPH D. BRONZINO)
A- Recommended books and references (scientific journals, reports…).	BIOMATERIALS
B-Electronic references, Internet sites…	Google, Google Scholar
12. The development of the curriculum plan 1.Work in conformity with the existing curricula in international universities 2.follow up in scientific developments with the global education sector 3.using new applications in mathematical equations and give them to students.	

Surface Engineering

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the program specification.

1. Teaching Institution	Babylon University
2. University Department/Centre	The Engineering Materials College / Department of Metallurgical
3. Course title/code	Surface Engineering
4. Modes of Attendance offered	weekly
5. Semester/Year	semester
6. Number of hours tuition (total)	30
7. Date of production/revision of this specification	1/9/2021
8. Aims of the Course: 1. Understand the importance of surface engineering in engineering components. 2. Recognize surface-dependent properties and failures.	

3. Comprehend the scope and significance of surface engineering.
4. Classify surface engineering techniques based on their characteristics.
5. Understand the scope and general principles underlying surface engineering processes.
6. Identify the various methods of material removal for surface engineering.
7. Explain the principles and techniques employed in cleaning, pickling, etching, and grinding processes.
8. Recognize the role of surface roughness and learn techniques to estimate it.
9. Understand the principles and techniques involved in polishing and buffing.
10. Explore the different methods employed for achieving desired surface finishes.
11. Examine the importance of surface roughness in relation to polishing and buffing.
12. Explain the principle behind hot dipping and its applications.
13. Illustrate examples of hot dipping processes such as galvanizing and aluminizing.
14. Understand the principle of aluminizing and its scope of application.
15. Recognize the benefits and limitations of aluminizing ferrous components.
16. Learn the theory and principles of electrodeposition/plating.
17. Explore the scope of applications for electrodeposition/plating techniques.
18. Understand the theory and principles behind electroless-plating.
19. Recognize the scope of applications for electroless-plating processes.
20. Comprehend the principle of pack carburizing and its applications.
21. Recognize the significance of pack carburizing for modifying steel and ferrous components.
22. Understand the principle of liquid carburizing and its scope of application.
23. Examine the diffusion process involved in liquid carburizing.
24. Explain the principle of gas carburizing and its scope of application.
25. Recognize the diffusion process involved in gas carburizing.
26. Understand the principle of nitriding and its scope of application.
27. Recognize the diffusion process involved in nitriding.
28. Learn the principle and technique of flame hardening for steel components.
29. Understand the scope of applications for flame hardening processes.
30. Understand the principle and technique of induction hardening for steel components.
31. Recognize the scope of applications for induction hardening processes.

9· Learning Outcomes, Teaching ,Learning and Assessment Methode

A- Cognitive goals

1. Understand the importance and scope of surface engineering in relation to engineering components, surface-dependent properties, and failures.
2. Classify surface engineering techniques and define the general principles associated with surface engineering.
3. Comprehend the principles, techniques, and applications of surface engineering by material removal, including cleaning, pickling, etching, grinding, polishing, and buffing.
4. Evaluate the role of surface roughness and estimate surface roughness parameters in surface engineering processes.
5. Explain the principles and applications of surface engineering by material addition from a liquid bath, focusing on hot dipping (e.g., galvanizing and aluminizing).
6. Understand the principle and scope of application of aluminizing as a surface modification technique for ferrous components.
7. Describe the theory and scope of application of electrodeposition/plating as a method of surface engineering by material addition.

Explain the theory and scope of application of electroless plating as a surface engineering technique

B. The skills goals special to the course.

8. Understand the principle and scope of application of pack carburizing as a surface modification method for steel and ferrous components.
9. Explain the principle and scope of application of liquid carburizing, which involves diffusion from the liquid state, as a surface modification technique.
10. Describe the principle and scope of application of gas carburizing, which involves diffusion from the gaseous state, as a surface modification method.
11. Understand the principle and scope of application of nitriding, which involves diffusion from the gaseous state, as a surface modification technique.
12. Explain the process and applications of flame hardening of steels.
13. Describe the process and applications of induction hardening of steels.
14. Understand the general classification, scope, and principles of surface engineering by energy beams, including different types of energy beams and their intensity/energy deposition profiles.

