



كلية هندسة المواد/قسم هندسة المعادن
الوصف الاكاديمي



Description of Academic Program & Syllabus Department of Metallurgical Engineering College of Materials Engineering

وصف البرنامج الاكاديمي
و المقرر الدراسي



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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



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Other External Influences	Practical Training in factories and companies
Date of Description Preparation	9/2/2025
Date of File Completion	9/3/2025



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Academic Program Description Form

University Name: University of Babylon

Faculty/Institute: Faculty of Materials Engineering

Scientific Department: Metallurgical Engineering

Academic or Professional Program Name: Bs.C.

Final Certificate Name: Bs.C. Metallurgical Engineering

Academic System: Semestral

Description Preparation Date: 25\9\2025

File Completion Date: 11 \5\2026

Signature:

Head of Department

Name: Basem Al-Zubaidy

Date:

Signature:

Scientific Associate

Name: Auda Jabbar Braihi

Date:

The file is checked by:

Department of Quality Assurance and University Performance :Raed Hussein Alwan
Director of the Quality Assurance and University Performance Department:

Signature:

Approval of the Dean
Abdel Al-Rahem K. Abed Ali

Date: 17/5/2026



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:

- Preparing engineering cards capable of working in factories, laboratories, and companies.
- Promoting scientific research and discussing matters related to engineering applications.
- Meeting the needs of the labor market through creative engineering skills.

2.Specific Objective:

- Developing engineering skills and innovation.
- Introduce students to metallurgical engineering and its importance.
- Instilling ethical and professional values in engineering work.
- 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 |



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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 & Third Stage according to Bologna System

Fourth Stage

Stage	Code	Course Name	Credit Hours	
			Th	Pr
Fourth Stage	Me Mt Ds441111(3,2)	Design and Selection of Engineering Materials I	3	2
	MeMtCp441212(2,2)	Casting Processes	2	2



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	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	
2A	Knowledge the basics of materials and types in general and minerals in particular	



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3A	Studying and knowing the engineering of materials of all kinds and their field of application	Comprehensive understanding of all properties and characteristics of materials and especially of metals and new alloys
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	
<p>A. Interactive Lectures: Using modern tools like PowerPoint</p> <p>B. Group Discussions: Encouraging students to discuss engineering questions</p> <p>C. Practical Projects: Using digital platforms and tools for interactive learning</p> <p>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</p>	<p>A. Laboratories Assays: Training the students to use accurate methods for experimental work</p> <p>B. Exercises for Making Samples: Participating students in manufacturing alloys in different methods as casting, powder metallurgy</p> <p>C. Teamwork: Group of students are organized to discuss the latest engineering matters</p> <p>D. Seminars: Seminars are set between students and faculty members to exchange ideas and discuss engineering problems</p>



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

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		Permanent	Temporary	
12	Haydar Abdulhassan Hussain Al-Ethari	Prof.	Mechanic Eng.	Cutting Metals			√	
3	Ahmed O. Al-Roubaiy	Prof.	Mat. Eng.	Met. Eng /Welding Eng.			√	



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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	Haydar Hassan Jaber	Prof.	Met. Eng.	Biometals			√	
10	Ekbal mohammed saeed	Prof.	Met. Eng.	Met. Eng. /Intelligent Alloys			√	
11	Nawal Mohammed Dawood	Prof.	Mat. Eng.	Advanced Biometals			√	
12	Abdulsameea Jasim Abdulzehra Alkilabi	Prof.	Mat. Eng.	Met. Eng /Welding &Met. Eng.			√	
13	Zuheir Talib Khulief	Prof.	Mat. Eng.	Met. Eng.			√	
14	Nabaa Sattar Radhi	Prof.	Mat. Eng.	Met. Eng.			√	
15	Basem Mohysen Mohammed Zubaidy	Ass. Prof.	Mat. Eng.	Met. Eng.			√	
16	Zaineab Fadhil Kadhim	Ass. Prof.	Mat. Eng.	Met. Eng. /Thermodynamic			√	
17	Khalid M. Al-Janabi	Ass. Prof.	Met. Eng.	Met. Eng.			√	
18	Ayad Mohammed Nattah	Ass. Prof.	Mat. Eng.	Met. Eng.			√	



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19	Baraa Hasan Hadi	Ass. Prof.	Mat. Eng.	Met. Eng.			√	
20	Nagham Yass Khudair	Lect.	Mechanic Eng.	Thermally			√	
21	Wafa Mahdi jodia	Lect.	Mechanic Eng.	Production Eng.			√	
22	Hussein Fawzy Mahdy	Lect.	Prod. Eng. & Metallurgy	Prod. Eng			√	
23	Muqdad Jaber	Lect.	Mat. Eng.	Met. Eng.			√	
24	Rula Sami Khudhair	Lect.	Computer Eng.	Artificial Intelligence & Robotics			√	
25	Zaineb Fouad hamza	Lect.	Mat. Eng.	Met. Eng.			√	
26	Ruaa Hatem Kadhim	Lect.	Mat. Eng.	Met. Eng.			√	
27	Shahad Ali Hammood	Lect.	Mat. Eng.	Met. Eng.			√	
28	Qabas Khalid Naji	Lect.	Mat. Eng.	Met. Eng.			√	
29	Osama Ihsan Ali	Lect.	Mat. Eng.	Met. Eng.			√	
30	Zainab Abidulellah	Lect.	Mat. Eng.	Met. Eng.			√	
31	Walaa Amer Mughir	Lect.	Mechanic Eng.	Applied Mechanics			√	
32	Khaldun Emad Fadhel Aldawoudi	Ass. Lect.	Mat. Eng.	Met. Eng.			√	
33	Kwther Yehya	Ass. Lect.	Mat. Eng.	Met. Eng.			√	
34	Manar Assaf	Ass. Lect.	Mat. Eng.	Met. Eng.			√	
35	Saleh Sabah AL-Turaihi	Ass. Lect.	Mat. Eng.	Met. Eng.			√	



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36	Rafaah Ibrahim Jabaar	Ass. Lect.	Electric. Eng.	Power			√	
37	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,



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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



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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
C4	C3	C2	C1	B4	B3	B2	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 Option(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/ Second Semester
			*	*			*	*	*	*	*	C	Corrosion engineering(II)	MeMtCe332222(2,2)	
*	*			*	*					*	*	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 materials	MeMtEb331515(2,0)

Values	Skills	Knowledge	Core(C) or Option(O)	Course Name	Course Code	Year
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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/L evel	
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	MeMtWm4422 22(2,2)	
	*	*				*	*	*	*				C	Metallurgy applications by computer(II)	MeMtCa44252 5(1,2)	
*	*	*	*	*	*	*	*	*	*		*		C	Industrial engineering &quality control(II)	MeMtIq44262 6(3,0)	

*	*			*	*					*	*	C	Surface engineering	MeMtSe441414(2,2)
	*	*						*				C	English language(II)	
*				*	*					*	*	C	Nano-materials technology	MeMtNt442424(2,2)
*	*		*	*			*	*	*	*	*	C	Engineering project	MeMtEp441717(2,4)

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 engineering 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—multiple constraints and conflicting objectives	Lecture	Quiz and oral 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 Edition
2. Main references (sources)	Materials Selection in Mechanical Design by Michael F. Ashby, Third Edition
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:	
<ol style="list-style-type: none">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 to 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 casting 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 their 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 with 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 factors such as mechanical properties, thermal conductivity, corrosion resistance, and cost.
2. **Casting Process Knowledge:** Understanding various casting processes (e.g., sand casting, 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 tools.
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 design considering material consumption, processing, and additional finishing operations.
7. **Knowledge of Heat Treatment:** Understanding the effects of heat treatment on casting 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, including allowances for machining or finishing processes, and addressing issues like surface roughness.
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 potential 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	<p>Required readings:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Core texts <input checked="" type="checkbox"/> Course books <input checked="" type="checkbox"/> Other
	<p>Special requirements (including, for example, workshops, periodicals, software, websites)</p>

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 studies are done. knowing Finite element and finite difference methods. learning Drawing: key points, lines, areas Volumes: 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 axisymetry problems . Analysis of die castings, heat transfer in two dimensions. student to the basic principles of analysis of metallurgical applications with ansys.