Teaching and Learning Methods

1. Lecture-based Teaching: The instructor can deliver lectures to introduce each topic, covering the key concepts, definitions, principles, and scope of surface engineering. This strategy helps provide a foundation of knowledge and theoretical understanding.
2. Visual Aids and Demonstrations: Visual aids such as slides, diagrams, and animations can be used to enhance understanding of the processes involved in surface engineering. Demonstrations can also be conducted to show practical examples of various techniques, such as cleaning, pickling, grinding, polishing, buffing, hot dipping, electrodeposition, etc.
3. Case Studies and Examples: Real-world case studies and examples can be discussed to highlight the application and significance of surface engineering techniques. This helps students connect theoretical knowledge with practical scenarios and understand the relevance of surface engineering in different industries.
4. Hands-on Laboratory Work: Practical laboratory sessions can be organized where students can directly engage in surface engineering experiments or simulations. This hands-on experience allows students to apply theoretical concepts, work with tools and equipment, and develop practical skills.
5. Group Discussions and Problem Solving: Group discussions and problem-solving sessions can be conducted to encourage active participation and critical thinking. Students can be given specific surface engineering problems or scenarios to analyze and propose suitable solutions. This strategy fosters collaborative learning and improves problem-solving abilities.

Assessment methods

Regular assessments, such as quizzes, assignments, and exams, can be used to evaluate students' understanding and progress. Providing timely feedback helps students identify areas for improvement and reinforces their learning.

C. Affective and value goals

C1. Give hard questions to the students for reaching to the right answers
C2. . Give importance to the subject with respect to time, scientific substance and discipline
C3. Encouragement of right answers & discussion of wrong answers.

D. General and rehabilitative transferred skills(other skills relevant to employability and personal development)

D1. Verbal communication
D2. Teamwork
D3. Written communication
D4.planning and organizing

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2	Introduction:	Engineering components, surface dependent properties and failures, importance and scope of surface engineering.	Direct lecture	Give abrupt questions to the students The classical discussion
2	2	Surface engineering:	classification, definition, scope and general principles.	Direct lecture	Give abrupt questions to the students The classical discussion
3	2	Surface engineering by material removal	Cleaning, pickling,	Direct lecture	Give abrupt questions to the students The classical discussion
4	2	Surface engineering by material removal	Etching, grinding.	Direct lecture	Give abrupt questions to the students The classical discussion
5	2	Surface engineering by material removal	polishing, buffing (techniques employed, its principle). Role and estimate of surface roughness.	Direct lecture	Give abrupt questions to the students The classical discussion
6	2	Surface engineering by material addition	From liquid bath - hot dipping (principle and its application with examples (Galvanizing and aluminizing)).	Direct lecture	Give abrupt questions to the students The classical discussion
7	2	Surface modification of ferrous components	Aluminizing (principle and scope of application).	Direct lecture	Give abrupt questions to the students The classical discussion
8	2	Surface engineering by material addition	Electrodeposition / plating (theory and its scope of application).		
		Surface engineering by material addition:	Electroless-plating (theory and its scope of application).		
9	2	Surface modification of steel and ferrous components	Pack carburizing (principle and scope of application).	Direct lecture	Give abrupt questions to the students The classical discussion
10	2	Surface modification using liquid/molten bath	liquid carburizing (diffusion from liquid state) (principle and scope of application).	Direct lecture	Give abrupt questions to the students The classical discussion
11	2	Surface modification using gaseous medium	Gas carburizing (diffusion from gaseous state) (principle and scope of application).	Direct lecture	Give abrupt questions to the students The classical discussion

12	2	Surface modification using gaseous medium	Nitriding (diffusion from gaseous state) (principle and scope of application).	Direct lecture	Give abrupt questions to the students The classical discussion
13	2	Flame hardening of steels	Flame hardening of steels	Direct lecture	Give abrupt questions to the students The classical discussion
14	2	Induction hardening of steels	Induction hardening of steels	Direct lecture	Give abrupt questions to the students The classical discussion
15	2	Surface engineering by energy beams:	General classification, scope and principles, types and intensity/energy deposition profile.		

11. Infrastructure	
1. Books Required reading:	1- principal texts 2-methodical books 3-other additional sources
2. Main references (sources)	Surface Engineering, ASM Handbook, Volume 5, 9th Edition
A- Recommended books and references (scientific journals, reports…).	Thermochemical Surface Engineering of Steels, Edited by Eric J. Mittemeijer and Marcel A. J. Somers, 2015
B-Electronic references, Internet sites…	https://www.studocu.com/en-gb/document/imperial-college-london/tribology/surface-engineering-summary-notes-for-exam-revision-download-my-onenote-alongside-this-document/14610884
12. The development of the curriculum plan 1.Work in conformity with the existing curricula in international universities 2.follow up in scientific developments with the global education sector 3.using new applications in mathematical equations and give them to students.	

Second Semester
Design of Engineering Materials II
COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.

1. Teaching Institution	University of Babylon
2. University Department/Centre	Scientific Department / Department of Ceramic and Building Materials Engineering
3. Course title/code	**Design of Engineering Materials**
4. Modes of Attendance offered	weekly
5. Semester/Year	Semester/ Fourth
6. Number of hours tuition (total)	45 hrs.
7. Date of production/revision of this specification	2024/9/15
8. Aims of the Course	
The primary objective of this course is to outline the importance of concept generation and selection in decision making exercises in a product development. learn how to finalize the product architecture, determine the shape or form of the parts to attain the requisite functions, and quantify the important design parameters.	

9· Learning Outcomes, Teaching ,Learning and Assessment Methode

- A- Cognitive goals .

Knowledge - Remembering or recalling information about materials data .

- Comprehension - The ability to obtain meaning and understanding from information.
- Application - The ability to use this information in design of mechanical parts.
- Analysis - The ability to break information into parts to understand it better through analysis the design product mechanically and economically.

B. The skills goals special to the course.

By the end of this course, the student will learn

B1) Design strategy of materials and selection of materials for design

B2) Clarify the basic steps in the design process.

B3) Recognize and develop lists of independent and dependent parameters for a mechanical design from which to develop quantitative measures of performance.

B4) Develop optimization equations for selection of materials for defined design projects.

B5) Use methods of design on a base of minimization of conflict between environmental impact, total costs and functional characteristics of new items.

Teaching and Learning Methods

2- Interactive lectures at classes
2- E-learning on campus
3- Scientific trips
5- Workshops
6- Student groups
7- Experiential learning

Assessment methods

7- Monthly Exams
8- oral assessment
9- reports
10- Assignments & other activities.
11- Quizzes (Shock exams).
12- HomeWorks

C. Affective and value goals

C1.

C2.

C3.

C4.

D. General and rehabilitative transferred skills(other skills relevant to employability and personal development) D1. D2. D3. D4.

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	3		**Introduction**	Lecture	Quiz and oral discussion
2	3		**Materials in design**	Lecture	Quiz and oral discussion
3	3		**The design process**	Lecture	Quiz and oral discussion
4	3		**The Environment of Materials Design**	Lecture	Quiz and oral discussion
5	3		**Design tools and materials data**	Lecture	Quiz and oral discussion
6	3		**Design tools and materials data**	Lecture	Quiz and oral discussion
7	3		**Function, material, shape, and process**	Lecture	Quiz and oral discussion
8	3		**Engineering materials and their properties**	Lecture	Quiz and oral discussion
9	3		**Engineering materials and their properties**	Lecture	Quiz and oral discussion
10	3		**Exploring material properties**	Lecture	Quiz and oral discussion
11	3		**Designing hybrid materials**	Lecture	Quiz and oral discussion
12	3		**Designing hybrid materials**	Lecture	Quiz and oral discussion
13	3		**Hybrid case studies**	Lecture	Quiz and oral discussion
14	3		**Hybrid case studies**	Lecture	Quiz and oral discussion
15	3		**statistics in fracture (Weibull Modulus)**	Lecture	Quiz and oral discussion

11. Infrastructure	
1. Books Required reading:	Materials Selection in Mechanical Design by Michael F. Ashby, Third Editiion
2. Main references (sources)	Materials Selection in Mechanical Design by Michael F. Ashby, Third Editiion
A- Recommended books and references (scientific journals, reports…).	(i) J. G. Gerdeen, H. W. Lord and R. A. L. Rorrer, Engineering Design with Polymers and Composites, Taylor & Francis, 2005 (ii) M. F. Ashby and K. Johnson, Materials and Design, Butterworth Publication, 2002 (iii) D.R. Askeland and P.P. Phule, The Science and Engineering of Materials, Thomson Brooks/Cole Publication, 4th edition, 2006
B-Electronic references, Internet sites…	
12. The development of the curriculum plan	

Nanomaterials

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the program specification.