9. Learning Outcomes, Teaching ,Learning and Assessment Methode

- A- Building integrated projects in terms of interfaces and characteristics and writing equations related to metalworking.
- B- 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
<p>12. The development of the curriculum plan</p> <p>1. Work in conformity with the existing curricula in international universities</p> <p>2. follow up in scientific developments with the global education sector</p> <p>3. using new applications in mathematical equations and give them to students.</p>	

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
<p>8. Aims of the Course:</p> <p>1. Understand the importance of surface engineering in engineering components.</p> <p>2. Recognize surface-dependent properties and failures.</p>	

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

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- principal texts 2-methodical books 3-other additional sources			
		Surface Engineering, ASM Handbook, Volume 5, 9th Edition			
		Thermochemical Surface Engineering of Steels, Edited by Eric J. Mittemeijer and Marcel A. J. Somers, 2015			
		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	<p>The primary objective of this course is to outline the importance of concept generation and selection in decision making exercises in a product development.</p> <p>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.</p>

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 Edition
2. Main references (sources)	Materials Selection in Mechanical Design by Michael F. Ashby, Third Edition
A- Recommended books and references (scientific journals, reports...).	<p>(i) J. G. Gerdeen, H. W. Lord and R. A. L. Rorrer, Engineering Design with Polymers and Composites, Taylor & Francis, 2005</p> <p>(ii) M. F. Ashby and K. Johnson, Materials and Design, Butterworth Publication, 2002</p> <p>(iii) D.R. Askeland and P.P. Phule, The Science and Engineering of Materials, Thomson Brooks/Cole Publication, 4th edition, 2006</p>
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
Shafaie

Prof. Dr. Saad Hameed Al-

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	<p>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.</p>
Basic details of the subject	<p>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.</p> <p>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.</p> <p>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.</p>
Textbooks	-----
External sources	<ol style="list-style-type: none">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	<ul style="list-style-type: none"> •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
=	=	<ul style="list-style-type: none"> •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 <ul style="list-style-type: none"> •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
=	=	<ul style="list-style-type: none"> •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 <ul style="list-style-type: none"> •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
=	=	<ul style="list-style-type: none"> •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
=	=	<ul style="list-style-type: none"> •Copper and its alloys •Nickel and its alloys •Titanium and its alloys Welding considerations for nonferrous metals	Welding Metallurgy of Nonferrous Metals	2	7
=	=	<ul style="list-style-type: none"> •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
=	=	<ul style="list-style-type: none"> •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
=	=	<ul style="list-style-type: none"> •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

=	=	<ul style="list-style-type: none"> •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
=	=	<ul style="list-style-type: none"> •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
=	=	<ul style="list-style-type: none"> •Overview of plastic and composite welding •Joining methods for plastics and composites •Welding parameters and their effects <p>Microstructure and performance of welded plastic/composite joints</p>	Welding Metallurgy of Plastics and Composites	2	13
=	=	<ul style="list-style-type: none"> •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
=	=	<ul style="list-style-type: none"> •Recap of key concepts and topics •Practice exercises and problem-solving sessions •Final exam review and preparation <p>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,</p>	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	<p>:Required readings</p> <ul style="list-style-type: none"> <input type="checkbox"/> Core texts <input type="checkbox"/> Course books <input type="checkbox"/> 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 language

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- display screen

Using the

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

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.