1. Teaching Institution	Babylon University
2. University Department/Centre	The Engineering Materials College / Department of Metallurgical
3. Course title/code	Nano materials
4. Modes of Attendance offered	weekly
5. Semester/Year	semester
6. Number of hours tuition (total)	30
7. Date of production/revision of this specification	20/9/2024
8. Aims of the Course: Teaching the student the properties of nanoparticles and its measuring methods (diameter, shape, density) and the effect of nano size on the physical properties.	

9· Learning Outcomes, Teaching ,Learning and Assessment Methode

A- Cognitive goals

A1. Knowledge what the nanoparticles is.
A2. Knowledge the particle size effect on the properties.
A3. Knowledge the properties which affected by micronization.

B. The skills goals special to the course.

B1. Acquire skill in determine the appropriate particle size ceramic materials sintering.
B2. Acquire skill for relationship between particle size and melting point.
B3. Acquire skill for relationship between particle size and wettability.
B4. Acquire skill in determine the density of nanoparticles.

Teaching and Learning Methods

3- The lecture method
4- The discussion method

Assessment methods

4. The classical discussion during the lecture
5. Make quizzes
6. (oral, monthly and final) examinations to assess the level of students intelligence

C. Affective and value goals

C1. Give hard questions to the students for reaching to the right answers
C2. . Give importance to the subject with respect to time, scientific substance and discipline
C3. Encouragement of right answers & discussion of wrong answers.

Teaching and Learning Methods

6- Using the display screen
7- Discussion
8- Student groups
9- Experimental education
10- Interactive education

Assessment methods

1-direct & abrupt questions
2-large competition inside the class between students for more inducing them on thinking

D. General and rehabilitative transferred skills(other skills relevant to employability and personal development)

D1. Verbal communication
D2. Teamwork
D3. Written communication
D4.planning and organizing

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2	Size effect and properties of nanoparticles	Definition of nanoparticles	Direct lecture	Give abrupt questions to the students The classical discussion
2	2	Size effect and properties of nanoparticles	Features of nanoparticles	Direct lecture	Give abrupt questions to the students The classical discussion
3	2	Size effect and properties of nanoparticles	Evaluation of size of nanoparticles	Direct lecture	Give abrupt questions to the students The classical discussion
4	2	Properties of nanoparticle and size effect	Morphological/structural properties, Thermal properties	Direct lecture	Give abrupt questions to the students The classical discussion
5	2	Properties of nanoparticle and size effect	Electromagnetic properties, Optical properties	Direct lecture	Give abrupt questions to the students The classical discussion
6	2	Properties of nanoparticle and size effect	Mechanical properties, Melting point	Direct lecture	Give abrupt questions to the students The classical discussion
7	2	Properties of nanoparticle and size effect	Wettability, Surface tension	Direct lecture	Give abrupt questions to the students The classical discussion
8	2	First month exam			
9	2	Particle size	Definition of particle size	Direct lecture	Give abrupt questions to the students The classical discussion
10	2	Particle size	Measuring methods	Direct lecture	Give abrupt questions to the students The classical discussion
11	2	Particle shape	Two-dimensional particle projection image Three-dimensional particle image	Direct lecture	Give abrupt questions to the students The classical discussion
12	2	Particle density	Density measurement of	Direct lecture	Give abrupt questions to

			powders composed of nanoparticles		the students The classical discussion
13	2	Specific surface area and pore	Specific surface area and pore	Direct lecture	Give abrupt questions to the students The classical discussion
14	2	Composite structure	Composite structure of nanoparticle	Direct lecture	Give abrupt questions to the students The classical discussion
15	2	Second month exam			

11. Infrastructure	
1. Books Required reading:	1- principal texts 2-methodical books 3-other additional sources
2. Main references (sources)	NANOPARTICLE TECHNOLOGY HANDBOOK
A- Recommended books and references (scientific journals, reports…).	Handbook of NANOSCIENCE, ENGINEERING, and TECHNOLOGY
B-Electronic references, Internet sites…	Google, Google Scholar
12. The development of the curriculum plan 1.Work in conformity with the existing curricula in international universities 2.follow up in scientific developments with the global education sector 3.using new applications in mathematical equations and give them to students.	

Plasticity and Metals Forming:

University of Babylon/College of Materials Engineering

Department of Metallurgical Engineering

Class: 4 (2024-2025)

Subject: Plasticity and Metal Forming Prof. Dr. Saad Hameed Al-Shafaie

Theoretical Hours: 3 Units: 3

Week No.	Theoretical Program
1.	Stress - strain relations
2.	Theoretical equations relate the stress with strain
3.	Flow curves and strain hardening
4.	Effect of strain rate, temperature and the hydrostatic pressure on the mechanical behavior of metals
5.	Effect of strain rate, temperature and the hydrostatic pressure on the mechanical behavior of metals
6.	Temperatures of and recrystallization
7.	Classification of forming according to temp. and strain rate
8.	Plastic deformation and temp
9.	rising in metal forming
10.	Types of forming and formability, Effect of friction and lubrication on metal forming Effect of friction and lubrication on metal forming
11.	Wire drawing and the factors effect on it ; reduction and deformation (uniform and non-uniform), determination of force and work with and without of friction, Super plus work and defects in wire drawing
12.	Deep drawing: equipments, variables and determination of force and works, Factors affecting the LDR; and drawing defects
13.	Types of extrusion, Determination of force and works for extrusion and extrusion defects
14.	Rolling; types and main variables, determination of 1-force and works for rolling with and without of external tension, 2- max. reduction, Rolling defects
15.	Types of forging, Determination of forging force and Forging defects

2nd Semester	
Course Objectives	It is not hidden from many workers in the industrial field the major role of forming operations in many different industrial sectors, nor is it hidden from any specialist in them. Therefore, some subjects related to this science are taught in materials engineering and some other engineering departments, such as forming technology. However, none of these or other subjects have addressed a very important topic in the industrial field, which is metal forming. Therefore, the newly appointed engineer in some industrial sectors is surprised that the work required of him is designing forming machines, which was not focused on throughout his years of study.
Basic details of the subject	Forming any metal requires taking into account certain principles to achieve the desired goal of the formed joint, as the reasons for the failure that occurs in the formed joint are due to a group of factors that may not include the forming method used or the choice of the material to be formed, as many of the causes of the failure of the formed material are due. Designing any formed material requires knowledge of many things, including the determinants of the methods and techniques of forming operations, the problems resulting from the process itself and related to the deformations of the formed material and how to treat it, the suitability and availability of the metals used in the design, knowledge of calculating the size of the formed material and its suitability to the working conditions, the total cost of forming, and others. The design engineer may be ignorant or negligent in his applications of the basic design principles that facilitate the production of formed metal products. It is possible to obtain improved quality accompanied by reducing the cost by intelligently utilizing the design principles related to the forming process.
Textbooks	---------
External sources	1-K.P.Sinha & S.C.Prasad, "Theory of Metal Forming and Metal Cutting"1979. 2-Trent E.M., "Metal Cutting"1984. 3-B.L.Juneja & G.S.Sekhon, "Fundamentals of Metal Cutting and Machine Tools"1987.

	4- Sandvik Coromant "Modern Metal Cutting – a practice handbook"1994. 5-P.N.Rao,"Manufacturing Technology (Metal Cutting & Machine Tools)"2004. 6-S.Kalpakjian & S. Schmid, "Manufacturing Processes for Eng. Materials"2008. 7-T.Childs &Others, "Metal Machining, Theory and Applications"2000.				
Quick Exams	3				
Monthly exams	1				
Chapter Estimates	Daily activity	First monthly exam	Second monthly exam	Quick Exams	Final Exam
	5	15	15	5	50

Welding Metallurgy

Course Description

This course description provides a concise summary of the main features of the course and the learning outcomes expected of the student, demonstrating whether the student has made the most of the learning opportunities available. It must be linked to the programme description.

1. Educational institution	University of Babylon
2. University department/center	Department of Metallurgical Engineering / College of Materials Engineering
3. Course name/code	Welding Metallurgy
4. Programs in which it is included	Bachelor's
5. Available forms of attendance	Weekly

6. Semester/year	Semester
7. Number of study hours (total)	15
8. Date this description was prepared	17-9-2024

9. Course objectives:

1- Weldability: Learn about the factors that influence weldability, including material selection, joint design, and welding procedure parameters. Understand the concept of weldability and its application to different materials, such as carbon steels, stainless steels, aluminum alloys, and other metals.

2- Phase Transformations: Explore the phase transformations that occur during welding, including solidification, heat-affected zone (HAZ) formation, and fusion zone development. Understand the microstructural changes and mechanical properties associated with these transformations.

3- Welding Defects: Identify and analyse common welding defects, such as porosity, cracking, lack of fusion, and excessive distortion. Understand the metallurgical factors that contribute to these defects and develop strategies to minimize or prevent their occurrence.

4- Heat Affected Zone (HAZ): Study the microstructural changes and mechanical property variations in the HAZ resulting from the thermal cycle experienced during welding. Understand the concept of HAZ hardness and its implications on weld integrity and performance.

5- Weld Metal Microstructure: Examine the microstructure of the weld metal and its relationship to the welding process parameters, cooling rates, and alloy composition. Learn about the influence of microstructure on mechanical properties, such as strength, toughness, and corrosion resistance.

10. Learning outcomes, teaching and learning methods and assessment

1. Understanding of Weldability: Gain knowledge about the factors affecting weldability, such as material selection, joint design, and welding parameters.
2. Familiarity with Phase Transformations: Comprehend the phase transformations that occur during welding, including solidification, HAZ formation, and fusion zone development.

3. Identification and Analysis of Welding Defects: Develop the ability to identify and analyse common welding defects, their causes, and preventive measures.

4. Knowledge of Heat Affected Zone (HAZ): Understand the concept of HAZ, its significance in weld integrity, and its influence on material properties.

5. Understanding of Weld Metal Microstructure: Acquire knowledge of weld metal microstructures and their relationship to welding process parameters, alloy composition, and mechanical properties.

Subject-specific skills

1. Weldability:

Factors influencing weldability, such as material properties, joint design, and welding parameters

Selection of appropriate welding processes for different materials

2. Phase Transformations in Welding:

Solidification and grain structure development during welding

Heat-affected zone (HAZ) formation and its characteristics

Fusion zone and weld metal microstructure

4. Welding Defects and Their Metallurgical Causes:

Common welding defects, including porosity, cracks, lack of fusion, and distortion

Metallurgical factors leading to welding defects

Prevention and mitigation strategies for welding defects

5. Heat Affected Zone (HAZ) and its Metallurgical Characteristics:

HAZ microstructure and its relationship to welding parameters and material properties

HAZ hardness and its implications for weld integrity and performance

Heat treatment techniques for controlling HAZ properties

6. Weld Metal Microstructure and Mechanical Properties:

Influence of welding parameters and cooling rates on weld metal microstructure

Relationship between weld metal microstructure and mechanical properties (e.g., strength, toughness,

and corrosion resistance) Effect of alloying elements on weld metal properties
Teaching and learning methods
Delivering lectures using discussion method Using the board Using e-learning Showing models Video
Assessment Methods
Short Exam Homework Distributing short topics to enable the student to discuss them
Thinking skills 1- Conduct a short exam to know the extent of benefit from the lecture 2- Ask intellectual questions and identify students with high ability to follow the lecture and what is related to the subject 3- Know the percentage of benefit students have from the lecture - a referendum at the end of each lecture and diagnosing the defect
General and transferable skills (other skills related to employability and personal development). 1- Raise a problem related to the industry and how to solve it

11. Course structure

Assessment Method	Teaching Method	Name of Unit/Course or Topic	Required Learning Outcomes	Hours	Week
Discussion-Quiz-Homework	Class lecture	•Overview of welding processes •Introduction to metallurgy and its importance in welding •Basic principles of welding metallurgy •Types of welding joints and their characteristics	Introduction to Welding Metallurgy	2	1
=	=	•Welding heat sources and their characteristics •Heat transfer during welding •Influence of welding parameters on heat input •Heat-affected zone (HAZ) and its significance	Welding Processes and Heat Transfer	2	2
=	=	Common welding defects and their causes •Non-destructive testing (NDT) methods for weld inspection •Visual inspection and quality control in welding Introduction to destructive testing techniques	Welding Defects and Inspection	2	3
=	=	•Microstructures of carbon and low-alloy steels •Effect of welding on steel microstructures •Heat-affected zone (HAZ) in carbon and low-alloy steels consumables and their selection for Welding carbon and low-alloy steels	Welding Metallurgy of Carbon and Low-Alloy Steels	2	4
=	=	Stainless steel classifications and properties •Weldability of stainless steels •Austenitic, ferritic, and martensitic stainless steel weldments Selection of filler metals for stainless steel •welding	Welding Metallurgy of Stainless Steels	2	5
=	=	•Aluminum and its alloys: properties and classifications •Aluminum weldability and common challenges •Solidification and cracking behavior in aluminum welds •Filler metal selection for aluminum welding	Welding Metallurgy of Aluminum and Its Alloys	2	6
=	=	•Copper and its alloys •Nickel and its alloys •Titanium and its alloys Welding considerations for nonferrous metals	Welding Metallurgy of Nonferrous Metals	2	7
=	=	•Challenges in welding dissimilar metal joints •Compatibility issues and material selection •Microstructural changes in dissimilar metal welds Joining techniques for dissimilar metal combinations•	Welding Metallurgy of Dissimilar Metal Joints	2	8
=	=	•Weldability of castings •Microstructural features in welded castings •Joining heat-resistant alloys Post-weld heat treatment considerations•	Welding Metallurgy of Castings and Heat-Resistant Alloys	2	9
=	=	•High-strength steel classifications and properties •Weldability challenges and precautions •Microstructural changes in high-strength steel welds Preheating and post-weld heat treatment requirements	Welding Metallurgy of High-Strength Steels	2	10

=	=	•Overlay and cladding processes •Metallurgical considerations in weld overlay •Cladding materials and their properties •Microstructural analysis of overlay and cladding deposits	Welding Metallurgy of Weld Overlay and Cladding	2	11
=	=	•Challenges in welding aluminum to steel •Joining methods and filler material selection •Intermetallic phase formation and its effects Post-weld mechanical properties and testing	Welding Metallurgy of Welding Aluminum to Steel	2	12
=	=	•Overview of plastic and composite welding •Joining methods for plastics and composites •Welding parameters and their effects Microstructure and performance of welded plastic/composite joints	Welding Metallurgy of Plastics and Composites	2	13
=	=	•Introduction to advanced materials (e.g., superalloys, refractory metals) •Welding challenges and considerations for advanced materials •Microstructural features and properties of advanced material welds Emerging trends in welding advanced materials	Welding Metallurgy of Advanced Materials	2	14
=	=	•Recap of key concepts and topics •Practice exercises and problem-solving sessions •Final exam review and preparation Note: This syllabus provides a general outline and can be customized based on the specific needs of the course and the available time. It's essential to incorporate practical lab sessions, assignments,	Review and Final Exam Preparation and student engagement activities to complement the theoretical aspects of welding metallurgy.	2	15

12. Infrastructure	
Any book titled: Welding Metallurgy	:Required readings □ Core texts □ Course books □ Other
	Special requirements (including, for example, workshops, periodicals, software, websites)
	Social services (including, for example, guest lectures, vocational training, field studies)

13. Central admission - evening

Scientific secondary school graduate	Prerequisites
20	Minimum number of students
40	Maximum number of students

English Language

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.

1. Teaching Institution	Babylon University
2. University Department/Centre	The Engineering Materials College / Department of Metallurgical
3. Course title/code	English
4. Modes of Attendance offered	weekly
5. Semester/Year	semester
6. Number of hours tuition (total)	60
7. Date of production/revision of this specification	20/9/2024
8. Aims of the Course:	

Knowing all tense in the English language, knowing the difference between the present perfect simple and the present perfect continuous. Knowing the main verbs and auxiliary verbs. Knowing the modal auxiliary verbs and using them in request, permission, refusal.

9· Learning Outcomes, Teaching ,Learning and Assessment Methode

A- Cognitive goals

A1.Knowing the principles of the English lanuag

A2. Knowing the progress in the English language

A3:knowing the manner of speaking in the English language

B. The skills goals special to the course.

B1. Acquire skill in using the appropriate tenses in speak.

B2. Complete knowing in writing the paragraphs

B3. Acquire expertise in choosing the appropriate composite verbs

Teaching and Learning Methods

5- The lecture method

6- The discussion method

Assessment methods

7. The classical discussion during the lecture

8. Make quizzes

9. (oral, monthly and final) examinations to assess the level of students intelligence

C. Affective and value goals

C1. Give hard questions to the students for reaching to the right answers

C2. . Give importance to the subject with respect to time, scientific substance and discipline

C3. Encouragement of right answers & discussion of wrong answers.

Teaching and Learning Methods

11- Using the display screen

12- Discussion

13- Student groups

14- Experimen

tal education
15- Interactive education

Assessment methods

1-direct & abrupt questions
2-large competition inside the class between students for more inducing them on thinking

D. General and rehabilitative transferred skills(other skills relevant to employability and personal development)

D1. Verbal communication
D2. Teamwork
D3. Written communication
D4.planning and organizing

10. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1-2	4	Knowing the English tenses	Introduction and classification of tenses	Direct lecture	Give abrupt questions to the students The classical discussion
3-4	4	The main verbs and auxiliary verbs	how can use the main and auxiliary verbs	Direct lecture	Give abrupt questions to the students The classical discussion
5-6	4	Using the present perfect	Solving exercises about the difference between present perfect and continues	Direct lecture	Give abrupt questions to the students The classical discussion
7-8	4	Using Narrative tenses	Exercise about present simple and present perfect	Direct lecture	Give abrupt questions to the students The classical discussion
9-10	4	Using the simple past and continuous past	Exercises about the simple past and past perfect	Direct lecture	Give abrupt questions to the students The classical discussion
11-12	4	How can make questions	Negative question and Tail questions	Direct lecture	Give abrupt questions to the students The classical discussion
13-14-15	6	Using the future tenses	Exercises about the tenses in future	Direct lecture	Give abrupt questions to the students The classical

					discussion
16-17-18	6	Expressing the quantity	Classification the count and uncounted nouns	Direct lecture	Give abrupt questions to the students The classical discussion
19-20	4	Using modal auxiliary verbs	Using auxiliary verbs in different sentences	Direct lecture	Give abrupt questions to the students The classical discussion
21-22	4	The relative sentences	The defining relative sentences and non defining relative sentences	Direct lecture	Give abrupt questions to the students The classical discussion
23-24	4	Expressing the habits	Knowing the good habits and bad habits	Direct lecture	Give abrupt questions to the students The classical discussion
25-26	4	Using if	Three condition in using if	Direct lecture	Give abrupt questions to the students The classical discussion
27-28	4	adjectives	Using the adjectives	Direct lecture	Give abrupt questions to the students The classical discussion
29-30	4	Adverbs and prepositions	The uses of adverbs and prepositions	Direct lecture	Give abrupt questions to the students The classical

					discussion

11. Infrastructure	
1. Books Required reading:	1- principal texts 2-methodical books 3-other additional sources
2. Main references (sources)	New headway plus(Liz and John Soars)-Oxford
A- Recommended books and references (scientific journals, reports…).	New headway plus (Liz and John Soars)Work Book
B-Electronic references, Internet sites…	Google, Google Scholar
12. The development of the curriculum plan 1.Work in conformity with the existing curricula in international universities 2.follow up in scientific developments with the global education sector 3.Using new paragraphs in the metallurgical and give them to students.	